

South Sudan: An Infrastructure Action Plan

A Program for Sustained Strong Economic Growth



AFRICAN DEVELOPMENT BANK GROUP

South Sudan: An Infrastructure Action Plan

A Program for Sustained Strong Economic Growth

Foreword

We are privileged to present the Infrastructure Action Plan (IAP) for South Sudan. This flagship report is the outcome of an exemplary intensive and rich dialogue with the Government of the Republic of South Sudan (GRSS), Development Partners and other key Stakeholders, including the private sector.

South Sudan became officially independent on 9 July 2011. It is the newest African country faced with not only unique challenges, but also opportunities. The economic base is currently narrow, with a heavy dependence on the oil sector. The country has undergone decades of war, underdevelopment and other calamities that contributed to the fragility of its institutional, economic and social structures. The country has one of the lowest social development indicators in Africa.

At the same time, South Sudan is endowed with abundant natural resources, including a large amount of mineral resources, aquatic and forest resources as well as fertile rain-fed agricultural land that is potentially irrigable to allow all-year cropping. The most pressing challenge of South Sudan is the urgent need for State building in a context of persistent internal and external threats to peace and security.

We share the view that the country will need to diversify its economy and promote inclusive growth, by improving the management of oil resources, building the requisite institutional capacity and continuously working towards creating the conditions for internal cohesion and regional stability. In this regard, rehabilitating and developing the dilapidated infrastructure offer great opportunities.

In this context, the IAP should be seen as part of the broader Bank's contribution to peace and state building efforts in South Sudan and the region. This flagship report is also part of a series of analytical work designed to strengthen the Bank's knowledge base in order to effectively assist Regional Member Countries (RMCs), particularly those in fragile situations. The IAP represents a key instrument for planning and programming, resource mobilization, policy dialogue and aid coordination for infrastructure development.

It is our hope that the IAP will go a long way in serving these overarching objectives, as it has already been used as a key guiding tool in the preparation of the South Sudan Development Initiative (SSDI), the successor to the South Sudan National Development Plan (SSDP).

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South Sudan: An Infrastructure Action Plan - A Program for Sustained Strong Economic Growth

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Preface

At the request of the Government of the Republic of South Sudan (GRSS), the African Development Bank Group (AfDB) has provided assistance in preparing this flagship Infrastructure Action Plan (IAP) aimed at putting in place an effective instrument for all stakeholders in the collective effort to provide the necessary full-fledged support to address the country's development challenges.

As early as in late 2010, the AfDB initiated work to assist the Government in preparing detailed needs assessments in agriculture and infrastructure sub-sectors (energy, transport, water and sanitation, and ICT). The validation workshop of the draft reports took place in Juba in September 2011. The Bank was further requested to build on the work done to fast-track the preparation of an Infrastructure Action Plan (IAP) for South Sudan for the decade ahead. The first draft of the IAP was completed in February 2012, and validated in July 2012 in Juba at a national stakeholders' workshop attended by several participants from the GRSS, relevant sectors, civil society and other development partners.

The new Republic of South Sudan (RSS) is classified as a post-conflict country. South Sudan is characterized by a very high degree of socio-economic fragility, with weak institutional and human capacities and one of the lowest social development indicators in Africa. The political, security, economic and social situations have remained fragile. The country has also a narrow economic base, with a heavy dependence on the oil sector. In this context, the dilapidated infrastructure, mainly as a result of decades of war, has been identified as the most binding constraint for economic diversification and inclusive private sector-led growth and productive employment. Infrastructure development can also help address the most pressing challenge of South Sudan, namely the urgent need for peace and state building, including accommodating the high expectations of the population for peace dividend through job creation and improved livelihood.

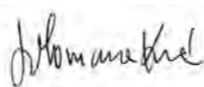
Peace and stability remain key prerequisites to addressing vigorously the infrastructure bottlenecks. The IAP, however, does not dwell on the volatility of the political and security landscape in South Sudan. It takes the position that infrastructure development in South Sudan will primarily require sustained and concerted efforts in addressing medium to long term structural, human and institutional factors, including devising appropriate financing arrangements. As long as these factors are not adequately dealt with, they will remain valid and persist over time.

The IAP proposes a major program for the development of basic infrastructure in the decade ahead that, in conjunction with a range of other initiatives aimed at building human capacities and labor force skills and strengthening institutions, would provide the basis for a transition to economic growth in the range of 9% a year in real terms in the non-oil economy.

The IAP analyzes the underlying institutional and other structural issues and factors of the economy of South Sudan. It presents appropriate and pragmatic structural and sustainable responses, with medium to long term perspectives. The proposed program takes into account the need for the endogenous development of domestic institutions and supply factors and conditions. The IAP considers a 10-year period, using 2010 as the base year. The implicit assumption made at the time of drafting the IAP was that the GRSS would be in a position to roll out its program of infrastructure development in the context of implementing its first South Sudan National Development Plan (SSDP) 2011-2013, following the independence in July 2011.

The proposed funding arrangement in the IAP involves the Government for more than 50% of the total requirements, while donors and the private sector will fill the remaining gap. At the time that this Report was drafted, there was no agreement between South Sudan and Sudan on the arrangements for sharing income from oil fields currently in production. The IAP report has, therefore, set out scenarios of possible outcomes ranging from an arrangement in which the national government of South Sudan receives 80% of the net oil income (scenario A: High Growth Case) to two other alternative scenarios (B and C) whereby the net receipt represents 96% and 69%, respectively. On the basis of the agreement on oil reached in September 2012 between the two countries, scenario A seems most likely.

We believe the IAP will definitely contribute to consolidating the AfDB's leadership role in collaborating with key stakeholders and assisting the GRSS in the design and implementation of infrastructure development in South Sudan.



Solomane Kone
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Acknowledgments

The Infrastructure Action Plan (IAP) Flagship Report for South Sudan was prepared by a team of staff and consultants from the African Development Bank Group (AfDB) led by Solomane Kone, Lead Economist in the Regional Department East 2 (OREB). The AfDB staff in the dedicated core team was comprised of: Mr. Abdul Kamara, Resident Representative (SDFO), Mr. Suwareh Darbo, Principal Economist (OREB), Mr. Andoh Mensah, Principal Country Program Officer (SDFO), Mr. Girma B. Bezabeh, Principal Transport Engineer (OITC.2), Mr. Boniface Aleobua, Principal Sanitation Engineer (OWAS.2), Mr. Engedasew Negash, Division Manager (ONEC.2), Mr. Lawal Umar, Principal Livestock Expert (OSAN.1) and Mr. Enock Yonazi, Principal ICT Expert (ICT4D). Mr. Abdul Kamara and Mr. Andoh Mensah are particularly acknowledged for the coordination work accomplished on the ground before the official full establishment of the South Sudan Field Office (SSFO). Upon taking up their respective duties in the newly-established SSFO, Mr. Jeremiah Mutonga (Resident Representative), Mr. Dejene Demissie (Principal Country Program Officer), and Mr. Joseph Muvawala (Chief Country Economist) have been instrumental in critical steps towards finalising the IAP, including the stakeholder validation workshop. Other members of the wider South Sudan Task Force also provided valuable comments and assistance in the process, namely Ms. Senait Assefa, Principal Resource Mobilization Officer (ORMU), Mr. James Wahome, Lead Economist (OSFU), Ms. Faith Kamau, Legal Expert (GECL.1) and Ms. Nana-Efua Spio-Garbrah, Young Professional (ORVP), Mr. Nyende Magidu (Senior Economist). Mr. Daniel Ugwoke, Team Assistant (OREB) provided excellent administrative support, including during the validation workshop of the infrastructure subsector needs assessments.

The team was assisted by consultants, namely Mr. Russell Cheetham, Lead Consultant, main coordinator and author to several chapters of the IAP, Mr. Felix Ndukwe (Agriculture), Mr. Andrian Rakotobe (Transport), Mr. Bizuneh Fikru (Power), Mesfin Abebe (Water and Sanitation), and Ms. Dorothy Okello (ICT). Mr. Timothy Wasswa edited the final manuscript and coordinated the final production of the report. The consulting firm, MK Mazrui and Associates was assigned the task of preparing provisional income statements for public entities that currently have responsibilities for infrastructure assets and or provision of infrastructure services in South Sudan, referred to as quasi State Owned Enterprises (SOEs).

The IAP Report benefitted from the general direction provided by Mr. Steve Kayizzi-Mugerwa, former Director of OREB. The IAP Report and the South Sudan Task Force also benefitted from the leadership and guidance provided by Mr. Aloysius U. Ordu, former Vice-President Country and Regional Programs and Policy (ORVP) from the very beginning of the long journey towards completing this IAP. The team also wishes to express its appreciation to Mr. Zondo Sakala, currently Vice-President ORVP for his encouragement, and support in ensuring seamless continuity in the final stages of completing the IAP. He is also acknowledged for his guidance and support in initiating numerous related activities to ensure effective implementation going forward.

A special appreciation goes to the Government of the Republic of South Sudan (GRSS) for the trust in the AfDB by requesting, at a very early stage prior to the official independence of the country, its expertise and advice in building the new State and co-leading the Economic Development Pillar of the South Sudan National Development Plan (SSDP), with particular emphasis on infrastructure and aid coordination. By late 2010, the AfDB had initiated work to assist the Government in preparing detailed needs assessments in agriculture and infrastructure sub-sectors (energy, transport, water and sanitation, and ICT). The validation workshop of the draft reports took place in Juba on 12-13 September 2011. The Bank was further requested by the Government to build on the work done to fast-track the preparation of an Infrastructure Action Plan (IAP) for South Sudan for the decade ahead. The draft report of the IAP was validated in July 2012 in Juba at a national stakeholder's workshop, attended by several participants from the GRSS, relevant sectors, civil society and other development partners, too numerous to mention here, but their individual and collective contributions are recognized and highly appreciated.

Without being exhaustive, the team is particularly grateful to the following top officials: Hon. Kosti Manibei Ngai, Minister of Finance and Economic Planning (MoFEP), his deputies Hon. Mary Jervase Yak and Marial Awou Yol, Deputy Ministers (MoFEP), and Mr. Aggrey Tisa Sabuni, Presidential Advisor on Economic Affairs, as well as Hon. Stephen Dhieu Dau, Minister for Petroleum and Mining, Hon. Garang Diing Akuong, Minister of Commerce, Industry and Investment, Hon. Lt. Gen Gier Chuang Aluong, Minister for Roads and Bridges, Hon. General Madut Biar Yel, Minister of Telecommunications and Postal Services, Hon. Prof. Peter A. Nyarba, Minister of Higher Education, Hon. Dr. Martin Limoro, Minister of Animal Resources, Hon. Simon Majok, Deputy Minister for Roads and Bridges, Hon. Mayom Kuoc Malek, Deputy Minister of Transport, Hon. Mary Nyaulang, Deputy Minister of Housing and Physical Planning, Hon. Kwong Danhier Gatluak,

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Acronyms and Abbreviations

AC	Asphalt Concrete
ACC	Area Control Centre
ADT	Average Daily Traffic
AfDB	African Development Bank
AFRALTI	African Advanced Level Telecommunications Institute
AICD	Africa Infrastructure Country Diagnostic
AIMS	Aid Information Management System
ALS	Approach Landing System
ARPU	Average Revenue per User
bbl/d	Barrels per day (of oil)
BDC	Business Development Center
BDPB	Board of Directors for Public Broadcasting Corporation
BP	British Petroleum
CAA	Civil Aviation Authority
CABIHRD	Capacity Building, Institutional and Human Resource Development
CBR	Cruse Birth Rate
ccTLD	country code Top Level Domain
CDR	Crude Death Rate
CES	Central Equatorial State
CFA	Cooperative Framework Agreement (for Nile Basin)
CIA	Central Intelligence Agency (United States)
CLTS	Community Led Total Sanitation
CNPC	China National Petroleum Company
COMESA	Common Market for Eastern and Southern Africa
CPA	Comprehensive Peace Agreement
CPW	Consumers Willingness to Pay
CRAI	Commission of Rights of Access to Information
CTO	Commonwealth Telecommunications Organization
DBST	Double Bituminous Surface Treatment
DG	Director General
DME	Distance Measuring Equipment
DOE	Department of Energy (United States)
DRB	Directorate of Roads and Bridges
DRC	Democratic Republic of the Congo
DVOR	Doppler VHF Omni-directional Radio
EAC	East African Community
EASSy	Eastern Africa Submarine Cable System
ED	Executive Director
EES	Eastern Equatorial State
EIA	Energy Information Administration (United States)
EIRR	Economic Internal Rate of Return
EISA	Environmental and Social Impact Assessment
ERRP	Emergency Road Repair Program
ESI	Electricity Supply Industry
FAO	Food and Agriculture Organization
FDPR	Final Development Plan Report (Rural Roads Rehabilitation Program)
FICSS	Fostering Innovation and Competitiveness in Southern Sudan
FIR	Flight Information Region
FRSC	Feeder Roads Steering Committee
FRTC	Feeder Roads Technical Committee
GDP	Gross Domestic Product
GNI	Gross National Income

GoNU	Government of National Unity (Sudan)
GoRSS	Government of Republic of South Sudan
GOSS	Government of Southern Sudan
GPS	Global Positioning System
GSM	Global System for Mobile Communications
GWh	Gigawatt Hours
HVFFV	High Value Fruits and Vegetables
IAP	Infrastructure Action Plan
IBA	Independent Broadcasting Authority
ICAO	International Civil Aviation Organization
ICB	International Competitive Bidding
ICT	Information and Communication Technologies
IDP	Internally Displaced Person
ILS	Instrument Landing System
IMF	International Monetary Fund
IOM	International Organization for Migration
IOR	Improved Oil Recovery
IRND	Inland River Navigation Department
ISO	International Organization for Standardization
IT	Information Technology
ITU	International Telecommunications Union
JAM	Joint Assessment Mission (for Sudan)
JS	Jonglei State
KGL	Kuwait Golf Link
km	Kilometers
KOAFEC	Korea-Africa Economic Cooperation
kWh	Kilowatt Hours
kV	Kilovolt
LCB	Local Competitive Bidding
LIFS	Low-income fragile State
LPG	Liquefied Petroleum Gas
LS	Lakes State
MAARI	Ministry of Agriculture, Animal Resources and Irrigation
MAF	Ministry of Agriculture and Forestry
MARF	Ministry of Animal Resources and Fisheries
MCA	Multi-criteria Assessment
MDTF	Multi-Donor Trust Fund
MEM	Ministry of Energy and Mining
MLTS	Medium to Long-term strategy
MoED	Ministry of Electricity and Dams
MoFEP	Ministry of Finance and Economic Planning
MoH	Ministry of Health
MoHPP	Ministry of Housing and Physical Planning
MoIB	Ministry of Information and Broadcasting
MoPI	Ministry of Physical Infrastructure
MoRB	Ministry of Roads and Bridges
MoT	Ministry of Transport
MoTPS	Ministry of Telecommunications and Postal Services
MTR	Ministry of Transport and Roads
MW	Megawatt
MWh	Megawatt Hours
MWRI	Ministry of Water Resources and Irrigation
NBHS	National Baseline Household Survey (for Southern Sudan, 2009)
NBI	Nile Basin Initiative
NBGS	Northern Bahr el Ghazal State
NBHS	National Baseline Household Survey, 2009
NBS	National Bureau of Statistics
NDB	Non-directional Beacon

NDB	Non-directional Beacon	SSRA	South Sudan Roads Authority
NDP	National Development Plan	SSRRC	South Sudan Relief and Rehabilitation Commission
NEAP	National Environmental Action Plan	SSTC	Southern Sudan Trans-Nile Company
NGO	Non-governmental Organization	SSUWC	South Sudan Urban Water Corporation
NPV	Net Present Value	STP	Short term program
NRA	National Regulatory Authority	TA	Technical Assistance
NRTC	New River Transport Company	ToR	Terms of Reference
NRW	Non Revenue Water	UK	United Kingdom
NTC	National Telecommunications Authority	UN	United Nations
O&M	Operations and Maintenance	UNDP	United Nations Development Programme
ODA	Official Development Assistance	UNHCR	United Nations High Commission for Refugees
OECD	Organization for Economic Cooperation and Development	UNMAO	United Nations Mine Action Office
ONGC	Oil and Natural Gas Corporation (of India)	UNOPS	United Nations Office for Project Services
OPRC	Output and Performance-based Roads Contracts	UNS	Upper Nile State
PAPI	Precision Approach Path Indicator	UPU	Universal Postal Union
PIAC	Public Internet Access Centre	U.S.	United States of America
PIC	Public Information Centre	US	Unity State
PIU	Project Implementation Unit	USAID	United States Agency for International Development
PO	Provisional Order	VMC	Visual Meteorological Conditions
PPP	Public Private Partnership	VOC	Vehicle Operating Costs
PSP	Private Sector Participation	WASHCOM	Water, Sanitation and Hygiene Community Management Services
PSP	Private Service Providers	WBGS	Western Bahr el Ghazal State
QoS	Quality of Service	WCSS	Water Corporation of South Sudan
RAI	Rural Accessibility Index	WES	Western Equatoria State
RAMS	Road Asset Management System	WFP	World Food Programme
RIP	Road Investment Program	WIMS	Water Information Management System
RISP	Regional Strategy Integration Paper	WS	Warrap State
RMF	Road Maintenance Fund		
RSMC	Road Safety Management Committee		
RSP	Road Safety Program		
RSS	Republic of South Sudan		
RTA	Road Traffic Accident		
RTC	River Transport Corporation		
SALS	Simple Approach Lighting System		
SARP	Standards and Recommended Practices		
SAR	Search and Rescue		
SDG	Second South Sudanese Pound		
SETIDP	Sudan Emergency Transport Infrastructure Development Project		
SHP	Small Hydropower Plant		
SLA	Service Level Agreement		
SMEC	Snowy Mountains Engineering Corporation (of Australia)		
SPLA	Sudan People's Liberation Army		
SPLM	Sudan People's Liberation Movement		
SRC	Sudan Railways Corporation		
SRTC	Sudan River Transport Company		
SS	South Sudan		
SSA	Sub-Saharan Africa		
SSBC	South Sudan Broadcasting Corporation		
SSCCSE	Southern Sudan Centre for Census, Statistics and Evaluation		
SSDP	Southern Sudan Development Plan		
SSEC	South Sudan Electricity Corporation		
SSERA	South Sudan Electricity Regulatory Authority		
SSHSS	Southern Sudan Health and Household Survey		
SSIA	South Sudan Investment Authority		
SSIRI	Southern Sudan Interactive Radio Instruction		
SSLC	South Sudan Land Commission		
SSNEP	South Sudan National Electricity Policy		
SSNPP	South Sudan National Petroleum Policy		

Part A

An Infrastructure Action Plan for South Sudan

Chapter 1 : Major Challenges Facing
the South Sudan Economy

Chapter 2 : A Strategy for Sustained
Strong Economic Growth

Chapter 3 : An Infrastructure Action
Plan For South Sudan

Chapter 4 : Economic Impact of the Action
Plan and Alternative Scenarios



Major Challenges Facing the South Sudan Economy

1 Major Challenges Facing the South Sudan Economy

1.1 The Setting

The Republic of South Sudan is a land-locked country that is bordered by Ethiopia to the East, Kenya to the South-East, Uganda to the South, the Democratic Republic of Congo to the South-West, the Central African Republic to the West, and Sudan to the North (see Map 1.1). It has a land area of 644,329 km² and a population that is currently estimated to be about 10 million after taking account of large influx of returnees and refugees in recent years. The average number of people per km² is only 13, making South Sudan one of the least densely populated countries in Sub-Saharan Africa¹. The terrain gradually rises from plains in the north and center to southern highlands along the border with Uganda and Kenya. The White Nile, which flows out of Central Africa, is the major geographic feature of the country. It supports agriculture and extensive wild animal populations. South Sudan is divided into ten states which correspond to the three historical regions of Sudan: Bahr el Ghazal, Equatoria and Greater Upper Nile (see Map 1.2). The ten states are further divided into 86 counties and several Payams and Bomas.

South Sudan and Sudan were part of Egypt under the Muhammad Ali Dynasty, and then later governed as an Anglo-Egyptian condominium until Sudanese independence was achieved in 1956. Shortly after independence civil war broke out. A prolonged period of conflict followed. Following the first civil war (1955-1972), the Southern Sudan Autonomous Region was formed in 1972. That arrangement lasted until 1983 when a second period of civil war erupted. This war ended with the Comprehensive Peace Agreement (CPA) which was signed in January 2005. Later that year, southern autonomy was restored when an Autonomous Government of Southern Sudan (GOSS) was formed. As part of that agreement, the south was granted a six-year period of autonomy to be followed by a referendum on its final status. The result of the referendum, held in January 2011, was a vote by 98.8% of the population in favor of secession. The Republic of South Sudan (RSS) became an independent state on July 9, 2011.

The now defunct Southern Sudan Legislative Assembly ratified a Transitional Constitution shortly before independence in July 2011. The Constitution, which came into force on Independence Day, is the supreme law of the land, superseding the Interim constitution of 2005. It provides for establishment of a mixed presidential system of government headed by a President who is Head of State, Head of government and Commander-in-Chief of the armed forces. It also provides for establishment of the national Legislature comprising two houses: a directly elected assembly, the National Legislative Assembly; and a second chamber of representatives of the States, the Council of States. The Constitution also provides for an independent judiciary, the highest body being the Supreme Court.

1.2 Major Development Challenges Confronted by South Sudan

1.2.1 What are the Major Challenges?

The land, water and mineral resource base of South Sudan are substantial in relation to the relatively small population of the country. Effective management and development of these resources offers the prospect of sustained strong economic growth for an extended period of time. International experience with development of low income economies such as South Sudan indicate that the essential ingredients for a successful transition to middle income with reduced poverty and improved livelihoods depends on the following: (i) well-functioning public and private institutions; (ii) well developed basic infrastructure; (iii) a stable macroeconomic framework; and (iv) a healthy and literate labor force.

¹ Other countries in Sub-Saharan Africa with low population densities include: Angola, Botswana, Central African Republic, Chad, Gabon, Mali, Mauritania, Namibia, Niger, Somalia, Sudan and Zambia.

Full realization of this very considerable potential will require concerted action to address a somewhat daunting array of challenges that currently confront this newly independent country. These include the following:

- Ensuring adequate internal security that is required for sustained strong economic development and improved well-being of citizens throughout the country.
- Responding to the challenges that stem from current and continued rapid growth in population and the labor force.
- Promoting a broad-based economic growth to reduce the current heavy dependence on the oil economy.
- Developing targeted programs that will result in a sustained reduction in the current very high levels of poverty in the country.
- Crafting a major program of infrastructure development to overcome the current major bottlenecks to business activity and cost-effective delivery of basic services throughout the country.

- Providing a stable macroeconomic environment that will create an attractive operating environment for domestic and international business and ensure economic stability for the people of South Sudan.

- Addressing a range of issues related to the gradual adjustments in public expenditure policies that will be required in the medium- and long-term in response to changing domestic needs and requirements for public service provision.

- Designing and implementing programs that will address the current institutional and human capacity constraints that confront South Sudan.

The discussion that follows provides an overview of the main issues that arise in each of these areas, except for infrastructure. Section 1.3 provides a more detailed assessment of the current status of the country's infrastructure and related provision of infrastructure services. The recently completed South Sudan Development Plan (SSDP) provides more detailed information on the ways in which the Government intends to address these concerns².

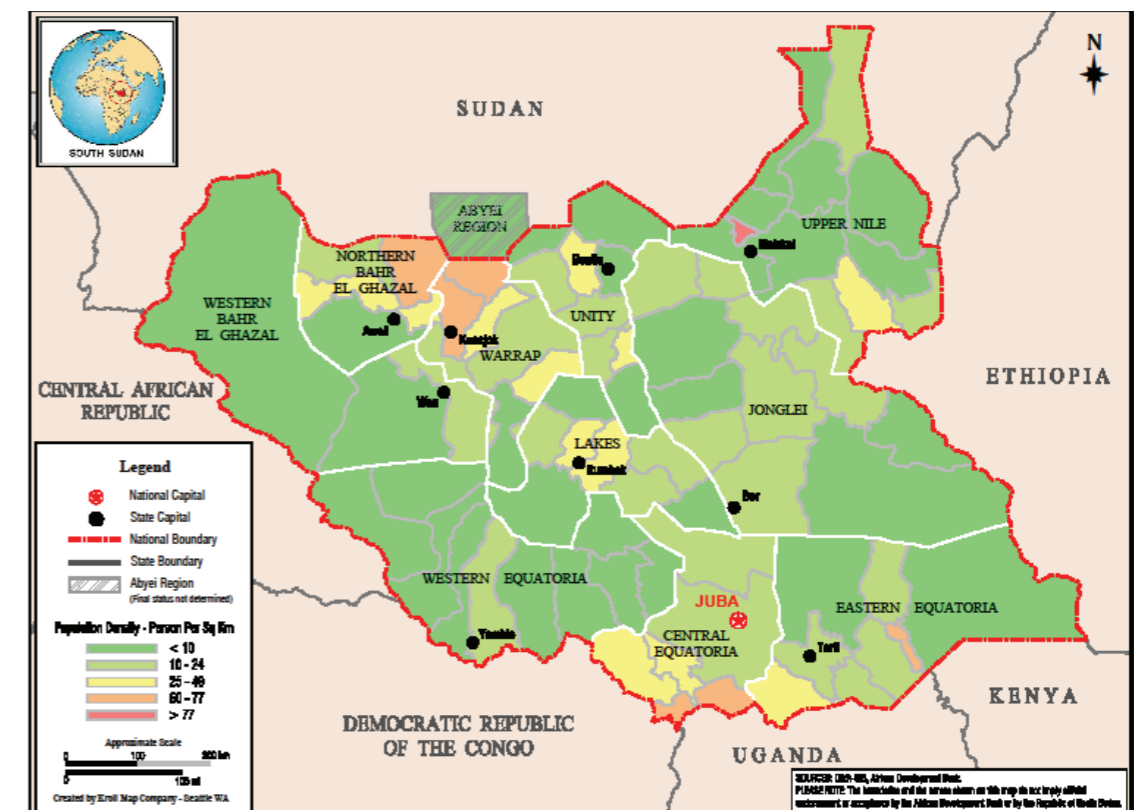
MAP 1.1: South Sudan and the Northeast Region of Africa



MAP 1.2: Administrative map of the Republic of South Sudan



MAP 1.3: Population Densities in South Sudan



2 See Government of South Sudan (2011), South Sudan Development Plan 2011-2013: Realizing Freedom, Equality, Justice, Peace and Prosperity for All. Council of Minister's Draft, Juba, July 5, 2011.

1.2.2 Importance of Internal Security

The Government has taken discernible measures to improve national security. As the SSDP indicates, improved security and deepening peace will be critical for the direct wellbeing of citizens throughout the country and for achieving sustained poverty reduction. A comprehensive approach will be required, including dealing with the causes of conflict, ensuring improved security within communities and improving access to conflict resolution systems and justice. An adequate level of security is also an essential prerequisite for a business environment that will attract the large amounts of private investment capital required for broad-based and sustained strong economic growth. Programs for improved internal security will need to be sensitive to a number of issues, including:

- Interventions related to the large number of Internally Displaced Persons (IDPs) within the country. The prolonged period on conflict led to serious neglect in the south, lack of infrastructure development, and major destruction and displacement. Informal estimates put the number killed by conflict and starvation at more than 2 million, with more than 4 million people that became IDPs or became refugees as a result of civil war and war-related impacts.
- Moreover, there is continuing uncertainty about the future inflow of South Sudanese from Sudan. South Sudan has passed a new law that allows for recognition of citizenship for all South Sudanese. At the time this Report was prepared, there was continued uncertainty about the legal status of those South Sudanese who were still resident in Sudan. Estimates vary, but most refer to about 1 to 1½ million South Sudanese that were displaced by the almost 50 years of conflict, or are the children of those who were displaced, who still live in Sudan.
- Continued internal conflict among ethnic and tribal groups. Historically, clashes among tribes revolved largely around cattle, but in more recent years conflict has been associated with the activities of armed groups, including the Lord's Resistance Army (LRA)

that is reported to be a continuing threat to civilians in Western Equatoria and some other states of South Sudan. To escape the activities of the LRA, refugees from Democratic Republic of the Congo (DRC) and Central African Republic have sought safety in South Sudan³.

- Continued development of the capacities of the South Sudan Armed Forces which consists primarily of Sudan People's Liberation Army (SPLA) that was previously the armed wing of the Sudan People's Liberation Movement (SPLM) and that is now in the process of becoming a regular army. Budget allocations to the SPLA currently account for about 28% of National Budget outlays, the single largest expenditure in the Budget.
- Land tenure and ownership is central to the task of ensuring adequate internal security. The SSDP makes reference to the existence of unclear land tenure policies, rules and practices and the territorial and symbolic role of land in disputes among communities within South Sudan. There is anecdotal evidence that claims over land in some locations have intensified in recent years because of speculation about its future value and the possible presence of mineral deposits⁴. The issue of access to land is detailed in Chapters 5 and 6 in the context of developing the very substantial agricultural potential of the country.

1.2.3 Rapid Growth of Population and the Labor Force

The 2008 census estimated the population of South Sudan to be at 8.26 million (Table 1.1). However, the census results are thought to have underestimated the total population resident in the country. Following the signing of the Comprehensive Peace Agreement (CPA) in 2005, and referendum and declaration of independence in 2011, there has been a substantial inflow of returnees, the precise number of which is not known with certainty. Annex 1 provides a detailed discussion about the available data on the number of returnees to South Sudan and hence the population of the country. The 2011 mid-year population is estimated by authors of this Report to be 10.05 million.

Table 1.1: Demographic Characteristics of South Sudan (As of mid-2008 population census)

State	Population	Households	Persons per household	Area (km ²)	Population density
Upper Nile	964 353	149 267	6.5	7 7 283	12
Jonglei	1 358 602	204 352	6.6	122 581	11
Unity	585 801	91 577	6.4	3 7 837	15
Warrap	972 928	177 776	5.5	4 5 567	21
Northern Bahr El Ghazal	720 989	139 963	5.2	3 0 543	24
Western Bahr El Ghazal	3 33 431	62 290	5.4	9 1 076	4
Lakes	695 730	100 076	7.0	4 3 595	16
Western Equatoria	619 029	120 247	5.1	7 9 343	8
Central Equatoria	1 103 557	189 057	5.8	4 3 033	26
Eastern Equatoria	906 161	162 407	5.6	7 3 472	12
South Sudan	8 260 581	1 397 012	5.9	6 44 330	13

Source: Southern Sudan Centre for Census, Statistics and Evaluation (2011), Statistical Yearbook for Southern Sudan 2010. Juba, 2011.

According to the census, there were 1.397 million households in South Sudan in 2008, which translates into six persons per household. Although the average population density in South Sudan is low, there is substantial variation among the states, ranging from a low of 4 persons per km² in Western Bahr el Ghazal to a high of 26 in Central Equatoria where the capital, Juba, is located. The total fertility of women of child bearing age in South Sudan is high; it is estimated at 6.2 compared with an average of about 5 for Sub-Saharan Africa as a whole. For the purposes of this Report, crude birth and death rates are estimated at 46 and 11 per 1,000 people respectively. As a result, the natural rate of increase in population (i.e., excluding the continuing inflow of returnees) is estimated by the authors of this Report to be about 3.5 % a year at the present time. The implication is that the population of South Sudan is young. The Census further indicates that as of 2008 about 51% of the population was under the age 18 years and 72% was under the age of 30 years.

As Annex 1 indicates, the urban population of the country is estimated to have been about 1.98 million as of mid-2011. Although the urbanization rate is relatively low at 20% of the total population, a critical feature of

demographic trends in South Sudan is that the urban population has been growing very rapidly and will very likely continue to do so for several more years.

According to the analysis in Annex 1 of this Report, the urban population increased from an estimated 1.125 million in mid-2007 to 1.980 million in mid-2011 – an average increase of 15% a year. This very rapid increase in the urban population stems primarily from three sources: (i) the very large number of returnees to the country that take up residence in urban areas; (ii) a substantial number of IDPs who are also located in urban camps; and (iii) voluntary movement of rural residents to urban centers to escape violence in their rural communities, and seek employment and access to basic services. Based on estimates of the growth in the population of the ten state capitals in Annex 1, it would appear that these centers have accounted for almost 50% of the increase in the urban population. The rapid urbanization of the country poses major challenges for provision of basic services to these population centers. In many cases, this urban expansion is exacerbating the problem of informal, unplanned settlements that lack basic infrastructure such as roads, water and sanitation services, and drainage systems.

³ See United Nations High Commission for Refugees (2011), 2011 UNHCR Country Operations Profile: Sudan. UNHCR website: www.unhcr.org/pages/49e483b76.html.

⁴ For a more detailed discussion of land policy issues see Pantuliano, Sara (2007), The Land Question: Sudan's Peace Nemesis. Overseas Development Institute, United Kingdom. March 2007.

Table 1.2: Projection of Population and Labor force

Indicator	2007	2008	2009	2010	2015	2020	Growth rate (% p.a.)	
							2007-2010	2010-2020
Total population, mid-year ('000)								
Urban	1 125	1 289	1 497	1 737	2 776	3 656	15.6	7.7
Rural	6 578	6 972	7 362	7 757	9 235	10 422	5.7	3.0
Total	7 702	8 260	8 859	9 494	12 01	214 079	7.2	4.0
Population 15-64 years	4 021	4 332	4 664	5 019	6 569	8 073	7.7	4.9
Labor force ('000)	3 390	3 652	3 931	4 231	5 537	6 805	7.7	4.9
Memo items:								
Urban population as % of total	14.6	15.6	16.9	18.3	23.1	26.0		
Labor force participation rate (%)	84.3	84.3	84.3	84.3	84.3	84.3		
Population 15-64 years (% of total)	52.2	52.4	52.6	52.9	54.7	57.3		

Source: Southern Sudan Centre for Census, Statistics and Evaluation (2011), Statistical Yearbook for Southern Sudan 2010. Juba. 2011.

The analysis of demographic trends in Annex 1 suggests that the population of South Sudan will continue to increase rapidly to about 14 million by 2020, at which time the urban population may be about 3.66 million, an equivalent to 26% of the total population. The projected doubling of the urban population in the decade ahead will continue to put a strain on the provision of health, education and infrastructure services. There is, of course, a degree of uncertainty about these projected trends, largely because of uncertainty about the extent to which there are more returnees from Sudan and neighboring countries, and the South Sudanese Diaspora, estimated at more than 2 million, returns to South Sudan.

The combination of a high population rate, continued in-migration, and a very young population means that there will be rapid growth in the labor force for at least another decade. As Table 1.2 indicates, based on the analysis of demographic trends in annex 1, the labor force is estimated to have grown by almost 8% a year during 2007-2010 and is projected to grow at an average of 5% a year for the next decade. One of the biggest challenges facing the country is the creation of substantial amounts of productive employment for a labor force that currently includes a significant number of people with limited education and skills. South Sudan will require a decade or

more of sustained strong economic growth, well in excess of the labor force growth rate of 5% a year, to meet these employment requirements. As the discussion in Section 1.3 of this Chapter indicates, lack of infrastructure is a major obstacle to sustained strong economic growth. The implication is that a substantial program of investment in infrastructure and related services will be a necessary, but not sufficient condition for a strong economic performance in the decade ahead.

1.2.4 Need for Broad-Based Economic Growth

There are no national income accounts for South Sudan for years prior to 2008. During the past three years, the Gross Domestic Product (GDP) of South Sudan has fluctuated because of changes in oil prices and so has the value added by the petroleum sector. For the period as a whole, GDP has averaged about \$12.7 billion at current prices (Table 1.3). Gross national income per capita has fluctuated, but has averaged about \$1,050 during this period. South Sudan is therefore at the low end of the Lower Middle Income Country category as defined by the World Bank.

Table 1.3: Gross Domestic Product by Expenditure (SDG millions at current prices)

Expenditure category	(SDG millions)			Composition (% of GDP)		
	2008	2009	2010	2008	2009	2010
Consumption						
Public	4 595.6	3 813.5	4 855.4	15.4	15.8	15.3
Private	9 574.7	10 952.7	12 198.5	32.1	45.3	38.4
Total	14 170.4	14 766.2	7 054.0	47.5	61.1	53.7
Gross investment						
Public	1 927.1	1 339.1	1 456.0	6.5	5.5	4.6
Private non-oil	77.5	563.7	952.1	0.3	2.3	3.0
Sub-total	2 004.6	1 902.8	2 408.1	6.7	7.9	7.6
Private oil	2 845.0	2 714.3	2 529.3	9.5	11.2	8.0
Total	4 849.6	4 617.1	4 937.4	16.3	19.1	15.5
Exports (goods & services)	22 812.6	16 364.3	21 823.8	76.5	67.7	68.7
Imports (goods and services)	(12 021.9)	(11 577.5)	(12 047.3)	(40.3)	(47.9)	(37.9)
GDP	29 810.7	24 170.1	31 767.9	100.0	100.0	100.0
Petroleum sector	20 303.9	13 812.6	18 963.0	68.1	57.1	59.7
Non-oil GDP	9 506.8	10 357.5	12 804.9	31.9	42.9	40.3
Memo items:						
GDP (\$ millions)	14 263.5	10 463.3	13 347.8			
Gross national income (\$ millions)	9 153.7	7 510.9	9 076.4			
Exchange rate (SDG=\$1.00)	2.090	2.310	2.380			

Source: Annex 2

The GDP of the country is dominated by the oil sector, the value added of which accounts for about 60% of total GDP. Value added by the petroleum sector has averaged about \$7.9 billion a year in the past three years. Non-oil GDP increased from \$4.55 billion in 2008 to about \$5.38 billion in 2010 (both at current prices) – an average rate of increase of about 16% a year. There are no firm estimates for non-oil GDP growth in real terms; however, the International Monetary Fund (IMF) puts domestic inflation at about 2.5% a year during 2009-10, which suggests that real non-oil GDP may have grown quite strongly in real terms during this period.

Official estimates of the composition of non-oil GDP are not yet available. For the purposes of this Report, a

rough estimate of the sectoral composition of non-oil GDP has been made for 2010, the details of which are set out in Annex 2. In 2010, about 37% of non-oil GDP was accounted for by agriculture, forestry and fisheries, 15% by industry, 36% by government services, with the remaining 12% accounted for by other services. The structure of the economy that emerges is therefore one in which oil accounts for 60% of total GDP, with the remainder of GDP accounted for primarily by subsistence agriculture and animal husbandry, and government services, mainly in the form of salaries and benefits to a relatively small number of civil servants (Table 1.4). Private sector activities in commercial agriculture, industry and services are a relatively small part of overall economic activity.

Table 1.4: GDP by Industrial Origin ,2010 (SDG millions current prices)

Sector	Value	Share (%)
Petroleum value added	18 963	59.7
Non-oil GDP		
Agriculture, forestry & fisheries	4 604	14.5
Manufacturing & mining	723	2.3
Construction	444	1.4
Transport & communications	604	1.9
Trade, hotels, tourism	1 033	3.3
Other services		
Government services	4 855	15.3
Other private services	542	1.7
Sub-total	5 398	17.0
Total non-oil GDP	1 2 805	40.3
Total GDP	3 1 768	100.0

Source: Annex 2.

1.2.5 High Incidence of Poverty in South Sudan

In South Sudan, despite the end of the war eight years ago, its negative impact continues to be felt on the lives and livelihoods of the people that will ultimately determine the country's future and ability to emerge from its history of armed conflict. For instance, the non-oil GDP per capita is estimated at \$625 in 2010, with value added in agriculture estimated at about \$320 per person living in rural areas. As to be expected, at these low levels of productivity the incidence of poverty in South Sudan is high. According to a recent survey undertaken by the Government of South Sudan, 50.5% of the population lives below the national poverty line which was defined as a level of consumption of less than SDG 73 per month (\$31.60 per month, or about \$1 a day). In rural areas, the incidence of poverty is about 55%, compared with about 24% in urban areas (see Table 1.5). The much lower level of poverty in urban areas, to a considerable extent, reflects the presence of relatively well paid government employees and people employed under international aid programs. Map 1.4 provides an overview of the spatial distribution of poverty in South Sudan. The incidence of poverty is highest in the states of Northern Bahr el Ghazal with 76% of the population below the poverty line, Unity with 68% below the poverty line, and Warrap with 64% below the poverty line. The lowest incidence of poverty is in the Upper Nile with 26% of the population below the poverty line.

Recent surveys in South Sudan indicate that food accounts for 79% of average household expenditures. With such a large share of expenditures allocated to food, many households are vulnerable to food price inflation and food shortages. According to a recent SSCSE report, 47% of the population is undernourished. These vulnerabilities point to the importance of expanding domestic food production to supply domestic markets and lowering the costs of imported food items. As the subsequent discussion indicates, improved infrastructure will play an important role in achieving these objectives.

However, the problem of poverty in South Sudan extends well beyond concerns about income and expenditures. Many of the social indicators for the country are among the lowest in the world. The indicators reported for South Sudan in Table 1.5, highlight the extent to which the country lags behind comparator countries in Sub-Saharan Africa and Low and Lower Middle Income countries in general. Only 16% of females and 40% of males are literate, compared with 53% and 70% for Sub-Saharan Africa. Less than half of the 6-13 year old children are enrolled in primary school. Inequality in access to education among boys and girls is high: the ratio of girls to boys in primary school is only 59%, compared with an average of 86% for Sub-Saharan countries as a whole and 87% for all low income developing countries. Child mortality and undernourishment rates among children are roughly comparable to the average for Sub-Saharan countries,

but maternal mortality rates exceed 2,000 per 100,000 live births – more than twice the average for Sub-Saharan Africa, and more than three times the average for Low

Income developing countries. Access to improved water and sanitation is also very low and less than half the average for Sub-Saharan countries.

MAP 1.4: Incidence of Poverty by State in South Sudan

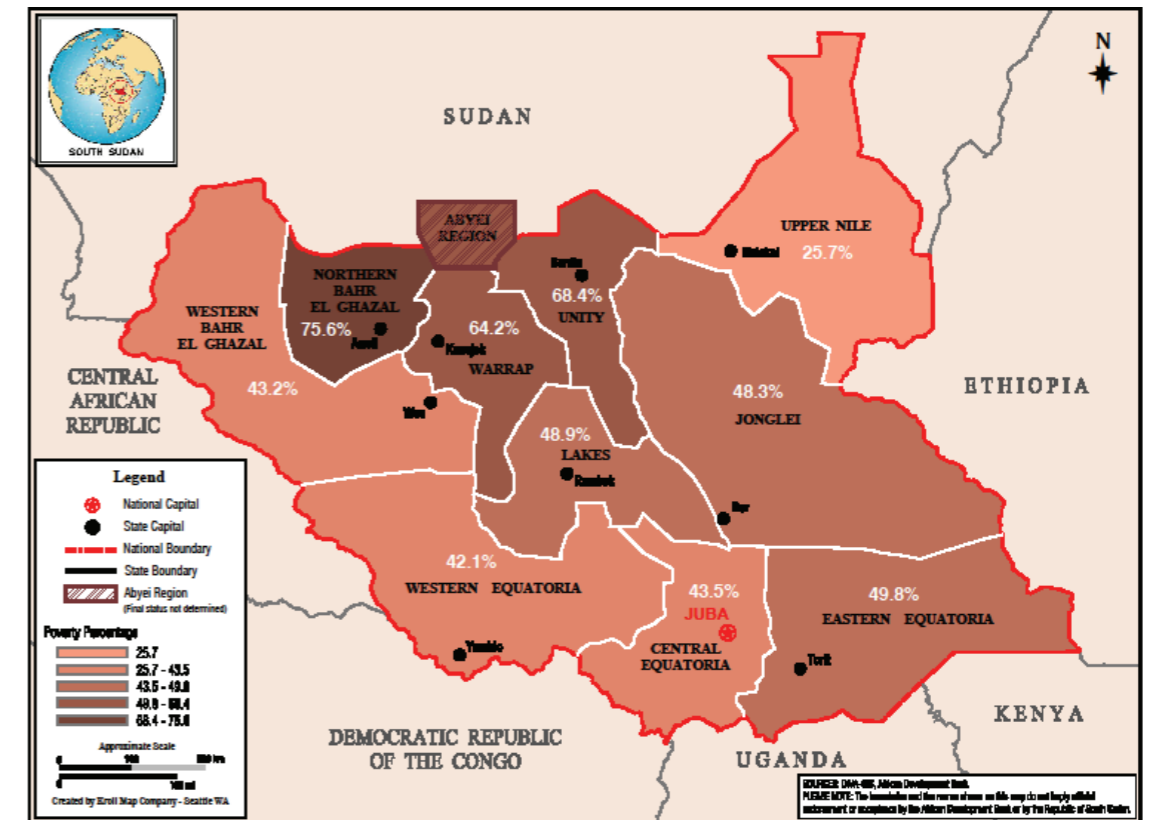


Table 1.5: Selected Socio-economic Indicators

Indicator	South Sudan	Low income countries	Lower middle income countries	Sub-Saharan Africa
Population (millions)	8,615	2 352	2 475	743
Gross national income per capita (\$)	1 050	585 1	923	746
Population density (persons per km ²)	13	83	63	31
Incidence of poverty (% of population)				
National average	50.6			41.1
Urban average	24.4			
Rural average	55.4			
Demographic indicators				
Total fertility (births per woman)	6.2	3.6	2.1	5.3
Crude birth rate (per 1 000 people)	46	29	16	40
Crude death rate (per 1 000 people)	11	10	7	17
Life expectancy at birth (years)	59	59	71	47

Indicator	South Sudan	Low income countries	Lower middle income countries	Sub-Saharan Africa
Education				
Adult literacy rate (% of 15 years and above)				
Female	16	50	93	53
Male	40	71	85	70
Net primary enrollment ratio (%)	48	78	93	66
Ratio of girls to boys in primary school (%)	59	87	99	86
Students per teacher	52	42	22	48
Health status				
Under five mortality rate (per 1,000)	135	114	39	163
Infant mortality rate (per 1,000)	102	75	31	96
Underweight children under 5 years (%)	34		13	30
Maternal mortality rate (per 100,000 live births)	2 054	684	163	921
Access to improved water and sanitation				
% of population with access	27	75	82	56
% of population with access	16	38	57	37

Source: World Bank, World Development Indicators, various issues. SSCSE, Key Indicators for Southern Sudan, February 2011.

1.2.6 Need for a Stable Macroeconomic Environment

Oil export income finances about 70% of the total public development and humanitarian programs of the country, with the international donor community funding most of the balance of the program (Table 1.6). Government revenues from non-oil sources of revenues finance less than 2% of the programs. This heavy dependence on oil revenues and donor assistance raises a number of basic issues for macroeconomic management and for key development programs in the country⁵. Some of these concerns also have important implications for the design of the proposed Infrastructure Action Plan outlined in the Report and for its implementation in the decade ahead.

The first concern is the effect of changes in oil prices on government revenues and the ability of the government

to ensure sustainable programs for development and humanitarian support. In recent years, large movements in international oil prices have had a significant impact on these revenues and hence public programs. The surge in oil prices in 2008 was largely responsible for the doubling of oil revenues that year. As a result, government spending rose from \$1.45 billion in 2007 to \$2.73 billion in 2008. Programs in almost all sectors were expanded. The sudden drop in oil prices in early 2009 led to a fiscal crisis in South Sudan as revenues fell below planned levels and expenditure commitments could not be realized. The decline in oil prices led to a \$1.4 billion decline in oil revenues. The major expansion in development and humanitarian programs of the government in 2008 was then followed by a major contraction in spending. As a result, budget expenditures declined by almost \$1 billion to \$1.8 billion in 2009. In the case of the infrastructure sector, for example, total disbursements in the national budget rose from about \$85 million in 2007 to \$390 million in 2008 and were then cut back to \$230 million in 2009.

Table 1.6: Sources of Funding for Public Development Programs in South Sudan, 2010

Funding source	Amount (\$ mill)	Share (%)
Oil revenues	2 365.7	69.7
Non-oil revenues	53.2	1.6
Donor assistance	973.9	28.7
Total funding	3 392.7	100.0
Less budget operating surplus	75.9	2.2
Total expenditures	3 316.8	97.8

Source: Annex Table 2.5 and Annex Table 2.8.

This recent volatility in oil prices has brought considerable uncertainty to the management of public finances and the macroeconomic policy environment in South Sudan and as a consequence the government has focused on short-term interventions. In these circumstances, the risk is that there may be less emphasis on long-term projects that have potentially high returns, especially in the infrastructure sector where large projects typically have long lead times to completion. The experience of recent years underscores the importance of building up domestic non-oil sources of revenue from the current negligible base – a task that will span the next decade or more. Moreover, revenues from oil production are expected to decline rapidly in the decade ahead. In the absence of a strong program to develop alternative sources of budget revenues, the risk is that the Government will have difficulty in maintaining the current levels of spending. It is therefore imperative that the non-oil economy is developed as quickly as possible in the next 10 years to ensure that economic growth, job creation for a rapidly growing labor force, and broad-based improved access to services can be sustained in the face of declining oil revenues. Given the widespread lack of basic infrastructure in the economy, sustained strong growth in the non-oil economy will require a major program of infrastructure development in the decade ahead.

The second concern about the current financing arrangements for the development and humanitarian programs of the country is the risk of so-called “Dutch disease.”⁶ As Table 1.6 indicates, 98% of the funding for public sector development and humanitarian programs comes from offshore. The inflow of \$3.34 billion in 2010

(oil revenues plus donor assistance) was 62 times the size of the non-oil GDP of the country. The large size of these inflows relative to the size of the non-oil economy means that there is a real risk that they could put upward pressure on the exchange rate of the country. Real exchange rate appreciation may then weaken the competitiveness of the country’s exports. The risk of “Dutch disease” is a matter for concern in South Sudan because the heavy dependence on financial inflows from abroad is not temporary, and will likely persist for some years. Continued upward pressure on the exchange rate will weaken the prospects for the large scale development of South Sudan’s land resources that are suitable for production of food and raw material exports to regional and global markets. Development of a well coordinated macroeconomic policy, in combination with the use of some form of sovereign wealth fund to save a portion of boom revenues for later use, can provide mechanisms for dealing with the potential effects of “Dutch disease.”⁷

1.2.7 Issues Related to Public Expenditure Policies

The prevailing pattern of spending on public services by Government and the donor community provides further insight into the challenges that must be addressed in the decade ahead if South Sudan is to have an extended period of sustained strong economic growth. As Table 1.6 indicates, non-oil revenues stagnated at about SDG120 million during 2008-2011. The share of non-oil revenues

⁵ For a recent assessment of measures needed to develop the non-oil revenue tax base see Zeru Gebre Selassie (2009), Non-Oil Revenue Study: Southern Sudan. Report to Ministry of Finance and Economic Planning, Juba, in two volumes: Volume I: Summary Final Report, and Volume II: Final Report. October 2009.

⁶ In the 1960s, the Netherlands experienced a large increase in its wealth after discovering substantial natural gas deposits in the North Sea. The development of this resource had serious repercussions on important segments of the Dutch economy. As a result, the Dutch guilder became stronger, making Dutch non-oil exports less competitive. This syndrome became known as “Dutch disease.” It is generally associated with discovery and development of natural resources such as oil, copper or other minerals, but it can occur as a result of any very large inflow of foreign currency, including those stemming from price surges for crops such as coffee or cocoa, or from large inflows of foreign direct investment or foreign aid.

⁷ There is an extensive literature on the “Dutch disease” problem. See, for example, Buiter, Willem H., and Douglas D. Purvis “Oil, Disinflation and Export Competitiveness: A Model of the “Dutch disease”” in Bhandari, Jagdeep and Bluford H. Putnam (1983), Economic Interdependence and Flexible Exchange Rates. Cambridge, MIT Press. Also, Calvalcanti, Tiago, Kamiar Mohaddes, and Medhi Raissi (2011), “Commodity Price Volatility and the Sources of Growth.” Cambridge Working Papers in Economics. <http://econ.cam.ac.uk/postgrad/km418/RMC.pdf>.

to GDP has steadily declined in these four years and is projected to be at 0.7% in 2011. Given the importance of building these revenue sources, these recent trends are not encouraging. Success in building these alternative sources will require an extended period of sustained strong growth in the non-oil economy that is led by domestic and international private investment. Creating the conditions for such investment and growth is one of

the major challenges for the government in the decade ahead. Central to this effort will be a major build-up in investment in the basic infrastructure of the country, which, as the discussion later in the Chapter indicates, is seriously deficient at this time and cannot provide the basis for an extended period of strong economic growth needed to create jobs for a labor force growing at 5% a year and reduce the high incidence of poverty in the country.

Table 1.7: National Government Revenues and Expenditures (In SDG millions)

Indicator	2005	2006	2007	2008	2009	2010	2011
Revenues							
Oil	1 869.1	2 732.9	2 964.5	6 670.9	4 121.5	5 630.3	5 656.4
Non-oil	0.6	3.2	13.3	118.7	118.3	126.6	110.7
Total	1 869.7	2 736.1	2 977.8	6 789.6	4 239.8	5 756.8	5 767.1
Expenditures							
Recurrent	437.7	2 623.9	2 538.2	4 100.7	3 232.6	4 485.2	4 508.9
Capital	14.7	957.6	398.3	1 611.9	1 002.0	1 090.9	1 258.2
Total	452.4	3 581.5	2 936.5	5 712.7	4 234.7	5 576.1	5 767.1
Overall budget balance	1 417.3	(845.5)	41.3	1 076.9	5.1	180.7	0.0
Memo items:							
Revenues as % of GDP				22.8	17.5	18.1	12.7
Non-oil revenues as % of non-oil GDP				1.2	1.1	1.0	0.8
Recurrent spending as % GDP				13.8	13.4	14.1	9.9
Capital spending as % of non-oil GDP				17.0	9.7	8.5	8.9

Source: Annex Tables 2.4 and 4.1.

On the expenditure side of the equation, recurrent outlays account for about three-quarters of total spending, with salaries accounting for more than 50% of these outlays. Capital spending, which was about 17% of non-oil GDP in 2008, has declined to an estimated 8% for 2011. Table 1.8 provides a summary of the budget and donor disbursements for each of the 11 sectors in 2010. Total spending from the combined budget and donor sources was \$3.32 billion, 71% of which came from the National Budget and the balance from donors. The largest allocations among donors were for the following budget sector categories: social and humanitarian affairs, health care, infrastructure, and public administration. These four sectors accounted for three-quarters of total donor disbursements in 2010. The National Budget accounted for 100% of the transfers to the states, and about 90% of total spending in the following sectors: accountability, rule of law and security. The social and humanitarian affairs and health care sectors received the smallest allocations in the National Budget, presumably because of the large role currently played by donors in these two sectors.



Table 1.8: Combined Sources Funding for National Development Programs, 2010 (Disbursements in \$ millions)

Sector	National budget (\$ mill)	Donor assistance (\$ mill)	Total		National (% of total)
			(\$ mill)	Share (%)	
Accountability	224.1	23.2	247.3	7.5	90.6
Economic functions	68.2	24.1	92.3	2.8	73.9
Education	117.3	57.0	174.3	5.3	67.3
Health	58.6	181.1	239.7	7.2	24.4
Infrastructure (incl. housing)	267.2	152.2	419.4	12.6	63.7
Natural resources & rural development	77.9	72.9	150.8	4.5	51.7
Public administration	354.9	109.6	464.5	14.0	76.4
Rule of law	279.7	38.1	317.8	9.6	88.0
Security	636.5	37.7	674.2	20.3	94.4
Social & humanitarian affairs	30.6	278.1	308.7	9.3	9.9
Transfers to states	228.0		228.0	6.9	100.0
Total expenditures	2 342.9	973.9 3	316.8	100.0	70.6
Memo item:					
Core program for infrastructure development	295.4	137.0	432.5	13.0	68.3
Core infrastructure program as % non-oil GDP	5.5	2.5	8.0		
Core capital expenditure as % non-oil GDP	4.4	1.9	6.3		
Exchange rate (SDG per US\$)	2.38				

Source: Annex Tables 2.5, 2.6, 3.1 and 3.2.

As illustrated in table 1.8, total spending by Government and donors on the core infrastructure program was \$433 million in 2010, two-thirds of which came from the budget and the remainder from donors. About 80% of the Government's program was allocated to capital works with the balance allocated to recurrent expenses, the most important of which was salaries of ministry staff. There is no precise information available for the share of the donor program that is accounted for by capital spending. Informal estimates by the authors of this Report suggest that about three-quarters of the donor program is allocated to capital expenditures. The implication is that capital outlays on the core infrastructure program in 2010 were equivalent to 6.5% of non-oil GDP. As the discussion in Chapter 3 indicates, there will have to be a substantial increase in allocation of public resources for infrastructure development in the decade ahead if the basic requirements of the country are to be met.



1.2.8 Limited Institutional and Human Capacities

As noted earlier, adult literacy rates in South Sudan are low. In fact, with a national average of 28%, South Sudan – along with Burkina Faso and Chad – currently has the lowest adult literacy rate in all of Africa. This is particularly the case in rural areas where the average literacy rate is only 24%. In urban areas, it is currently about 52%. With current low enrollment rates for children of school age, the problem of illiteracy will very likely continue for an extended period. At the present time, for example, the literacy rate for 15-24 year old people is only 35% in rural areas and 65% in urban areas. The implication is that a large portion of the existing work force of the country lacks basic skills in reading and writing. Sustained strong economic growth is expected to generate large numbers of jobs within South Sudan, especially for skilled and unskilled workers in construction activities, transport and communications and commercial agriculture. The fundamental issue that confronts the Government is the need for programs that will accelerate the pace at which the skills of the labor force are expanded. Lack of progress in developing a cadre of skilled and semi-skilled South Sudanese workers may result in some combination of large inflows of foreign workers, and domestic pressures on wage rates for skilled and semi-skilled workers that, in turn, undermines the international competitiveness of the domestic business community.

Weak institutional capacities are also a matter of concern. A recent report by Kamier (2011) notes that institutional conditions in South Sudan are fragile, delivery capacities remain extremely weak, and there is an acute need for a professional and accountable public service to create increased confidence in the Government⁸. According to a recent UNDP report, half of all positions in ministries were unfilled in 2010, 50% of public servants had only early education and only 5% had a graduate degree of higher⁹.

1.2.9 Weak Operating Environment for Private Business Activity

Sustained improvement in the provision of infrastructure services will require the development of private sector capacities for provision of these services. Such capacities are at an early stage of development in South Sudan. A small domestic private sector has emerged in South Sudan

which is bimodal comprising a large number of small or even very small businesses on one hand, and a limited number of rather medium firms on the other. According to a recent report prepared for the African Development Bank, most of the formal businesses in the country are small and medium-sized enterprises. There are about 50 larger firms involved mainly with banking, telecommunications and manufacture of beverages¹⁰. Medium-sized firms number about 500 and are mainly in construction, hotel and restaurant services and trade-related services. Small firms number about 8,000 and are involved with services similar to that of the medium-sized ones. In addition to these registered businesses, there are more than 10,000 micro-firms (typically individual entrepreneurs) involved in petty trade. Almost all of the larger companies are foreign-owned, as many South Sudanese still lack the capital to start larger businesses.

A Business Registry was created in 2006. It reported that as of December 2010, 10,746 businesses had been registered in South Sudan. There has been dramatic growth in the number of SMEs that are registered; by end 2010 8,984 had obtained certificates of incorporation, up from 471 in 2006. According to the 2010 Business Survey Listing (SSCCSE, 2011), the number of registered businesses in the state capitals grew from 1,294 at end 2005 to 7,332 at end 2010. Three-quarters of these businesses employed less than three people, and about 90% of these businesses had less than five employees. As Table 1.9 indicates, more than 80% of these businesses are in wholesale and retail trade, accommodation and food services. There were 89 firms involved in construction, and in infrastructure related services there were 149 registered businesses, two-thirds of which were in information and communications.

The Interim Constitution that was adopted in December 2005 provided for the development of free enterprise and the protection of property rights. More recently, in the GOSS Growth Strategy for 2010-2012 and in the subsequent SSDP, the government reiterated its commitment to private-sector led growth¹¹. The International Finance Corporation (IFC) Doing Business in Juba 2011 ranked at 159th out of 183 economies on the ease of doing business (Table 1.9). A number of key conclusions emerged from this survey. First, South Sudan's legal and regulatory framework remains incomplete; several important laws such as the Labor Bill and a new Companies Bill have been drafted but not yet enacted. The IFC reports that since 2005, 19 laws guiding business registration, operation and exit have been drafted, nine of which have been enacted by the Legislative Assembly and with several more submitted to the Assembly and are awaiting approval¹².

Table 1.9: Number of Registered Businesses in State Capitals in 2010

Type of business activity	Number	Percentage
Agriculture, forestry and fisheries		
Mining and quarrying	10	0.1
Electricity, gas, steam and airconditioning		
Manufacturing	199	2.7
Water supply, sewerage and waste management	7	0.1
Construction	89	1.2
Wholesale and retail trade	5 116	69.8
Transportation & storage	45	0.6
Accommodation and food services	1 037	14.1
Information and communications	97	1.3
Finance and insurance	52	0.7
Professional, scientific and technical services	46	0.6
Administrative and support services	10	0.1
Education	31	0.4
Health and social services	361	4.9
Arts, entertainment and recreation	22	0.3
Other services	211	2.9
Total	7 333	100.0

Source: SSCSE (2011)

Second, the existing legal system can be confusing. South Sudan operates under three distinct and overlapping legal frameworks: (i) laws passed by the National Assembly in Khartoum; (ii) the Laws of the "New Sudan" – enacted by the Sudan People Liberation Movement before 2005; and (iii) the Laws of Southern Sudan – enacted by the Legislative Assembly of Southern Sudan after 2005. Alongside this, customary law – traditional justice applied by community chiefs and built upon custom and tradition, have been used to resolve many disputes.

Third, some of the key institutions that regulate Juba's private sector are either absent or overlapping. There is confusion among federal, state and county jurisdictions over business licensing, taxes, customs, and land administration. Lack of

coordination has meant that entrepreneurs have had to deal with each level of government separately.

Fourth, Juba's institutional capacity and infrastructure remain underdeveloped. Public authorities lack the qualified staff needed to implement regulations – namely, civil engineers to inspect construction sites, auditors to ensure tax compliance, and specialized legal professionals to handle commercial cases. According to The Economist more than half of all civil servants have not completed primary education.¹³ Without a public credit registry or private credit bureau in Juba, creditors cannot obtain reliable information on debtors and without a collateral registry; entrepreneurs have a hard time using their assets as guarantees for loans.

⁸ See Kameir, E. (2011), The Political Economy of South Sudan: A Scoping Analytical Study.

⁹ See UNDP (2010).

¹⁰ DCDM (2011), A Study on South Sudan's Competitiveness and an Assessment of the Country's Cross Border Trade with its Neighbouring Countries. Draft Report prepared for African Development Bank. December 2011.

¹¹ The draft Growth Strategy, for example, states that "Economic growth is driven by the private sector, with GOSS (at all levels) limiting its role to: creating an enabling environment, addressing constraints to investment, and providing public goods."

¹² See International Finance Corporation (2011), Doing Business in Juba 2011: Comparing Business Regulation in Juba and 183 Economies. World Bank Group, Washington DC, 2011.

¹³ The Economist (2011), "Now for the Hard Part," The Economist, Print edition, February 3, 2011

Table 1.10: Doing Business Indicators (Rank among 183 economies)

Indicator	Juba	Sudan (Khartoum)	Sub-Saharan Africa
Starting a business	123	121	126
Dealing with construction permits	49	139	117
Registering property	124	40	121
Getting credit	176	138	120
Protecting investors	173	154	113
Paying taxes	84	94	116
Trading across borders	181	143	136
Enforcing contracts	74	146	118
Closing a business	183	183	128
Overall ease of doing business	159	154	137

Source: IFC (2011).

1.2.10 Impediments to Cross-Border Trade

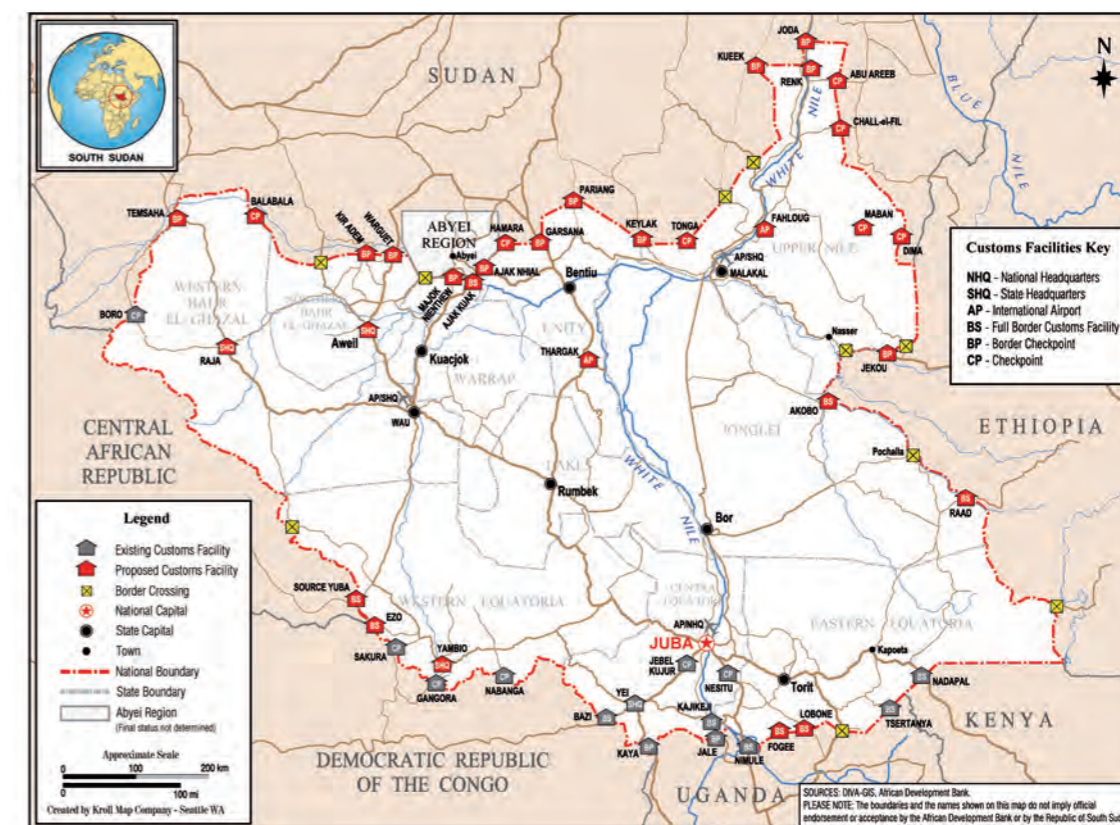
The bulk of South Sudan's external trade is with Uganda, Kenya and Ethiopia and for trade involving use of seaports the primary route is through Uganda and Kenya to and from the port of Mombasa. Accurate information on the volume and value of this trade is not available at this time because there are significant volumes of informal, unrecorded trade. Trade is highly asymmetric; volumes and values of imports from these trading partners are substantially larger than South Sudan's exports to them.

There are several reasons inhibiting smooth trade but one major concern of traders is the delays involved in getting clearance for goods coming into and out of the country. At the present time, only 14 customs facilities are operational in South Sudan, including facilities at four airports and seven border crossings. There are 53 facilities that are not

currently operational, although there are proposals to reopen two more airport facilities and facilities at 15 more border crossings (see Map 1.5).

With sustained economy recovery, the volume of international trade will continue to expand rapidly. Early action will be needed to ensure that customs capacities and procedures do not become a major bottleneck and a source of increased transport costs as a result of long waiting times at border crossings. At the present time, there are no one-stop stations at border crossings that speed clearance on both sides of the border. In a number of customs stations, processing of clearances is done manually and is cumbersome because of limited staff capacities and cumbersome administrative procedures. In some cases, trade is recorded only by value and not volume. A recent report of IFC (2011) provides additional insight into the costs of cross-border trading for the Sudan business sector (and for development programs that require substantial import of materials).

MAP 1.5: Border Crossing and Customs Stations in South Sudan



In order to trade overseas, cargos to and from Juba go through 2 customs border posts – at the Nimule/Bibia border between Sudan and Uganda and at Malaba between Uganda and Kenya. A business in Juba has to submit 11 documents, wait 60 days and spend \$9,420 to import a standard container of cargo through the port of Mombasa (Table 1.11). To export through the same port, a Juba-based business needs to submit 9 documents, wait 52 days

and spend \$5,025. In other parts of Sub-Saharan Africa, the process is quicker and cheaper: importing takes, on average, 38 days and costs \$2,492 while exporting takes 32 days and cost \$1,962. Juba ranks 181st out of 183 economies included in the IFC survey. Early action will be needed to ensure that customs capacities and procedures do not become a major bottleneck and a source of increased transport costs as a result of long waiting times at border crossings.

Table 1.11: Juba Trading Through Port of Mombasa, Kenya

Activity	Time (days)	Cost \$ per container
Exporting		
Documents preparation	28	275
Customs clearance and technical control	4	375
Ports and terminal handling	6	375
Inland transportation and handling	14	4 000
Export total	52	5 025
Importing		
Documents preparation	34	525
Customs clearance and technical control	3	430

Activity	Time (days)	Cost \$ per container
Ports and terminal handling	6	390
Inland transportation and handling	17	8 075
Import total	60	9 420

Source: IFC (2011).

1.3 Large Infrastructure Deficit for South Sudan

1.3.1 Current Status of Infrastructure in South Sudan

Decades of civil war basically inhibited the provision of basic infrastructure and this undermined much of its production capacity. As a result, most goods – such as food, construction materials, and basic inputs – are imported. And exports other than oil are minimal. Given that about 80% of the population lives in rural areas, the lack of basic infrastructure for many years now has been a serious impediment to the development of the large agricultural potential of the country.

At this juncture, a key issue for policy makers is compilation of a systematic assessment of the magnitude of the current infrastructure deficit and the extent to which it is an obstacle to acceleration of economic growth, job creation, increased incomes and reduced poverty. There has been only minimal investment in basic infrastructure over the past quarter century. Large

areas with very low population densities and decades of internal conflict have made it difficult to provide adequate infrastructure services throughout the country. Moreover, there has been a major decline in the quality of the little infrastructure that does exist: some of the facilities that were put in place several decades ago were damaged by the civil war and there have been negligible amounts of routine maintenance. As a result, most existing infrastructure is in need of rehabilitation. Moreover, relative to the population of the country and its GDP, there is not sufficient infrastructure to meet the needs of an economy that has the prospect of sustained strong economic growth in the decade ahead. As noted earlier, the SSDP attaches considerable importance to the provision of new and rehabilitation of the existing infrastructure of the country and its expansion in support of sustained strong economic growth.

It is clear that in the decade ahead there is a compelling case for the upgrade and expansion of all aspects of the basic infrastructure of the country. Numerous empirical studies point to the important role played by infrastructure in promoting economic growth. The AICD (2011) suggests that a major improvement in infrastructure in South Sudan could boost per capita growth in non-oil GDP by 3.5 percentage points.

Table 1.12: Selected Indicators for Comparator Countries, 2009

Country	Population		GDP (\$ bill)	GDP per capita (\$)	Population in poverty (%)
	Total (mill)	Rural (%)			
Burkina Faso	15.757	81.2	8.133	516	46.4
Burundi	8.303	87.9	1.251	151	66.9
Eritrea	5.224	76.9	1.873	359	53.0
Malawi	15.692	74.3	4.728	301	65.3
Niger	15.891	78.6	5.244	330	59.5
Rwanda	10.277	81.6	5.265	512	51.2
Average	11.857	79.6	4.416	372	57.1
Memo item:					
South Sudan	8 858.872	83.1	4 484	506	50.6

Source: African Development Bank statistics database. Notes: (i) GDP for South Sudan is non-oil GDP; (ii) The incidence of poverty is for the most recent reported year and not 2009, except for South Sudan.

To facilitate comparisons in the development of infrastructure and associated services, a group of six comparator countries have been identified within the Sub-Saharan Africa Region whose level of development is roughly similar to that of South Sudan. These countries are listed in Table 1.12. They all have high proportions of the population living in rural areas; their aggregate GDP is roughly comparable to the non-oil GDP of South Sudan, as is their GDP per capita; and the incidence of poverty in these countries is high and again, roughly comparable with that of South Sudan.

Table 1.13 compares selected infrastructure-related indicators for South Sudan with other comparator countries. A number of points emerge from this comparison:

- The population density of South Sudan is very low, and is similar to that of Niger. This low population density has major implications for the design of infrastructure programs and the cost of bringing infrastructure services to many of the low density counties of South Sudan.
- South Sudan has a substantially larger area of land suited to permanent cropping than the comparator countries, and currently only a very small portion of this land is irrigated. There is substantial potential to expand irrigated agriculture to meet domestic and international demand for food crops and agricultural raw materials.
- Only 2% of the existing road network in South Sudan is paved, and most roads are impassable during the wet season making it difficult if not impossible for rural people, which raises the transportation costs and also hinders the movement of goods from rural areas to urban centers and markets in the country. With the exception of Burkina Faso, substantially larger portions of the networks of the comparator countries are paved.
- Within South Sudan, there is a lack of connectivity among regions and between urban and rural areas. Moreover, there are only limited connections with neighboring countries. Connectivity with Sudan in the north is primarily by air or river. On the road network, most traffic is between Juba and Uganda. There is an urgent need to improve connectivity and in so doing improve access to basic services throughout the country and support the integration of domestic markets. A high priority is therefore given by the Government to development of basic infrastructure, especially road networks, to improve this connectivity and provide enhanced support for agricultural development throughout the country.
- The road density, as measured by the km of road per thousand persons, is low in South Sudan and in all of the comparator countries except Burkina Faso. The average for Sub-Saharan Africa as a whole was 2.5 for the period 2000-06. A small number of Sub-Saharan countries do have quite high ratios of roads to population, including for example, Namibia at 21 per thousand, Botswana at 13 per thousand, South Africa and Zambia at about 8 per thousand, and Zimbabwe at 7 per thousand.
- There is no national rail network in South Sudan. The branch line from Babanusa in the North to Wau in South Sudan (446 km) is the only line in the country. It was heavily damaged during the conflict with the North and ceased commercial operations in 1991. It is currently being rehabilitated.
- A range of constraints limit the pace of recovery in the Nile river transport system. For example, Juba Port has suffered from siltation at its entrance. Navigational aids on the river require rehabilitation or re-installation, and in many locations dredging is required to open up the waterways after more than two decades of neglect. There is also a general shortage of equipment for operating river transport services, including a lack of handling equipment for containers, and vessels that are not in operating condition.
- Only one percent of the population has access to electricity. As a result, per capita consumption of electricity is estimated at about 80 kWh for 2010. Data are not available for the comparator countries, but for the low income countries of the world, the average consumption of power was 375 kWh in 2004. Inadequate electric power supply and its high cost is a major constraint on the economy. There is no national grid in South Sudan, only a series of isolated networks that serve three of the state capitals (Juba, Malakal and Wau) and Renk. The South Sudan Electricity Corporation (SSEC) has only 18.8 MW of installed capacity that is operational and it supplies these state capitals. Electric cooperatives provide 2.8 MW of capacity for the rural towns of Yei, Maridi and Kapoeta. The average tariff for SECC supplied power is 22 US cents per kWh while the cost of power supplied by the cooperatives is 53 US cents per kWh. According to recent surveys, 70% of businesses in South Sudan have their own diesel generators for power supply. Electricity is widely regarded as one of the most serious constraints to doing business in South Sudan.
- After decades of war, access to water supply and sanitation services is severely constrained. Only 27% of the population has access to improved water supplies, whereas the average for the comparator countries is about 68%. In the case of sanitation services, only 16% of the population has access to improved sanitation. In the case of the comparator countries, access ranges from 6% for Eritrea to 59% for Malawi. Many of the water points recorded in the national database are not operational. One-third of the population still relies on surface water as its main source. Access to piped water is practically non-existent, and more than 60% of the population relies on wells and boreholes for access to water. Three quarters of the population does not have access to any type of sanitation facility.
- In the case of communications, teledensity is poor. South Sudan has not experienced the explosive development of mobile phone and internet use seen in many other countries in Africa. Prices of ICT services are high, with most of the focus in the market on voice services. Data services are very limited and expensive.

Table 1.13: Selected Indicators for Infrastructure Services

Indicator	Year	Burkina Faso	Burundi	Eritrea	Malawi	Niger	Rwanda	South Sudan
Population (millions)	2009	15.757	8.303	5.224	15.692	15.891	10.277	8.109
Urban (%)	2009	18.8	12.1	23.1	25.7	21.4	18.4	26.3
Area ('000 sq.km)	2009	274	26	101	94	1 267	25	644
Population per sq km ('000)	2009	58	323	52	167	13	417	13
Permanent cropland (% of total area)	2008	0.2	15.2	..	1.3	..	11.3	..
Irrigated land (% of cropland)	2006	0.3	1.5	3.5	2.2	0.5	0.6	..
Road network (km)	2000-06	92 495	12 322	4 010	15 451	18 423	14 008	12 642
Road network paved (%)	2000-06	4.2	10.4	21.8	45.0	20.6	19.0	2.0
Road density: km/1 000 sq km	2000-06	338.1	479.5	39.7	164.2	14.5	567.8	19.6
Road density: km/1 000 persons	2000-06	5.9	1.5	0.8	1.0	1.2	1.4	1.6
Motor vehicles per 1 000 people	2007	11.0	..	11.0	9.0	..	4.0	..
Access to electricity (% of population)	2000-06	10.2	2.1	..	7.5	..	5.4	1.0
Urban	2000-06	53.5	20.9	..	34.0	..	27.2	6.7
Rural	2000-06	0.8	0.2	..	2.5	..	1.5	..
Firms with own generator (%)	2000-06	24.0	41.9	..	49.1	24.8	58.0	70.0
Access to improved water (% of population)	2008	76.3	72.5	60.9	81.6	51.2	64.8	27.0
Urban	2008	95.0	83.0	74.0	95.0	96.0	77.0	..
Rural	2008	72.0	71.0	57.0	77.0	39.0	62.0	..
Access to improved sanitation (% of population)	2008	12.6	41.4	5.5	59.2	8.1	22.6	16.0
Urban	2008	41.0	44.0	14.0	51.0	27.0	34.0	..
Rural	2008	6.0	41.0	3.0	62.0	3.0	20.0	..
Telephone subscribers per 100 people	2005	7.7	2.9	2.1	6.1	..	3.5	..
Mainline	2005	0.7	0.4	0.8	1.0	..	0.2	0.1
Mobile	2009	21.0	10.0	3.0	17.0	17.0	24.0	12.0
Households with own telephone (%)	2005	4	..	..	6	..	1	15
Households with television (%)	2005	7	14	14	3	5	2	3
Internet users per 1 000 people	2009	11	8	49	50	8	44	..
Personal computers per 1 000 people	2005	2	5	8	2	1	..	1

Sources: World Bank database for comparator countries. Data for South Sudan from AICD (2011) and government sources. Note: data for South Sudan are for 2008 or 2009.

1.3.2 High Cost of Infrastructure Services

Not only is access to infrastructure services very limited within South Sudan, but the poor state and limited development of infrastructure results in high costs for these services. The high costs associated with ports, transport and trade logistics have a serious impact on the business environment and the profitability of business activities. The World Bank (2009) survey of the business climate in Sudan reported that more than 60% of businesses in Malakal reported that transportation was a major impediment to doing business.

Domestic transport costs are high and more particularly higher than in neighboring countries. Transport freight rates in South Sudan can be as high as US 20 cents per ton km. The freight rate from Kampala to Juba is about US 18 cents per ton km, more than twice the freight rate from Mombasa to Kampala (Table 1.14). The cost of transporting a ton of freight from Mombasa to Kigali, a distance of some 1,700 km, is about \$105. Transport of a ton of freight from Kampala to Juba, about one-third the distance, costs \$113. Freight costs in Sudan are in line with those in other East African countries as a result of a competitive trucking industry and the low price of fuel. However, South Sudan makes very limited use of Port Sudan; its primary gateway to the sea is Mombasa. The expectation is that reliance on Kenya for access to sea freight will grow in the coming years.

Table 1.14: Road Freight Charges for Various Transport Corridors

Gateway	Destination	Mode	Distance (km)	Time (days)	Cost per ton/km (\$ cents)	Total cost per ton (\$)
Mombasa	Kampala	road	1 145	5~6	6.0	69
Mombasa	Kigali	road	1 700	5~7	6.2	105
Kampala	Juba	road	630		18.0	113
Khartoum	Port Sudan	road	668		8.0	53
Khartoum	Juba	road	1 197	8	10.6	127
Khartoum	Malakal	road	679	5	15.8	107
Khartoum	Malakal	road & river		7		75
Malakal	Juba	river		2		270
Durban	Lusaka	road	2 300	9~10	3.9-5.6	109

Source: African Development Bank (2009), African Development Bank (2011), AICD (2011).

The very high transport costs stem from the poor state of the infrastructure which results in smaller loads and longer travel times. The Juba bridge, for example, limits loads to no more than 45 tons. The poor road conditions increase travel times substantially. Poor roads between Yei and Kaya on the border with Uganda, result in travel times of 24 hours for the 90 kilometers of travel – an average speed of about 4 km per hour. Moreover, trucks encounter transit bottlenecks along the way. Yoshino (2009) reports the example of a truck transporting sacks of onion from Kassala to Malakal, a distance of 835 km, that was subject to tax and fee payments at about 20 different locations, totaling SDG 2,000 (equivalent to about \$800). Moreover, the imbalance in trade between South Sudan and its neighbors has a big impact on transport costs. The trucking companies that operate in South Sudan are mainly Kenyan and Ugandan companies. These trucks return empty from Sudan to Uganda, increasing significantly the cost of transport services.

In the case of electric power, the average cost of power in South Sudan is as high as \$0.37 per kWh, double the average cost of power in Sub-Saharan Africa which is estimated at \$0.18 per kWh and five times what is paid in other developing countries. These high prices reflect the fact that South Sudan has one of the highest costs of power production in Africa. The high cost stems, in part, from the use of small-scale diesel generation and from the high cost of diesel fuel.

1.3.3 Freight Logistics and Costs

As noted earlier, much of the South Sudan economy relies on cross border trade. There has been an encouraging development of private business activity in the country since 2005; but years of conflict have wiped out much of the country's infrastructure. As the AICD (2011) study has noted, poor infrastructure, coupled with high costs,

contributes to the long times and costs associated with moving freight within and outside South Sudan. The two key trading arteries are Mombasa and Port Sudan to Juba. The AICD study suggests that Mombasa is the more competitive option for inbound goods to South Sudan, based on times and costs associated with moving along these arteries. Importing freight to South Sudan takes between 30 and 60 days from the coastal gateways of

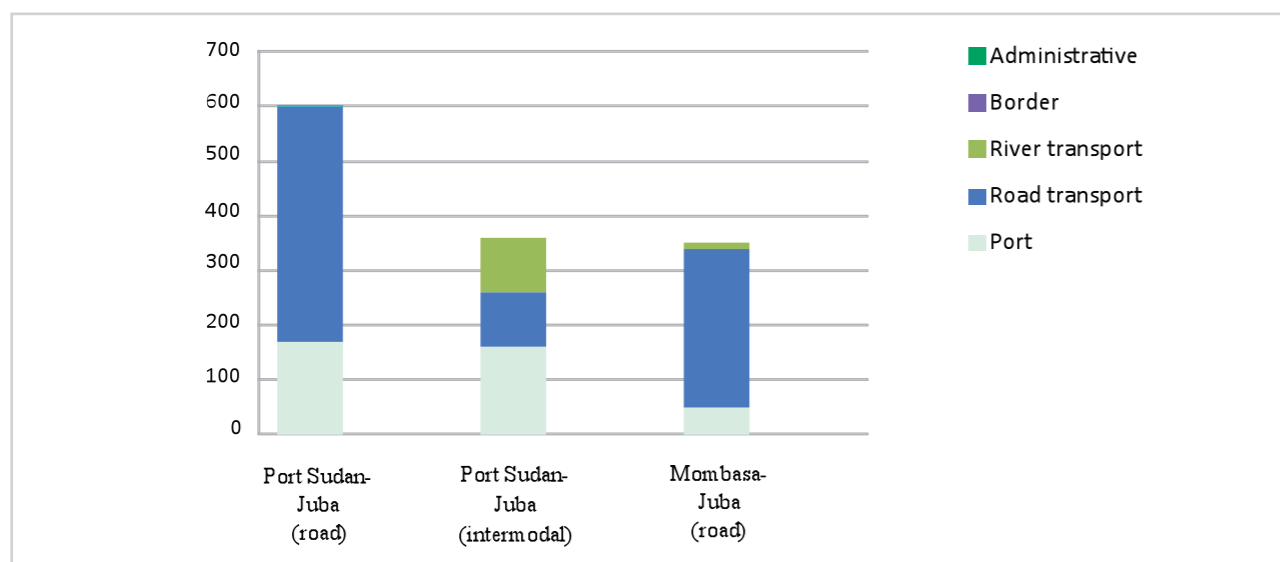
Mombasa or Port Sudan. As Chart 1.1 indicates, the transit time for freight coming through Mombasa is almost half that through Port Sudan. The main reason for the shorter time is greater efficiency in port handling in Mombasa. Port times for Mombasa are about 15 days, compared to more than 30 days for Port Sudan. The other point that emerges from the AICD study is that port-related charges increase the cost of moving freight by as much as 25% (Chart 1.2).

Figure 1.1: Transit Times for Imports (Time required to import freight in hours)



Source: AICD (2011).

Figure 1.2: Price for Importing Freight to South Sudan (Cost per ton in US\$)



Source: AICD (2011).

Inland transportation between Mombasa and Juba takes 17 days and costs \$8,075 for importing and 14 days and \$4,000 for exporting. These high costs stem not only from geography; they also arise from a burdensome administrative process, multiple checkpoints, and transport infrastructure constraints. The details are discussed at some length in the IFC (2011) report.

The other reason for large differences in transit times is that during the rainy season from April/May to October/November each year, a majority of roads in South Sudan are impenetrable. Multimodal road-river transport is the only alternative for travel for half the year. The multimodal transport costs are typically lower than for road, but the river transport adds about six days to the travel time.

1.3.4 High Unit Costs of Road Construction

Costs of road construction in South Sudan are very high in comparison with other Sub-Saharan African countries (Table 1.15). Section 7.2.5 of chapter 7 provides a detailed assessment of these costs for various types of roads. According to the AICD study, several factors contribute to these high costs. First, the ongoing construction boom in South Sudan prompted by substantial additional funding by Government and donors for rehabilitation of infrastructure and buildings has been hampered by the small domestic supply base for construction services and materials.

Table 1.15: Cost of Rehabilitation and Reconstruction of 2-lane Inter-urban Roads

Country	Average cost (\$/km)
DRC	228 872
Ethiopia	388 207
Ghana	261 052
Malawi	420 838
Mozambique	278 661
Nigeria	329 909
South Sudan	760 000 ~1 000 000

Source: World Bank (2009).

These very high construction costs, in effect, divert substantial amounts of public funds from other high priority investments in health, education, water supply and sanitation, for example. Moreover, they can also undermine the economic rationale for investment in portions of the national road network where traffic volumes are modest.

1.3.5 Inadequate Levels of Maintenance of Infrastructure

Inadequate levels of spending on routine maintenance of newly constructed or rehabilitated infrastructure assets have also contributed to the deterioration in the quality of these assets. The analysis undertaken in the individual infrastructure chapters in Part B of this Report suggests that the capital replacement cost of infrastructure assets

owned by the National Government was about \$1.45 billion in 2011, about 60% of which was transport sector assets. The level of spending required to keep these types of infrastructure assets in good working order is typically in the range of 3% to 5% of the capital value of the asset. This suggests that allocations in the National Budget for routine maintenance of the public infrastructure assets should have been in the range of \$45-70 million. The 2011 National Budget reports an allocation of \$20 million equivalent for maintenance of transport sector assets, but there do not appear to be specific allocations for public assets in other sectors. The international donor community has also been contributing modest amounts to the routine maintenance of some of these public infrastructure assets, but detailed information about the level of support provided in 2011 is not available. On the basis of this somewhat incomplete information, it would appear that budget allocations for routine maintenance are currently not at the levels required to ensure that

recently rehabilitated infrastructure assets are adequately maintained. In the case of the roads sector, for example, Chapter 7 reports that over the past five years a total of some 5,000 km of roads have benefited from some rehabilitation; however, informal estimates suggest that only 30% of these roads are currently in good condition.

1.3.6 Inadequate Levels of Cost Recovery for Infrastructure Services

One of the persistent problems for the provision of infrastructure services by public entities in South Sudan is the choice of pricing policies for these services and for cost recovery. According to the AICD (2011) study, the average cost of water production in the Upper Nile Water Corporation is about \$1.00 to \$1.20 per cubic meter, which is broadly in line with comparable costs for water utilities in other water-abundant areas in Sub-Saharan Africa. Water tariffs are set at about \$0.80 per cubic meter which, according to the AICD, is higher than other African benchmarks. However, cost recovery is very low, with only 40% of revenues being recovered. This situation undermines the financial sustainability of the water utility as revenues cover only half of the operating costs and none of the capital costs – a situation that typically leads to continued inadequate levels of maintenance even if facilities have been subject to major rehabilitation. A related problem is that 30% of water production is lost due to leakages in the system which stem from inadequate levels of maintenance. The Upper Nile Water Corporation loses about \$1 million a year due to various inefficiencies. Experience with this Corporation provides insight for the management of the South Sudan Urban Water Corporation. The challenge for the latter will be to build the financial viability of the entity through a combination of reduction in system losses,

improved cost recovery and revenue collections.

As noted earlier, power tariffs in South Sudan are high. However, revenue collection is substantially lower than the actual cost of supplying power. The combination of under-pricing power production costs, high technical and non-technical losses (AICD reported transmission and distribution losses of 50% of total electricity produced in 2006 – double what is reported for other countries in Africa) and under-collection of accounts payable (only 40% of bills were paid in 2006) meant that the power utility had a very large operating deficit in 2006. The implication is that in 2006 the SSEC had hidden costs of almost \$9 million – equivalent to about 190% of revenues collected. Development of a financially viable power utility in South Sudan is a high priority to reduce demands on the national budget and to develop a commercially viable partner for potential Public-Private Partnerships (PPPs) in the decade ahead.

1.3.7 Large Financing Requirements for Infrastructure

At the present time, there is a modest allocation of public resources for the rehabilitation, upgrade and expansion and maintenance of basic infrastructure. As Table 1.16 indicates, the total government and donor allocation for basic infrastructure capital and recurrent costs was about \$430 million in 2010 – some 68% of which came from the National Budget. The Government spent the equivalent of 4.4 % of non-oil GDP on capital outlays for the core infrastructure of the country, together with donor spending of a little over 2% of non-oil GDP. In \$ terms, total spending on the core infrastructure program is projected to decline in 2011, largely because of the projected depreciation of the SDG from an average of 2.38 pounds per dollar in 2010 to 2.95 in 2011.

Expenditure category	2006	2007	2008	2009	2010	2011
National budget						
Recurrent expenses	14.9	25.1	39.3	34.3	57.9	60.6
Capital expenditures	67.6	36.6	359.4	204.7	237.5	179.0
Total	82.5	61.6	398.7	239.0	295.4	239.6
Aggregate spending						
Recurrent expenditures	20.9	34.1	57.7	60.8	85.4	87.2
Capital expenditures	91.6	72.6	432.9	311.0	347.1	285.4
Total	112.5	106.6	490.6	371.9	432.5	372.6
Memo items:						
Disbursement ratio for donor programs	75.0	75.0	64.5	76.2	73.9	73.8
Capital spending as % non-oil GDP			9.5	6.9	6.5	5.1
Recurrent spending as % non-oil GDP			1.3	1.4	1.6	1.6
National budget (SDG millions)						
Recurrent expenses	32.4	50.6	82.2	79.2	137.9	178.7
Capital expenditures	146.6	73.9	751.2	472.9	565.2	528.0
Total	179.1	124.5	833.3	552.0	703.1	706.7
Exchange rate: national currency per US\$	2.17	2.02	2.09	2.31	2.38	2.95

Source: Annex Table 2.5, Annex Table 3.1 and Annex Table 3.2.

If South Sudan is to close the very large infrastructure gap outlined in the preceding discussion, there will have to be a substantially larger allocation of financial resources for the program. In a recent assessment, AICD (2011) indicated that South Sudan will need to allocate an average of about \$1,080 million a year in the decade ahead to address the severe infrastructure deficit of the country.¹⁴ The study

estimates that the average annual outlay on operations and maintenance of the infrastructure network would be about \$280 million a year. The levels of spending in the recent past have been about 40% of the levels proposed by the AICD study. Mobilization of substantially larger amounts of funding for the infrastructure programs poses yet another major challenge for the Government.

Table 1.16: Estimates of Expenditures on Infrastructure Related Programs (In \$ millions)

Expenditure category	2006	2007	2008	2009	2010	2011
On-going donor programs						
Planned disbursements	40.0	60.0	142.3	174.5	185.5	180.3
Actual disbursements						
Recurrent expenditures	6.0	9.0	18.4	26.6	27.4	26.6
Capital expenditures (80% of total)	24.0	36.0	73.5	106.3	109.6	106.4
Total	30.0	45.0	91.9	132.9	137.0	133.0
Undisbursed balance (annual)	10.0	15.0	50.5	41.6	48.5	47.3

¹⁴ See Ranganathan, Rupa and Cecile M. Briceño-Garmendia (2011), South Sudan's Infrastructure: A Continental Perspective. Africa Infrastructure Country Diagnostic. Country Report. June 2011. Their calculations imply that the average GDP for the 2011-2020 period was \$6.02 billion (presumably at 2010 constant prices). This appears to be on the low side, given that the non-oil GDP of South Sudan was about \$5.38 billion equivalent in 2010.



A Strategy for Sustained Strong Economic Growth

2 A Strategy for Sustained Strong Economic Growth

2.1 Importance of Sustained Strong Growth

2.1.1 Growth Strategy of the National Development Plan

The Government has recently completed the South Sudan Development Plan (SSDP) for the period 2011-2013.¹ The Plan provides a detailed framework for development in the short-term and broad indications of the development strategy for the long-term. To ensure a prosperous future in the medium- and long-term, the Plan accords high priorities to peace and security, governance and the revitalization of key sectors of the economy including agriculture, the mainstay of the economy. Programs to achieve these objectives are crafted around the following four core building blocks for the SSDP: (i) improving governance; (ii) achieving rapid rural transformation focusing on infrastructure expansion to improve livelihoods and increase employment opportunities; (iii) improving and expanding social services, especially education and health; and (iv) deepening peace building and actions that enhance security. These building blocks are mutually reinforcing and interdependent. Improved security will be critical for achieving renewed economic growth and for extending social services. It is also important for human wellbeing, investor confidence and the cost of doing business. Similarly, improvements in road transport infrastructure are important for generating agricultural growth and for the provision of basic social services. Improvements in health and education will contribute in important ways to productivity enhancement and inclusive economic growth.

It gives priority in the near-term to building strong institutions required to promote a transparent and accountable state and improving capacity at all levels of government. It also emphasizes the importance of promoting private sector-led economic growth and the delivery of basic services to reduce the incidence of poverty among the population. The Plan makes specific reference

to the following priorities for economic development:

- Increase agricultural production;
- Increase livestock production;
- Improve and expand the road infrastructure of the country;
- Expand and improve the water and sanitation infrastructure of the country; and
- Ensure good management of oil sector resources.

However, it also recognizes that these actions can only be successful by maintaining relative peace and security for the population throughout South Sudan in the short-term and the long run.

According to the SSDP, the initial emphasis will be on using oil wealth to drive rural economic recovery and development. This will enable the poor to participate in and to benefit from accelerated economic growth. The Plan emphasizes the importance of diversifying the sources of growth in the economy to create the much needed employment and livelihood opportunities.

As Chapter 5 indicates, the country is endowed with abundant natural resources, including a large amount of fertile rain-fed agricultural land that is potentially irrigable, aquatic and forest resources as well as mineral resources. Given these natural resources, a youthful but low capacity labour force, and the current low productivity and investment levels, the SSDP concludes that the greatest potential for new growth in the short-term is likely to be from the small-scale private, predominantly family, agriculture and livestock sectors. By boosting human capacity rapidly, particularly around economic literacy and numeracy and modern farming and livestock production methods, and improving access to inputs, basic farming tools and markets, the impediments to agricultural growth can be significantly reduced or removed. But for this to have maximum impact on poverty and employment, the Plan concludes that gender inequalities in agriculture must be addressed, not least because a very large number of farmers are women and a significant number of households are headed by women. Moreover, enabling returnees and former combatants to participate in this renewed rural growth requires them to have access to land.

¹ See Government of South Sudan (2011), South Sudan Development Plan 2011-2013: Realizing Freedom, Equality, Justice, Peace and Prosperity for All. Council of Minister's Draft, Juba, July 5, 2011

In addition to developing the country's rural potential, it will be important to develop other economic activities over time to diversify the economy further and generate higher wage employment. These include non-oil mining, energy, telecommunications, construction, small- and medium-scale processing/manufacturing and financial services. Increased construction activities in roads and buildings and water supply, for example, have already created significant employment, as has the expansion of education and health services.

Oil currently provides 98% of public sector revenue and almost all foreign exchange earnings, thus making the country's economy extremely vulnerable to changes in oil prices and its production levels. Furthermore, oil production peaked in 2009 and is projected to decline sharply over the next 10 years. While the oil production provides much needed revenue, the extreme dependence on oil creates a major challenge for macroeconomic and fiscal management; and the impending sharp decline in oil income exacerbates this situation. Fiscal sustainability and stable public expenditures are the cornerstones of macroeconomic stability. The SSDP promotes efforts to diversify the economy, develop other sources of public revenue, and expand employment and livelihood opportunities. A core component of this growth will be building the Government's non-oil revenues in the coming period.

Because of a lack of baseline data at the time the SSDP was prepared, there is no formal macroeconomic framework in the Plan that gives projections for key macroeconomic

variables such as GDP, public finance and expenditures, population growth and employment; however, the Plan does include two detailed scenarios for the revenues flows that may come from the oil sector in the next 2½ decades.²

2.1.2 Importance of Increased Levels of Public and Private Investment

As the foregoing discussion indicates, South Sudan will need an extended period of sustained strong economic growth if there is to be substantial progress in reducing the high incidence of poverty in the country and in creating productive employment opportunities for the rapidly growing work force. These are among the most important challenges facing the country today. Progress on poverty reduction will require: (i) a reduction the current high levels of unemployment and underemployment in the country, especially among the rural population; and (ii) creation of productive employment for a labor force that is growing at about 5% a year with 250,000 new entrants into the labor force each year. As the SSDP indicates, the petroleum sector adds some two-thirds of the value added for the country, but makes a minimal direct contribution to employment creation. The vast majority of the population must therefore find productive employment opportunities in the non-oil sectors of the economy, and especially in the agriculture, forestry and fisheries sub-sectors. Employment generation and improved livelihoods is not only important for poverty reduction, but is central to maintaining peace and security.

Table 2.1: Trends in GDP Growth and Gross Investment Rates

Region	Average annual growth (% p.a.)				Gross investment as % GDP				
	1970-80	1980-90	1990-00	2000-05	1970	1980	1990	2000	2005
Sub-Saharan Africa	4.0	2.1	2.5	4.3	17		18	17	19
East Asia and Pacific	6.6	7.8	8.5	8.4	26		35	30	38
South Asia	3.5	5.2	5.6	6.5	16		23	23	37
Latin America and Caribbean	5.5	1.6	3.3	2.3	21		19	20	21

Source: World Bank, World Development Indicators, various issues.

The immediate challenge is that the investment rate in the economy must be raised to substantially higher levels if the country is to enjoy an extended period of sustained strong economic growth. The experience of other developing countries provides insight into the nature of the challenge

ahead. During 2008-2010, the level of gross investment averaged 17% of total GDP, which is basically the same as the average for Sub-Saharan Africa (SSA) countries for the period 1970-2005 (Table 2.1). At these investment levels, GDP growth per decade in SSA has ranged from 2.1% p.a.

in the 1980s to 4.3% p.a. in 2000-05. And in Latin America, investment levels of about 20% of GDP over the past three decades have resulted in GDP growth of about 2.5% p.a. These experiences stand in sharp contrast with East Asia where investment rates for the past three decades at least have exceeded 30% of GDP and GDP growth has been in the range of 7-9% p.a. More recently, a similar pattern has emerged in South Asia with investment rates rising to well over 30% of GDP in the past decade and GDP growth moving up from 3.5% p.a. to 6.5% p.a.

The position taken in this Report is that the country will need to raise the non-oil GDP growth rate to about 8-9% a year in the decade ahead to reduce poverty and create productive opportunities for a rapidly growing and underemployed work force. This scenario is referred to in this Report as the High Growth Scenario. It will take time to build the required institutional and business environment required for this outcome. However, investment rates will also have to rise steadily from their current levels of about 20% of non-oil GDP to about 35% by 2020.

Table 2.2: Summary of Proposed Investment Program for the High Economic Growth Scenario
(\$ millions at 2010 constant prices and exchange rate)

Indicator	Estimates	Projection						Total 2011-20
	2010	2011	2012	2013	2014	2015	2020	
Private investment in petroleum sector	1 063	1 173	888	849	789	740	573	5 012
Investment in the non-oil sectors								
Public								
Agriculture (incl. irrigation)	55	79	99	118	139	162	259	856
Infrastructure	400	335	414	764	939	977	1 568	4 997
Other	157	153	164	176	206	218	357	1 275
Total	612	568	677	1 059	1 284	1 357	2 184	7 128
Private								
Agriculture (incl. irrigation)	25	30	60	100	150	206	676	1 222
Infrastructure	51	52	119	318	382	340	330	1 541
Other	324	336	357	395	445	517	630	2 681
Total	400	418	536	813	977	1 063	1 636	5 444
Total								
Agriculture (incl. irrigation)	80	109	159	218	289	368	935	2 078
Infrastructure	451	387	533	1 082	1 321	1 316	1 897	6 538
Other	480	489	521	571	651	735	987	3 956
Total	1 012	986	1 213	1 872	2 262	2 419	3 819	12 571
Memo items:								
Non-oil GDP	5 380	5 083	5 739	6 051	6 428	6 868	10 246	
Incremental capital-output ratio ¹	1.0	(3.7)	1.9	6.0	6.0	5.5	4.5	
Non-oil investment as % non-oil GDP								
Public	11.4	11.2	11.8	17.5	20.0	19.8	21.3	
Private	7.4	8.2	9.3	13.4	15.2	15.5	16.0	
Total	18.8	19.4	21.1	30.9	35.2	35.2	37.3	
Growth in non-oil GDP (% p.a)		5.5	12.9	5.4	6.2	6.8	9.1	

Source: Annex Table 4.4. Note 1: The incremental capital-output ratio (ICOR) is for the non-oil economy. It excludes petroleum sector investment and value added.

Table 2.2 provides a summary of the estimated investment expenditures for South Sudan for 2010 and 2011, along with projections for 2012-2020. The projections for the sectoral investment requirements were derived in the following manner:

- Private investment in the existing oil fields is assumed to decline steadily in the decade ahead as production declines. Oil investment is projected to decline from 8% of GDP in 2010 to about 4.5% by 2020. However, as noted earlier, there is a very real possibility of additional

² One scenario in the SSDP assumes that 100% of net income is allocated to South Sudan; the other assumes an allocation of 50% of net income. See Annex 5 for a further discussion of these options.

improved oil recovery (IOR) investment in the existing field and in new exploration. These possibilities are beyond the scope of this Report and are therefore not considered here.

- The investment program for the agricultural sector is based on the proposed program set out in Chapter 6 of the Report which calls for a total investment of \$4.8 billion (including investments in irrigation) for the period 2011-2020.
- The investment of \$12.3 billion in infrastructure is based on full implementation of the proposed Infrastructure Action Plan as set forth in Chapter 3 of this Report, and described in detail in Part B of this Report.
- The aggregate amount of investment of \$24.6 billion in the non-oil economy for the 2011-2020 period is indicative of the amount required to close the existing very large infrastructure gap and launch a substantial program of expansion in agriculture, thereby raising the growth rate of the non-oil economy to about 9% a year in real terms by the end of the decade.³ The projected growth in non-oil GDP averages 7% a year for the decade as a whole.

Public investment, which includes that by the Government and the international donor community, is projected to rise steadily from about 11% of non-oil GDP at the present time to about 20% by 2020. The proposed infrastructure program accounts for about 70% of this public investment. Private sector investment in the non-oil economy is

currently in the range of 8% of non-oil GDP. Spurred by a vigorous program to develop agriculture and the natural resources of the country, this category of private investment is projected to rise to about 16% of non-oil GDP in the second half of the decade ahead.

2.2 Sources of Growth at the Sectoral Level

2.1.1 Overview

Table 2.3 provides a summary of the projection of GDP for the High Growth Scenario for the decade ahead. Because of the projected decline in the oil sector in the next decade, GDP peaks at about \$37 billion in 2012 and then declines to about \$33 billion by 2015 and gradually rises to about \$34 billion by 2020. However, the average annual decline in petroleum value added of 6.5% a year is offset by growth in non-oil GDP of about 7% a year in the decade ahead. The implication is that in real terms GDP per capita declines from a peak of about \$1,550 in 2011 to about \$1,030 by 2020 (both at constant 2010 prices and exchange rate). National income per capita is estimated at about \$1,100 at the present time, but it declines steadily to a little more than \$900 in the latter part of the decade ahead (at 2010 constant prices and exchange rate). This may result in South Sudan being reclassified by the World Bank from Lower Middle Income developing country to Low Income status.

Table 2.3: Sectoral Composition of Growth in GDP (GDP at 2010 constant prices and exchangerate)

Sector	2011	2015	2020	2011-20
Annual growth rate (% p.a.)				
Petroleum sector	31.2	(14.1)	(9.5)	(6.5)
Non-oil GDP				
Agriculture, forestry & fisheries	(25.1)	5.6	6.0	4.8
Non-oil minerals & manufacturing	5.0	9.0	13.8	9.5
Construction	8.0	12.0	14.0	12.5
Transport & communications	5.5	9.0	11.9	9.0
Government services	5.0	5.0	7.5	5.4
Other services	6.3	11.7	13.9	10.1
Total non-oil GDP	(5.5)	6.8	9.1	6.8
Total GDP	16.4	(4.4)	3.1	0.7

³ The incremental capital-output ratios (ICORs) reported in Table 2.2 were applied to the annual levels of investment to obtain the annual increase in non-oil GDP. Note that the ICOR is assumed to increase sharply during 2013-2015 because of the sharp increase in capital outlays on major infrastructure projects that take several years to complete and therefore only produce benefits in the form of increased growth in output several years later. The ICORs are assumed to decline steadily to about 4 by the end of the decade. At this level, the ICORs are similar to those for other developing countries whose policy framework is designed to produce strong economic growth.

Sector	2011	2015	2020	2011-20
Share of GDP (%)				
Petroleum sector	59.7	48.5	28.5	
Non-oil GDP				
Agriculture, forestry & fisheries	14.5	17.4	21.6	
Non-oil minerals & manufacturing	2.3	3.2	5.3	
Construction	1.4	2.4	4.2	
Transport & communications	1.9	2.7	4.2	
Government services	15.3	18.8	24.2	
Other services	5.0	7.1	12.1	
Total non-oil GDP	40.3	51.5	71.5	
Total GDP	100.0	100.0	100.0	

Source: Annex Table 4.7.

Table 2.4 provides a summary of aggregate growth trends for these six countries for the period 1980-2006. Economic growth was very weak during 1980-2000, but most of the comparators experienced an improved growth performance in the past decade. This recovery was led by the agriculture sector which grew at an average of 5.6% a year in real terms

during 2000-2006 – a growth rate roughly comparable to that projected for South Sudan. In the decade ahead, effective use of oil revenues, together with concerted efforts to improve the operating environment for private business can result in a stronger performance by South Sudan than that of the comparator countries over the past three decades.

Table 2.4: GDP Growth in Comparator Countries (In % per annum)

	1980-00	2000-06	2006-09
Agriculture	1.2	5.6	
Industry	1.6	4.5	
Services	3.4	3.8	
GDP	2.2	4.5	4.6

Source: World Bank country database.

2.2.2 Development of Petroleum Resources

Overview of the sector: Oil was discovered in Sudan the 1980s by Chevron; the first oil was produced and exported in 1999 following the completion of the pipeline from central Sudan to the Red Sea port of Bashair. Two main blends of crude oil are currently produced – Nile Blend and Dar blend. The major production fields are located in South Sudan, while the major oil refineries, ports and

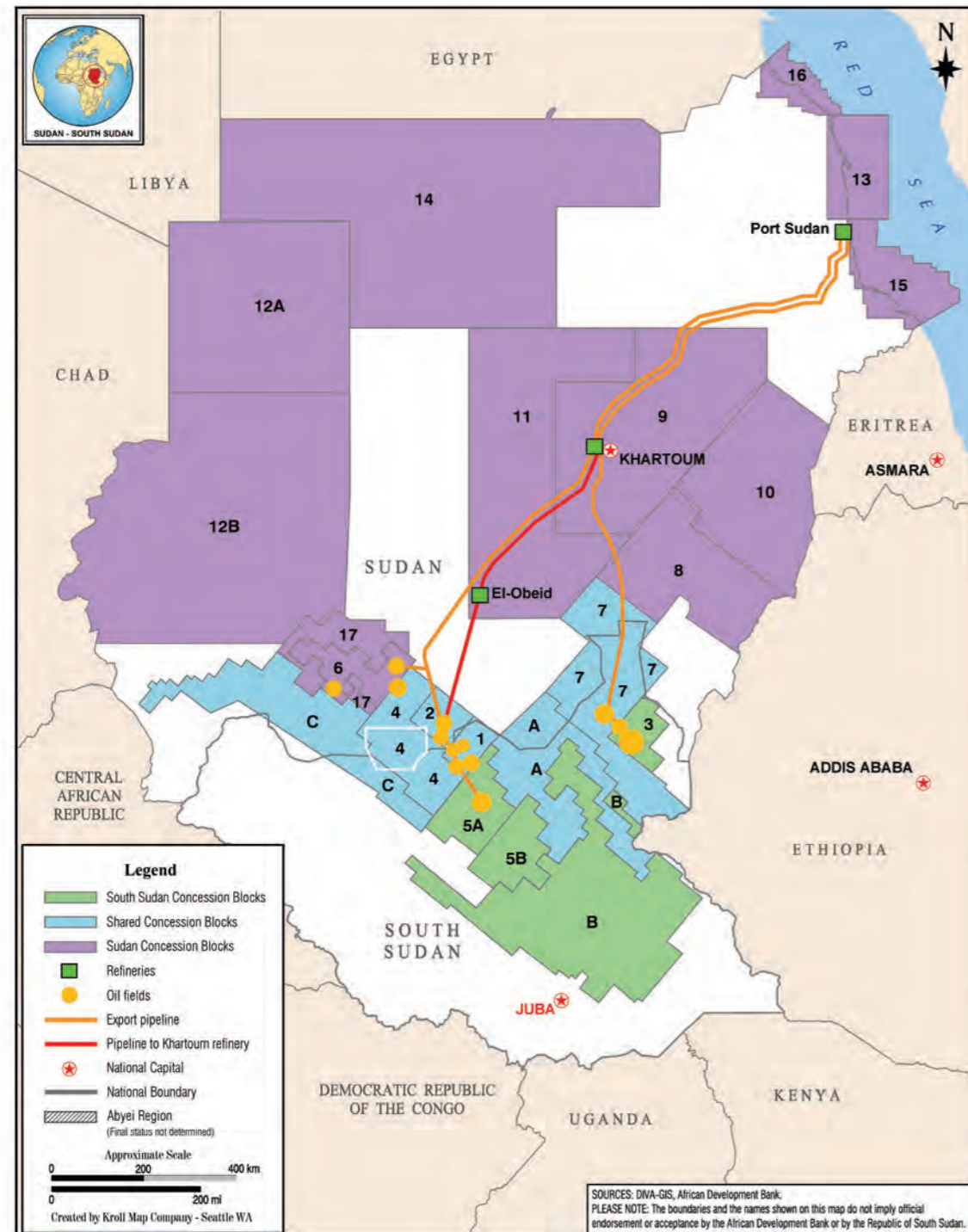
pipelines are located in the Republic of Sudan in the north. Total refining capacity is reported to be 131,700 bbl/d. According to the Oil and Gas Journal (OGJ), Sudan as a whole had five billion barrels of proved oil reserves as of January 2011. However, estimates of reserves range from 4.2 to 6.7 billion barrels.⁴ The majority of these reserves are located in the Muglad and Melut Basins, both of which are located in South Sudan. Because of the many years of civil conflict, exploration for new reserves has been very limited and confined to the Central and South Central parts of Sudan.

⁴ See www.eurasiareview.com/01102011.

Production is sourced from two groups of blocks in addition to output from smaller, newer fields that have come on-stream recently. Map 2.1 shows oil concessions in South Sudan (RSS) and Sudan. Concessions have been awarded for most of the demarcated blocks; a small number are being processed and an even fewer number are still free blocks. Blocks in RSS include EA, B, 5A, and 5B. Blocks 6, 8, 9, 10 (free), 11, 12A, 12B, 13, 14, 15, 16 (Halayib) are located in the Sudan. Production is now

largely concentrated in Blocks 3, 7 (Dar blend) and Blocks 1, 2, 4 (Nile blend), and to a lesser extent Block 6 (Fula crude) and block 5A (Tar jath crude). Though most of the producing fields are now in South Sudan, there are also a few producing fields in the Sudan as well as vast concession areas. This concentration stems from the fact that Chevron Company had extensively surveyed these areas resulting in the availability of reliable information.

MAP 2.1: Oil and Gas Concessions in South Sudan and Sudan



The fields have been developed in a traditional onshore manner by drilling a number of production wells equipped with powerful pumps in the wells to boost oil production. Natural gas associated with oil production is mostly flared or reinjected. Few water injection wells have been drilled for pressure maintenance and displacement of oil for reservoir management. This has resulted in high initial oil production, which has then declined rapidly. The average oil recovery factor in Sudan is estimated at 23% compared with a world average of 30%, and 46% in the case of Norwegian fields. Preliminary studies indicate that the fields have good reservoir properties with light oil, which suggests that more oil could probably be recovered by using more advanced recovery methods such as injection of water and chemicals or injection of gas. More advanced technologies could also reduce the very high water production level and increase oil production.

The Sudan National Petroleum Corporation (Sudapet), Sudan's national oil company, has been active in oil exploration and production. Because of limited technical and financial resources, Sudapet has often entered into joint ventures with foreign companies in oil projects, but remains a minority shareholder. Nilepet is South Sudan's national oil company, but its role is yet to be fully determined. At the time that this Report was drafted, there had been no announced changes in production sharing agreements, contract terms, or oil sector policies in South Sudan.

Foreign companies involved in Sudan's oil sector are primarily from Asia, the most significant of which are China National Petroleum Company (CNPC), the Oil and Natural Gas Corporation (ONGC) of India, and PETRONAS from Malaysia.

Table 2.5: Actual and Projected Oil Revenues and Production Costs (\$ millions at current prices)

Indicator	Actual			Estimate	Projected		
	2008	2009	2010	2011	2012	2015	2020
Oil export income							
Oil production ('000 bbl/d)	306.2	361.5	359.5	353.6	337.5	211.1	115.2
Average oil price (\$)	97.1	53.4	69.3	94.2	94.7	103.2	130.6
Total revenues	10 845.2	7 043.4	9 098.6	12 159.3	11 666.7	7 951.3	5 493.5
Production costs							
Capital expenditures	1 361.2	1 175.0	1 062.7	1 195.4	916.0	796.2	674.6
Operating costs	546.1	522.3	579.4	754.1	723.6	493.1	340.8
Operating income	1 993.3	1 183.0	1 741.3	2 682.9	2 805.2	1 739.7	1 078.0
Total payments to Petroleum Co	3 900.6	2 880.3	3 383.4	4 632.4	4 444.8	3 028.9	2 093.4
Management and transportation	584.3	516.0	550.9	754.1	723.6	493.1	340.8
Total payments	4 484.9	3 396.3	3 934.3	5 386.6	5 168.3	3 522.0	2 434.2
Net income	6 360.3	3 647.1	5 164.3	6 772.7	6 498.3	4 429.3	3 059.3
Memo item: petroleum value added							
Value added at current prices	9 714.8	6 005.1	7 968.3	10 651.0	10 219.5	6 965.1	4 811.9
Value added at 2010 constant prices		6 094.6	7 968.3	10 452.4	9 902.6	6 473.1	4 088.3

Source: Annex Table 5.1.

Oil production in South Sudan and revenue sharing arrangements: Production in the South was about 360,000 thousand barrels per day in 2010 (Annex Table 5.1), which means that South Sudan is the third largest oil producer in Sub-Saharan Africa.⁵ In the absence of actions aimed at improved oil recovery (IOR) from existing fields and

exploration and development of new fields, production is expected to decline steadily from the peak of 361.5 million bbl/d in 2009. Table 2.5 provides a summary of revenues and production costs for 2008-2010, an estimate for 2011, and projections to 2020. The essential point in these projections is that oil revenues (at current prices)

⁵ According to recent reports by the US Energy Information Administration, production by other Sub-Saharan countries is as follows: Nigeria (2.2 million bbl/d), Angola (1.4 million bbl/d), Equatorial Guinea (330,000 bbl/d), Congo Brazzaville (244,000 bbl/d), and Gabon (237,000 bbl/d).

will decline by 50% in the decade ahead as a result of a substantial decline in production from existing fields in the absence of IOR measures or development of new fields. Net income also declines by about 50%.

As the discussion in Chapter 1 indicates, value added by the petroleum sector has accounted for more than 60% of GDP in the past three years. Value added is expected to peak at about \$10.6 billion in 2011 (at 2010 constant prices). In the scenario set forth in Table 2.5 in which there is no IOR in existing fields and no development of new

fields, petroleum sector value added declines to about \$4.8 billion by 2020 (at 2010 constant prices) – equivalent to only 45% of the 2011 forecast. This decline will have serious economic consequences for the South Sudan economy. Apart from the pressure that a large decline in revenues may put on the national budget, a sharply reduced level of production would also lead to reduced opportunities for the domestic supply of goods and services to the petroleum sector that, in turn, would have indirect effects on employment in these industries.

and pays a transit fee for the use of pipelines and port facilities plus support for further development within the Republic of Sudan that will contribute to financial stability in that State.

- Scenario IV in which the oil producing states receive 2% of net income and the Republic of Sudan receives 29% of net income (\$15 billion during 2011-2020). South Sudan therefore receives 69% of net income (\$31.1 billion during 2011-2020). This scenario approximates the reported position being taken by the Republic of Sudan in the ongoing negotiations.
- Scenario V in which the oil producing states receive 2% of net income, and the Republic of Sudan and the Republic of South Sudan split the remaining net income equally, each with a 49% share (each receives \$23.1 billion during 2011-2020). This scenario is included primarily as a bench mark since it reflects arrangements that were in place prior to South Sudan gaining independence in July 2011.

As Table 2.6 indicates, among these three scenarios there is a very large difference in the amount of oil income received by South Sudan. As the subsequent discussion indicates, under the Scenario II sharing arrangements, South Sudan has the possibility of funding its high priority development programs and allocating some income to its proposed wealth fund.

opportunities to process food products and raw materials for value addition, job creation and increased earnings. Only a successful transformation of the country's agriculture sector will reverse the decline of the sector and restore the country as a net exporter of agricultural commodities. The Government has not only identified the sector as the potential engine of growth and economic transformation, it has also selected the cereals, livestock and high value fruits and vegetables sub-sectors as the primary areas of focus that would drive economic growth and poverty reduction in the country during the medium-to long-term. Given the current spatial production patterns in South Sudan, every state in the country will benefit from expansion of production of these prioritized sub-sectors.

The SSDP objective is to make agriculture the locomotive of a broad-based and equitable growth and driver of economic diversification and industrialization. The key to realizing the potential of the agriculture sector lies in the ability of South Sudan to transit, on a timely basis, from the current subsistence model of agriculture characterized by inefficient production system, low productivity and absence of market orientation to an invigorated smallholder cum commercial agriculture model driven by the infusion of new domestic and foreign direct capital investment, adaptation of modern technology, supportive infrastructure and improved extension and agriculture research services.

A key objective of the strategy is to increase the share of non-oil GDP by accelerating agricultural production, which, in turn, will serve as a catalyst for economic-industrial transforming and growth in South Sudan. Secondary objectives of the strategy are to increase smallholder and rural household income, and, enhance national food security. Subsumed under these objectives is the provision of agricultural extension services, transport and off farm infrastructure, which are key imperatives for agricultural growth and trade expansion through market access.

In 2011 the Ministry of Commerce, Industry and Investment produced a strategy paper that provides a national framework for agricultural development in South Sudan with ambitious targets for the 2011-2016 period.⁶ These include the following: (i) increase non-oil GDP by 25%; (ii) increase exports of crop products by 50%; (iii) improve smallholder income by 50%; (iv) achieve food security in cereals and eliminate dependency on imports to meet the food needs of the country; (v) mobilize \$500 million of FDI through a Strategic International Agriculture Partner (SIAP) arrangement.

Table 2.6: Three Different Scenarios for Revenue Sharing (\$ millions at current prices)

Indicator	Actual			Estimate	Projected		
	2008	2009	2010	2011	2012	2015	2020
Scenario II: 2:80:18							
Allocation to oil-producing states (2%)	127.2	72.9	103.3	135.5	130.0	88.6	61.2
Revenue to GOSS & RSS (96%)	3 116.5	1 787.1	2 530.5	3 318.6	5 198.7	3 543.4	2 447.5
Revenue to GoNU (2%)	3 116.5	1 787.1	2 530.5	3 318.6	1 169.7	797.3	550.7
Scenario IV: 2:69:29							
Allocation to oil-producing states (2%)	127.2	72.9	103.3	135.5	130.0	88.6	61.2
Revenue to GOSS & RSS (69%)	3 116.5	1 787.1	2 530.5	3 318.6	4 483.8	3 056.2	2 110.9
Revenue to GoNU (29%)	3 116.5	1 787.1	2 530.5	3 318.6	1 884.5	1 284.5	887.2
Scenario V: 2:49:49							
Allocation to oil-producing states (2%)	127.2	72.9	103.3	135.5	130.0	88.6	61.2
Revenue to GOSS & RSS (49%)	3 116.5	1 787.1	2 530.5	3 318.6	3 184.2	2 170.3	1 499.1
Revenue to GoNU (49%)	3 116.5	1 787.1	2 530.5	3 318.6	3 184.2	2 170.3	1 499.1
Memo items: Additional revenue for RSS							
Scenario II over Scenario V	-	-	-	-	2 014.5	1 373.1	948.4
Scenario IV over Scenario V	-	-	-	-	1 299.7	885.9	611.9

Source: Annex Table 5.2.

One of the major challenges, therefore, is to pursue opportunities for IOR under the program that is currently supported by the Norwegian Government and petroleum industry. The cessation of conflict in the South will also provide opportunities for detailed exploration work that may identify additional petroleum resources suitable for development. The other major concern relates to arrangements for revenue sharing between the Republic of South Sudan and the Republic of Sudan. At the time this Report was drafted, negotiations on revenue-sharing arrangements were ongoing. For the purposes of this Report, a total of five different revenue sharing scenarios

were developed. These are described in some detail in Annex 5. Table 2.6 uses three of these five scenarios to illustrate the range of possible outcomes and the related financial implications associated with these outcomes. These scenarios are as follows:

- Scenario II in which the oil producing states continue to receive 2% of net income each year, and the Republic of Sudan receives 18% of net income, equivalent to \$10.6 billion during 2011-2020. In this scenario, the Republic of South Sudan receives 80% of the net income from oil extracted in the South (\$35.6 billion during 2011-2020)

The vision for the sector: Twenty-five years ago, Southern Sudan was a net exporter of cereals, livestock and other agricultural products. As Chapter 5 indicates, South Sudan soils and ecological characteristics make the country suitable for the supply of wide range of agricultural products. Developing the country's agricultural and livestock potential has been identified in the SSDP as the most feasible way to enable broad-based economic growth and food security in the short- to medium-term. The strategy envisages a South Sudan that would exploit

⁶ Source: Ministry of Commerce and Industry & Investment (2011): "Fostering Innovation and Competitiveness in South Sudan – Sector Growth Strategies." Juba, March 2011.

Table 2.7: Indicative Plan for Cropland Development (In hectares '000)

Indicator	Estimates			Projection				Indicative
	2010	2011	2012	2013	2014	2015	2020		2030
Harvested area								
Cereals	921	500	939	986	1 060	1 166	1 880	2 800
Other crops	79	80	81	84	100	154	620	1 900
Total	1 000	580	1 020	1 070	1 160	1 320	2 500	4 700
Cultivated land under rotation	1 681	2 114	1 726	1 684	1 675	1 671	1 500	1 570
Cultivated area	2 681	2 694	2 746	2 754	2 835	2 991	4 000	6 270
Memo items:								
Irrigated area (ha '000)	32	19	37	53	86	132	400	1 000
Cultivated as % total land area	4.2	4.2	4.3	4.3	4.4	4.6	6.2	9.7
Harvested as % of cultivated	37.3	21.5	37.1	38.8	40.9	44.1	62.5	75.0
Irrigated area as % total harvested	3.2	3.3	3.6	5.0	7.4	10.0	16.0	21.3

Source: Tables 6.5 and 6.11 and estimates by authors.

Proposed program for agricultural development: Chapter 6 sets out in detail the proposed strategy for accelerating the development of the agriculture sector in the decade ahead. Realizing the agriculture sector goal/objective will require a paradigm shift to a market-oriented smallholder and commercial farming mindset, exploiting opportunities for economies of scale in production and marketing of agricultural products. Given the size of the domestic market, South Sudan will necessarily have to create a market niche in the regional and international markets for a selected number of its agricultural products.

A shift to export-led growth will represent a milestone in the transformation of agriculture in South Sudan, pointing to successes in raising output through the combination of increased crop land use, the introduction of productivity-enhancing techniques and the removal of key infrastructure bottlenecks, making South Sudan a competitive regional and global player in the production and marketing of agricultural commodities. Consistent with the objectives of the SSDP, the emphasis is on accelerating production of cereals, high value fruits and vegetables and production of livestock products.

Table 2.8: Selected Indicators for Growth of the Agriculture Sector (\$ million at 2010 constant prices and exchange rate)

Indicator	Estimates		Projection					Total
	2010	2011	2012	2013	2014	2015	2020	
Investment								
Public								
Government	4.1	16.1	32.3	48.1	65.6	84.6	172.9	419.7
Donors	51.0	63.2	66.5	70.0	73.5	77.0	85.8	435.9
Sub-total	55.1	79.3	98.8	118.1	139.1	161.6	258.6	855.7
Private								
Smallholder farms	10.0	11.4	17.5	23.9	36.7	49.7	65.6	204.8
Commercial farms	15.0	18.6	42.5	76.1	113.3	156.3	610.3	1 017.1
Sub-total	25.0	30.0	60.0	100.0	150.0	206.0	675.9	1 221.9
Total	80.1	109.3	158.8	218.1	289.1	367.6	934.5	2 077.6

Indicator	Estimates		Projection					Total
	2010	2011	2012	2013	2014	2015	2020	
Agriculture value added								
Value added (\$ mill)	1 934.2	1 449.5	1 978.6	2 080.1	2 192.4	2 315.2	3 091.9	
Growth rate (% p.a.)	-	(25.1)	36.5	5.1	5.4	5.6	6.0	5.7
Cost of public services for agriculture								
Government	18.3	19.9	21.9	24.5	27.4	30.7	54.1	178.4
Donors	21.9	27.1	28.5	30.0	31.5	33.0	36.8	186.8
Total	40.2	46.9	50.4	54.5	58.9	63.7	90.9	365.2
Memo items:								
Rural population ('000)	7 756.6	8 068.9	8 369.1	8 677.2	8 970.7	9 235.5	10 422.0	
Value added per person (\$)	249.4	179.6	236.4	239.7	244.4	250.7	296.7	
Incremental capital-output ratio	-	(0.2)	0.3	2.2	2.6	3.0	5.3	3.1

Source: Annex Table 4.5.

Initially much of the increased production would go into the local market to meet domestic demand and replace imports. With full implementation of the proposed program, South Sudan would be exporting modest amounts of agricultural products to regional and international markets. As Table 2.7 indicates, under the proposed program, the total harvested area of cropland would increase to about 2.5 million ha by 2020, with an indicative long-term target of 4.7 million ha by 2030. The share of cultivated area that is harvested annually would increase sharply from about 37% at the present time to 63% by 2020. And the share of the harvested area that is irrigated would increase from 3% at present to about 16% by 2020. As the discussion in Chapters 6 and 7 indicates, the proposed expansion of cropped land and increased animal production would be supported by a major investment in the paved and all-weather gravel road network that improves substantially rural connectivity.

On-farm investment requirements and implications for agricultural growth: The magnitude of the investment and infrastructure needs for successful implementation of this strategy are large. As Table 2.8 indicates, private investment required to expand agricultural production capacities, and bring an additional 1.32 million ha under cultivation in the decade ahead, is estimated to be about \$3 billion (at 2010 constant prices and exchange rate). This investment would cover the cost of farm improvements, including irrigation, on-farm processing and on-farm and off-farm storage requirements and related infrastructure. Smallholders may account for about 15% of these capital costs. Commercial investment in medium- and large scale farming would require mobilization of about \$2.65 billion in the decade ahead. A substantial part of the latter would have to come from foreign direct investment (FDI) for large

scale commercial farming that is linked with smallholder development programs.

In addition to the private investment, the proposed program calls for a substantial increase in public funding for agricultural development, the bulk of which would come from the National Government and the international donor community. The share of the national budget allocated to agriculture, forestry and fisheries currently stands at about 1.5% a year. The Report proposes that this allocation rises to about 5% of the national budget by 2020. About \$350 million would cover the recurrent costs of public services to the industry, including for example, extension and veterinary services, improving preparedness and capacities for effective responses to food and agricultural threats, such as pests and diseases, development and enforcement of phytosanitary standards for products sold in domestic and international markets, and so on. About \$960 million would go to new capital works, including irrigation for smallholders, agricultural research, facilities for public markets and so on. The proposed 200,000 ha of smallholder irrigation to be completed in the decade ahead is estimated to cost \$400 million, for example. The donor community would be encouraged to support the program and cover about 45% of the total cost of the public program for agriculture, forestry and fisheries.

Sequencing of investment in agricultural production: In view of the prevailing food insecurity in South Sudan, the first priority is to improve food production for the domestic market. As discussed in Chapter 1, food security is a major and continuing concern for the country. According to the recent findings of the Food Security Monitoring System (FSMS) managed by the WFP, 10% of households were severely food insecure in October 2011,

37% were moderately food insecure, while the remaining 53% of households were food secure.⁷ Compared with the situation in 2010, the share of households that are moderately food insecure has increased while the severely food insecure households have remained at 10% of total households. During the initial phase, spanning three to five years, increases in production would be expected to reduce and ultimately eliminate the current high dependency on food imports and food aid.

As a practical matter, the transition to export-led growth will have to be phased in over the medium- and long-term. Entry into the export market in any discernible manner may only become feasible when the country has increased output sufficiently to offset the current national food deficit, and with investments in infrastructure along the lines proposed in this Report that bring the cost of access to regional and international markets into line with that of other countries in the region.

Successful implementation of a program along these lines, the total capital cost of which is estimated to be about \$4.8 billion in the decade ahead, would result in a transition to growth in agricultural value added of about 6% a year in real terms (Table 2.8). Sustained growth at this level for a decade or more would result in a fundamental transformation of the agricultural sector of South Sudan and lead to its reemergence as an important international supplier of food and agricultural raw materials.

Based on assumptions used in this Report about potential investment opportunities in agriculture, value added in the sector is projected to grow at an average of 5.7% a year during 2011-2020, increasing from an estimated 3% a year at present to 6% a year in the latter part of the decade. By 2020, the agriculture sector would account for about 21% of GDP, compared with an estimated 15% in 2010.

2.2.4 Prospects for Industrial Development

For the purposes of this Report, the industrial sector consists of mining activities other than oil, manufacturing, construction activities and utilities (power and water service provision being the main activities). The sector is currently very small, accounting for less than 5% of GDP. According to SSCSE data (Table 1.9), there were only 295 registered businesses in the industrial sector in 2010, including 199 in manufacturing, 89 in construction, and 7 in water and waste management services. As the preceding discussion indicates, a large push in agriculture and infrastructure in the decade ahead will open a significant range of possibilities for new investment in industrial activities, especially for the domestic market.

Development of non-petroleum mineral resources: The full extent of the potential for development of non-petroleum minerals industries is not known at this time. Minerals have been identified in a number of locations, but the extent of total reserves and recoverable reserves is not known.

- Artisanal mining for gold is undertaken near Kapoeta in Eastern Equatoria.
- Diamonds have been found at Namatina in Western Bahr el Ghazal, close to the border with the Central Africa Republic.
- The iron stone plateau, which stretches across the states of Northern Bahr el Ghazal, Western Bahr el Ghazal, Western Equatoria, Warrap and Lakes has substantial deposits of iron ore that offer prospects for development of smelting industry at some point.
- There are substantial deposits of limestone in Eastern and Western Equatoria.

Since the start of the first civil war in 1955, geological survey and mineral exploration with respect to non-petroleum minerals has been negligible. Information is not available on the number of domestic or international firms that are currently active in the mining sector. A first step in development of these possible mining activities will be the conduct of geological surveys and grant of licenses to potential investors for minerals exploration. Evaluation of these data will then begin to give insight into the prospects for development of mining activities in the country. For the purposes of this Report no assumptions have been made about the start-up of any large scale non-petroleum mining in the decade ahead.

Role of the construction industry: As the earlier discussion suggested, a successful transition to the proposed High Growth Scenario in the next decade will require a substantial increase in the level of investment in the country. In this scenario, total fixed investment in the non-oil GDP portion of the economy, which was about \$1.03 billion in 2010, would have to increase to about \$3.7 billion a year by 2020 (Table 2.2). Experience with the composition of investment expenditures in other Sub-Saharan countries suggests that, while there is considerable variation among countries regarding the shares of investment expenditures allocated to labor services, materials and equipment, a reasonably reliable rough rule of thumb is that materials account for about 45% of total investment outlays, labor services account for about 25% and capital equipment accounts for the remaining 30%. In the case of South Sudan, there is no detailed information about the typical composition of investment expenditures; however, value

added by the construction sector was equivalent to 19% of total spending on the non-oil component of fixed investment in 2010, which suggests that expenditure patterns in South Sudan may be roughly comparable to the experience of other countries.⁸

With fixed capital formation in South Sudan projected to

grow at close to 14% a year in real terms under the High Growth Scenario, the construction sector is expected to expand at a comparable rate for the decade ahead. This projected growth in investment spending has important implications, not only for the construction industry itself, but also for other markets that will provide support for these construction activities.

Table 2.9: Indicative Composition of Non-Oil Investment Expenditures for South Sudan (GDP at 2010 constant prices and exchange rate)

Indicator	2010	2015	2020	Growth rate 2010-20 (% p.a.)
Fixed capital investment (\$ mill)				
Materials	455	1 089	1 719	13.5
Equipment	369	823	1 146	11.3
Labor services	187	508	955	16.9
Total	1 012	2 419	3 819	13.5
Composition of expenditures (%)				
Materials	45	45	45	
Equipment	37	34	30	
Labor services	19	21	25	
Total	100	100	100	

Source: Estimates by authors.

Table 2.9 provides a very rough indication of possible trends in the composition of investment expenditures in South Sudan in the decade ahead. It is assumed that the share of labor services will gradually move up to about 25% of total spending, roughly in line with the levels of a number of other Sub-Saharan countries. Value added by the construction sector, which is estimated at about \$190 million equivalent in 2010 – or about 3.5% of non-oil GDP – would increase to about \$600 million by 2020 (at 2010 constant prices and exchange rate). This would be a three-fold increase in labor services required for construction activities. There is no information on the number of people currently employed in construction activities in the country, but by way of illustration an existing construction industry labor force of say 50,000 unskilled, semi-skilled and skilled workers would increase to perhaps 150,000 workers by 2020 – equivalent to almost a full year of new entrants into the labor force in the decade ahead. Close attention to increased use of labor intensive construction methods may enlarge substantially the employment impact of these proposed construction activities, especially in the roads sector.

Table 2.9 suggests that expenditures on construction materials would increase from an estimated \$470 million a year at present to \$1.65 billion by 2020. The implication is that there would be a substantial market for construction materials in the decade ahead. At the present time, there is minimal capacity for the domestic supply of these materials. As a result, almost all construction materials used in South Sudan are imported. Reliable information on the quantities and types of construction materials being imported is not available. More detailed analysis of these possible trends is required, but an investment program of the magnitude that will be required for the High Growth Case suggests the prospect of substantial new business opportunities that can have an important employment impact and reduce the current high dependence of imported construction materials.

The deposits of limestone, for example, may provide the basis for manufacture of cement and glass for supply to the construction industry. Full implementation of the proposed Infrastructure Action Plan will also open up substantial opportunities for quarrying materials for road

7 See World Food Program (2011), "South Sudan Food Security Monitoring, Round 5, October 2011." www.wfp.org, report dated December 12, 2011.

8 By way of comparison, the unweighted average ratio of construction value added to fixed investment is for the following group of countries for 2009-2010 was about 25%: Burkina Faso, Ethiopia, Kenya, Malawi, Niger, Rwanda, Sudan, and Uganda. The average for Sudan, for example, was 22%.

construction. As Chapter 7 indicates, in the decade ahead a total of 10,250 km of trunk, secondary and tertiary roads would be brought to an all-weather gravel standard and then maintained at this standard. The amounts of gravel required for this part of the road program will be substantial and will provide opportunities for the development of a significant quarrying industry. At this time, information is not readily available on the extent of the domestic quarrying industry in South Sudan and the availability of materials that will meet these construction requirements. The roads program will also create significant demand for asphalt, perhaps providing opportunities for establishment of a domestic manufacturing capability to supply the domestic and regional markets. More work is needed on the likely demand for these types of construction materials; for example, it is not clear whether the amount of carbonated rock in South Sudan is sufficiently large to justify construction of one or more cement plants that could compete with imports from Uganda.⁹ The underlying assumption used in this Report is that subject to further evaluation of these opportunities, it will be possible to attract private investment for the further development of quarrying activities and domestic manufacture on construction materials and that construction spending will be an important driver in the growth of the industrial sector in the decade ahead and a source of substantial employment opportunities.

The key issue will be the extent to which these opportunities provide employment for South Sudanese labor and benefit domestic business, or whether a substantial part of the construction work will be undertaken by foreign companies and involve large contingents of imported skilled and semi-skilled labor. At the present time, local contractors typically have only limited experience with and capacity for undertaking civil works projects. Moreover, many of these businesses face major challenges in building their capacity to bid successfully on civil works contracts of the government and donor community:

- Most have had very limited training and have only minimal experience in for bidding on civil works contracts. They often have limited understanding of the contract bidding procedures of government and donors. Moreover, the capacities of local companies for construction work is typically quite small; as a result, they cannot qualify for bidding on large contracts tendered by the government and by donors.
- The domestic banking system has limited capacity to provide support for local construction business activities. Most local contractors have very limited collateral to offer as security for bank loans and most have little or no credit history that the banks can consider. Contractors have difficulty in providing

bid and performance bonds should they be awarded contracts. They have difficulty in gaining access to bank financing because of their inability to provide bank guarantees, and performance and bid bonds.

An essential complement to the build-up in public sector capital works programs along the lines proposed in this Report will be a series of actions aimed at building the capacities of local business to compete successfully for construction contracts. Such a program would need to be built around the following activities:

- Build capacities for training domestic business in a range of areas, including maintenance of business and financial accounts, preparation of bid documents for government and donor construction contracts, preparation of applications to commercial banks for lines of credit. In response to similar challenges in East Asia in years gone by, a number of countries developed networks of Business Development Centers throughout the country, the purpose of which was to provide such services to small scale domestic business.
- Careful attention to the design of procurement contracts. The size of procurement contracts that are to be carried out under local competitive bidding (LCB) procedures should be aligned with the capacities of domestic contractors; for example, it may be that a significant number of local construction businesses have the capacity to handle construction contracts of say \$100,000. Where appropriate, contracts that are subject to LCB should be designed with these capacities in mind. In those cases where large construction contracts are required for successful implementation of projects and programs and are therefore subject to international competitive bidding (ICB), successful bidders should be encouraged to enter into sub-contracting arrangements with local firms.
- Consideration should also be given to setting up one or more companies that can rent construction equipment to local businesses. Many local contractors do not have the financial resources or certainty of the volume of work that would justify purchase of construction equipment. Again, in East Asia, governments on occasion took the lead in providing such a service through the creation of a fully autonomous equipment rental company that was publicly owned. In some cases, the rental equipment of the company came from donors who retained ownership of construction equipment used in donor-funded civil works programs. Once such projects were completed, ownership of the equipment was transferred to the government concerned who then transferred the equipment to the leasing company.

Prospects for the manufacturing sector: Manufacturing activities in South Sudan are limited. As Table 1.4 in Chapter 1 indicates, this Report estimates that the sub-sector accounted for about 2% of GDP (or 6% of non-oil GDP) in 2010). There are few manufacturers of any consequence in the country at this time, and as a result the bulk of the country's manufactured goods are imported from neighboring countries. The provisional balance of payments accounts prepared by the NBS suggest that total merchandise imports in 2010 were about \$3.8 billion. Based on the analysis in Table 2.9 above, imports of capital equipment and construction materials may have accounted for \$850 million or more in 2010. Data available for the oil industry suggest that imports by that sector may have accounted for about \$1 billion. This very rough estimate of the composition of imports suggests that in 2010 perhaps somewhere in the range of \$2 billion was spent on imports of food products and other consumer goods such as clothing, footwear, glassware and furnishings, and on textiles, raw materials and other manufactures. A more detailed assessment of the composition of these imports is beyond the scope of this Report, but such analysis is required for a serious evaluation of the prospects for private investment in import-substitution manufacturers.

There are efforts underway to revive several agro-processing industries that were operating in the region before the outbreak of civil war some 30 years ago. According to DCDM (2011), these include the following: (i) saw mills, fruit canning and a brewery in Wau, Western Bahr el Ghazal state; (ii) a kenaf project for manufacture and packaging of hessian cloth in Tonj, Warrap state; (iii) the Nzara agro-industrial complex in Western Equatoria State; (iv) a mongalla cotton spinning and weaving factory in Central Equatoria State; (v) paper making based on papyrus that grows in the Sudd and swamps in the states of Warrap, Unity, Upper Nile, Jonglei and Lakes; (vi) the shea butter project in Greater Bahr el Ghazal state; and (vii) a palm oil project in Western Equatoria state. These projects are all catering to niche demand in the domestic market. The survey undertaken during the recent DCDM study found that these firms faced a number of major constraints that adversely affected their competitiveness with imports and their future ability to export. These included inter alia, acute power shortages and high costs of running generators, high labor costs, lack of ready access to foreign exchange, poor transport infrastructure, difficulty in securing credit facilities, and high rental costs for office space.

Successful implementation of the proposed infrastructure program will address a number of these types of concerns; but it is clear that the Infrastructure Action Plan for the decade ahead will have to be complemented with actions that address these other obstacles, including for example, the problems in the financial services sector and labor market.

The proposed major expansion in commercial farming, forestry development and fisheries will open up opportunities for domestic manufacture of a growing range of food products and agriculture- and forestry-based raw materials for wood, textiles and other products. As indicated in Chapter 6, experience from other countries in the region (Ethiopia, Kenya and Uganda) suggest that large international firms that invest in agricultural production will also invest in downstream processing of these products. The working assumption in this Report is that with close attention to the foregoing types of concerns, the prospect is for rapid growth in manufacturing in the next decade, especially in view of the fact that it will start from a very small base. The growth in value added in the manufacturing sector is projected to accelerate to about 14% a year in real terms by 2020, with an average growth rate of 10% a year for the decade as a whole (see Table 2.3).

2.2.5 Contributions from Growth in Services

The services sector currently accounts for about 20% of GDP, which is equivalent to about 50% of non-oil GDP. The sector is dominated by national and state government services. The proposed development strategy for provision of services in the decade ahead places emphasis on creating the conditions for growth in employment and opportunities in the private sector, including transport and communications, financial services, tourism and trade. On this basis the services sector is projected to grow at an average of about 7% a year in the next 10 years.

Contribution of transport and communications: At the present time, there is very limited development of a domestic transport industry in South Sudan. As the discussion in Chapters 1 and 7 indicate, the domestic road network, until very recently, has been unusable. Opportunities for the development of a local transport industry were therefore very limited. The bulk of the road freight has been imports from Mombasa. In recent years, transport of goods into South Sudan has been dominated by relief goods arranged by WFP and others. Materials for UN peacekeeping forces were also a major traffic stream. Since the CPA, development projects have increasingly contributed to traffic growth. Sudan's import cargo transiting through Mombasa more than doubled between 2001 and 2005, from 67,000 tons to 141,000 tons. About 5,400 tons of Sudan's exports left through that port. The bulk of this freight would have been destined for Southern Sudan. There is no up-to-date information on the current volumes of road freight being transported in to and out of South Sudan or within the country.

⁹ A similar assessment that was undertaken in Burundi several years ago found that total imports of cement were about 140,000 tons a year (mostly from Uganda), and that the then known carbonated rock resources of Burundi were sufficient for a cement plant that could produce 60,000 tons a year for 20 years. The judgment was that a plant of this size was small and that it would not be able to compete with much larger scale plants in Uganda and elsewhere. See African Development Bank (2009).

What is clear is that traffic is dominated by road transport companies based in Mombasa (who are also the major carriers in East African region) and Uganda.¹⁰ The Kenyan trucking industry dominates the market and is competitive, but small tonnages for Sudan and the dominance of World Food Program (WFP) imply higher rates. There are over 50,000 trucks of all sizes registered in Kenya, of which about 4,000 participate in international traffic and a slightly larger number in internal long distance traffic.¹¹ Following consolidation a few years ago, a few large (fleets of at least 100 to 400 trucks) companies dominate this segment of transport. They are well-managed according to the financial institutions that lend to these companies. The main market for this fleet is Uganda transit traffic, and there is substantial competition among firms for it, as well as some competition from railways. This does not necessarily apply to the smaller tonnages involved in the transport of goods for South Sudan (thought to be about 10% of volumes of Uganda cargo). Further WFP rates tend to be the trend setters in this market because of the volume of relief cargo on the route to South Sudan. The terms of WFP transportation contracts are generally higher than other market rates because it pays a premium for reliability of services and equipment, and there is generally an element of emergency in its movements. The current cost for the movement of a TEU from Mombasa to Juba is about \$5,000. Transit time is ten days after leaving the port.

The major upgrade and improvement in the road network proposed for the decade ahead will bring significant opportunities for the development of a domestic road transport industry, at least for the internal transport of goods. It is not clear at this stage whether emerging South Sudanese trucking companies will be able to compete effectively with established Kenya and Uganda companies for freight to and from Mombasa. As the discussion below indicates, development of the tourism market also offers considerable opportunity for growth in demand for transport services.

The communications sector has been widely recognized as the fastest growing sector in South Sudan for some years now as a result of competition among service providers and expansion of the network. According to Table 1.9, there were 97 businesses registered as providers of communications services in 2010. As Chapter 10 indicates, the next big step in the industry will be the development

of a nation fiber optic network for the entire country with links to the global network of submarine cables, along with close attention to policies that will ensure universal access to the grid. This development will spur the growth of communications. Growth in the industry will be driven by provision of voice and data services and broadband use, including enhanced access to market information for farmers and pastoralists, for example, as well as increased use of radio, TV and computer services by households. The Report assumes that in response to these opportunities and the improvement in the transport network of the country, value added by transport and communications will grow by an average of 9% a year for the decade as a whole.

Role of government services: Based on estimates made by the NBS, government services account for about 22% of non-oil GDP, comparable in size to the agriculture sector. Budgeted salaries for the National Government were a little over \$1 billion in 2011. The current dominance of government services is expected to decline somewhat in the decade ahead as a result of substantial growth in the transport sector with the opening up and expansion of the road network, along with strong growth in communications, tourism and financial services. Value added by government services is projected to grow by about 5% a year in real terms during 2011-2020 based on the assumption that the National Government will exercise considerable restraint on the growth in civil service employment and in real terms, salaries.

Prospects for tourism: The country has the potential to become a major destination for eco-tourism. Wildlife biologists have long known that the grasslands, woodlands and swamps were home to elephants, ostriches, lions, leopards, hippos, buffalo, zebras, giraffes and other animals. Field surveys in recent years have revealed that South Sudan is home to what many believe is the largest migration of mammals in the world. Surveys and mapping undertaken by USAID and the Wildlife Conservation Society (WCS) indicate a migration internal to South Sudan that includes an estimated 1.3 million white-eared kob, antelope, gazelle, reedbeek and other animals. The USAID-funded Boma-Jonglei-Equatoria Landscape Program has supported efforts to find the best ways to protect the region's plant and animal life and to provide for as many as 17 ethnic groups that rely on the region for their livelihoods.

Table 2.10: Protected Conservation Areas in South Sudan

Land use category	Area (km ²)	Share (% of total)
National parks	64 090	9.9
Game reserves	31 335	4.9
Ramsar sites (Sudd)	57 000	8.8
Nature conservation areas	3 500	0.5
Total	155 925	24.2
Memo item:		
Total land area	644 331	100.0

Source: Estimates by authors.

MAP 2.2: National Parks and Game Reserves of South Sudan



¹⁰ The reason for this is the imbalance between import and export traffic in sea borne trade. This gives transporters based at Mombasa the advantage of location, as they would normally be at their home base waiting for import traffic while trucks based in the hinterland States coming with exports to Mombasa would have to wait for return cargoes without a confirmed booking in a foreign country, that is, Kenya.

¹¹ World Bank, "Kenya: Issues in Trade Logistics," 2005.

According to data reported by USAID (2007), the total protected conservation areas of the country stood at 142,195 km² in 2007, not including 13,760 km² of proposed conservation areas. South Sudan therefore has about 155,000 km² – equivalent to about 24% of the total land area of the country – of national parks, game reserves and conservation areas, including the Sudd which has been declared a Ramsar site (Table 2.10). Map 2.2 provides information on the location of these sites. However, much of the capacity to manage these protected areas was destroyed during the civil wars. According to the UNDP, many of the parks never underwent a consultation process with local stakeholders and protected area boundaries were never demarcated. Effective management of these areas is also constrained by inadequate policy arrangements and limited institutional capacities for wildlife and park management. The actual status of some of these protected areas is therefore uncertain.

At the time that this Report was drafted, the Ministry of Tourism and Wildlife Conservation was preparing a policy framework for wildlife conservation and management and tourism development. These papers will provide a framework for the development of tourism sites in the national parks. The Action Plan being developed by the Ministry will address a number of key issues, including: (i) basic infrastructure and facilities required for the promotion of tourism; (ii) construction of roads within these national parks and facilities that allow access by air; (iii) training of 15,000-20,000 rangers required for protection of the parks; (iv) surveys and mapping of animal populations and their migration routes at various times in the year; (v) measures that will provide for appropriate oversight and regulation of the tourism industry so as to ensure proper conservation of wildlife; and (vi) measures required to develop tourism-related services and facilities by the private sector, including accommodation and transport services.¹²

The preparation of a detailed program for tourist-related infrastructure for this Report was not undertaken, pending completion of the policy framework for development of the policy framework that will provide guidance for the development of the industry. Once this framework is in

place, the infrastructure framework laid out in this Report can be reviewed to include the requirements for development of eco-tourism in South Sudan. In the meantime, there is a clear need for capacity building and training within the Ministry to ensure that it has the necessary institutional and staff capacities to oversee the development of the industry consistent with the conservation of the important plant and animal resources of the country.

2.3 Financing Requirements for the High Growth Scenario

2.3.1 The Setting

As the earlier discussion indicates, a transition in the decade ahead to a period of sustained strong growth in the non-oil economy of South Sudan of about 9% a year in real terms will require a rapid ramp-up in gross investment to levels of about 35% of non-oil GDP by 2015. This compares with an investment level in the non-oil economy of about 20% of non-oil GDP at the present time. In other words, fixed investment in the non-oil economy would have to increase from about \$1 billion a year at present to about \$3.7 billion a year by 2020 (Table 2.11). The total investment required for the non-oil economy for the decade ahead is projected at \$25 billion (at 2010 constant prices and exchange rate).

There is little doubt that mobilization of this level of funding for investment poses a major challenge for the country in the decade ahead. As the analysis in Chapter 4 clearly shows that substantially lower levels of investment will imply slower economic growth. Slower economic growth will mean that the country will have difficulties in creating meaningful employment opportunities for a labor force that is young and is projected to grow at about 5% a year in the decade ahead. Funding for the program will have to come from a well developed partnership that involves the National and state governments, the international donor community, international investors and in the long-term development of the domestic financial market.

Table 2.11: Indicative Program of Funding for the Proposed Aggregate Investment Program
(In \$ millions at 2010 constant prices and exchange rate)

Indicator	2010	2011	2012	2013	2014	2015	2020
Gross investment							
Petroleum sector	1 063	1 173	888	849	789	740	573
Agriculture	80	109	159	218	289	368	935
Infrastructure	451	387	533	1 082	1 321	1 316	1 897
Other sectors	480	489	521	571	651	735	987
Total fixed investment	2 075	2 159	2 101	2 721	3 050	3 159	4 393
Sources of funding							
National Government	458	529	616	868	1 030	1 077	1 789
Donor community	608	532	611	842	854	877	1 210
Private sector							
Petroleum industry	1 063	1 173	888	849	789	740	573
Domestic savings	7	(100)	(114)	(87)	27	66	320
Foreign direct investment (net)	(61)	25	100	250	350	400	500
Sub-total	1 008	1 098	874	1 012	1 166	1 206	1 393
Total	2 075	2 159	2 101	2 721	3 050	3 159	4 393

Source: Tables 6.5 and 6.11 and estimates by authors.

2.3.2 Prospective Levels of Donor Support

As Table 2.12 indicates, donor support for South Sudan rose rapidly after the CPA was signed in 2005. Planned disbursements by donors were \$264 million by 2007. By 2010, donor support had risen to \$1.3 billion a year, 25% of which was humanitarian assistance. In per capita terms, total ODA assistance rose from \$34 per person in 2007 to \$138 per capita in 2010, including a little more than \$100 per capita in the form of development assistance. This compares with an ODA allocation for Sub-Saharan countries as a whole of about \$50 per capita at the present time.

The level of donor assistance for South Sudan for the decade ahead is uncertain as donors typically only commit funds a year or two in advance. For the purposes of this Report, it has been assumed that successful development of the agricultural potential of the country will reduce substantially the need for humanitarian assistance. As Table 2.12 indicates this type of support is assumed to decline steadily from an estimated \$110 million in 2011 to \$10 million a year by 2020. In the case of development

assistance, it is assumed that allocations for South Sudan will remain in the range of \$100 per person in the short term and with successful implementation of the nation's development programs, allocations of development assistance would rise gradually to about \$140 per capita by 2020. The implication is that total development assistance would increase from a high of about \$980 million in 2010 to about \$2 billion a year by 2020. There is no information available on the current share of donor assistance that is allocated to capital development programs and how much goes to meeting the costs of technical services, recurrent costs such as a provision of services to farmers, maintenance expenditures on infrastructure and so on. The analysis undertaken for this Report suggests that capital outlays by donors currently account for about 50% of total ODA. Given the proposed build-up capital development expenditures for infrastructure and agriculture, the share of ODA accounted for by capital outlays will need to exceed 60% in the short-term, and then remain at about 60% in the latter part of the decade (Table 2.12). Under these arrangements, the donor community would therefore fund about \$8.7 billion of investment expenditures in the non-oil economy in the decade ahead – equivalent to about one-third of the total required investment of \$25 billion.

¹² In 2008, for example, Al Ain National Wildlife, a company based in the United Arab Emirates, signed a 30-year lease agreement for 16,800 square kilometers of grasslands in South Sudan to be used for Safari tourism. The current status of the Company's program for development of tourism at this site while ensuring appropriate conservation of the wildlife and eco-systems is not known, given the very limited capacities of the Ministry of Tourism and Wildlife Conservation for oversight and regulation of such investment.

Table 2.12: Actual and Projected Level and Allocation of ODA for South Sudan (In \$ millions)

Indicator	Actual (at current prices)				Estimate 2011	Proposed (at 2010 constant prices)				
	2007	2008	2009	2010		2012	2013	2014	2015	2020
ODA programs (\$ mill)										
Social and humanitarian assistance	20	68	149	324	109	100	100	80	50	10
Development assistance										
Infrastructure	16	142	175	186	180	238	299	324	353	503
Other sectors	227	487	561	797	661	715	896	973	1 059	1 504
Sub-total	243	629	736	983	841	953	1 195	1 298	1 411	2 006
Total	264	696	885	1 307	950	1 053	1 295	1 378	1 461	2 016
ODA per capita (\$)										
Total ODA per capita	34	84	100	138	95	99	116	119	122	143
Development assistance per capita	32	76	83	104	84	90	108	112	118	143
Memo items:										
Population mid-year ('000)	7 702	8 260	8 859	9 494	10 048	10 594	11 116	11 589	12 012	14 079
ODA allocated for capital expenditure (% of total)				47	56	58	65	62	60	60
Infrastructure as % of development assistance	7	23	24	19	21	25	25	25	25	25

Source: Annex Tables 1.4 and 2.7 and estimates by authors.

2.3.3 Mobilization of Private Funds

It is assumed that the investment requirements of the petroleum industry will be met from within the industry either through retained earnings or mobilization of additional debt and equity in international financial markets. The primary sources of funding for the non-petroleum portion of the program to accelerate economic growth will therefore have to come from some combination of increased amounts of foreign direct investment (FDI)

and mobilization of domestic savings within South Sudan.

Mobilization of foreign direct investment. There is only a limited amount of information available at this time on the extent to which South Sudan is able to attract FDI. Anecdotal evidence suggests that there is an active dialogue with potential investors, but the amount of funding mobilized is not clear. According to data prepared by the National Bureau of Statistics, inflows of FDI have been running at about \$1 billion a year in recent years – a not insignificant annual inflow (Table 2.13).

Table 2.13: Inflows of FDI to South Sudan (\$ millions)

Category	2008	2009	2010
Capital inflows	1 086	1 081	1 002
Capital withdrawals	(1 361)	(1 175)	(1 063)
Net inflow	(275)	(94)	(61)

Source: World Bank country database.

However, the annual repatriation of capital by international investors has been even larger and as a result there was a net outflow of capital of \$430 million during 2008-2010. It is not clear how much of the capital movements were associated with the petroleum sector and how much was in other sectors of the economy. Also, it is not clear whether the net outflow was driven, in part, by concerns among investors about the lead-up to the referendum in early 2011 and its possible aftermath.

What is clear is that there will need to be a concerted effort to mobilize international investment in support of the proposed development program for the decade ahead. A three-pronged approach will be required:

- Strengthen the legal and regulatory framework for foreign investment, including in particular, the ability of investors to access land, and in the case of infrastructure related investment, strengthen the framework for the design and operation of PPP-type investment arrangements that include a range of possible options for partnerships, leasing arrangements, concessions and private ownership of assets such as power generation facilities with take-or-pay contracts for the sale of power into the state owned grid.
- The South Sudan Investment Authority (SSIA), which was transformed into the Ministry of Investment in June 2010, in collaboration with line ministries and the donor community, will need to translate the findings and recommendations in this Report, along with other sources of information, into a series of specific investment projects for agriculture, infrastructure, tourism, and so on that can be marketed to potential international investors.¹³

- Retain qualified technical support to assist in negotiations with potential investors. Such transaction advisory teams typically include legal, financial and technical expertise. The cost of these services is typically about 2% of the capital cost of a project. The implication is that for each \$1 billion of FDI that is successfully negotiated, the transaction advisory costs will be about \$20 million. Funding arrangements for such support will be needed.

The Investment Promotion Act of 2009 allows the provision of specific incentive packages, including concession privileges and preferential treatment. It grants unconditional transferability in and out of South Sudan through any authorized dealer bank in freely convertible currency of capital for investment, loan service payments, and remittance of dividends. The Act also permits arbitration or any other dispute resolution mechanisms, within or outside the courts, national or international, as specified in the Concession Agreement.

With concerted implementation of the aforementioned program, this Report assumes that net inflows of FDI will gradually build up to about \$500 million a year in the second half of the decade ahead (Table 2.11), with a total net inflow in the range of \$3.5 billion during 2011-2020.

Mobilization of domestic savings. The other source of private funds for the proposed program is domestic savings of individuals, households, and business entities within South Sudan. According to the provisional national income accounts released by the NBS, the national savings rate in South Sudan is surprisingly high. It averaged about 20% of national income during 2008-2010 (Table 2.14). This high saving rate is, of course, closely linked to the role of the petroleum industry, with a large portion of these savings being used to fund investment in the sector.

Table 2.14: National Savings of South Sudan (In SDG millions)

Indicator	At current prices		
	2008	2009	2010
Total fixed investment	4 849.6	4 617.1	4 937.4
National savings	4 960.8	2 584.1	4 547.9
Foreign savings	(111.2)	2 033.1	389.5
Total savings	4 849.6	4 617.1	4 937.4
Memo items:			
Total consumption expenditures	14 170.4	14 766.2	17 054.0
National income	19 131.1	17 350.3	21 601.9
Consumption as % GDP	74.1	85.1	78.9
National savings as % national income	25.9	14.9	21.1

Source: Annex Tables 2.1 and 4.7 and estimates by authors.

¹³ The SSIA was established by the Investment Promotion Act of 2009. This Government agency is responsible for: (i) the promotion of domestic and foreign investment in South Sudan; (ii) initiate and support measures to improve the investment climate; (iii) collect, analyze and disseminate information on existing investment opportunities; (iv) brand and project the image of South Sudan as an attractive destination for investors; and (v) provide advice to the Government on investment policy.

There are no reliable estimates for the level of savings outside the petroleum sector, but the working assumption is that the saving rate is low, given the widespread poverty and the fact that 80% of the population lives in rural areas not well connected to the market economy. The national savings rate for the six comparator Sub-Saharan countries referred to in Chapter 1 (see Table 1.12) averaged 7% of GDP in the 1990s and 8% for the period 2000-2006. It is very likely that the national saving rate for the non-oil economy of South Sudan is roughly similar to these countries. At a rate of say 5% of non-oil GDP, total savings would be in the range of \$240 million a year, but only a small portion is likely to be held in the form of financial assets. (Livestock is one of the more prominent forms of in-kind savings in South Sudan.) A major challenge for the decade ahead will be to develop the financial industry in South Sudan and ensure that macroeconomic and other policies are such that people have sufficient confidence in the system to hold a larger share of financial assets and to deposit these with financial institutions.

For the purposes of this Report the working assumption is that the development of this market will take time and that financial assets will not be a major source of funding for capital development programs in the decade ahead. To the extent that financial savings do grow, it is very likely that the bulk of these assets will be used to provide short-term working capital loans for the business community and consumer financing for households. It is assumed that private savings finance only \$700 million of the proposed capital works in the decade ahead, with a large portion of this in the form of labor that undertakes in-kind improvements to small businesses and farms.

2.3.4 Outlook for Central Government Revenues

As noted earlier, oil revenues account for 98% of the revenues of the National Government. These revenues are projected to decline in the decade ahead and there is uncertainty about the prospects for increasing non-oil revenues. A key issue, therefore, is whether National Government revenues will be sufficient to fund a large program of public capital works, especially in the infrastructure sectors.

The central issue here is the ongoing negotiation with the Republic of Sudan regarding oil revenue sharing arrangements between the two countries. By way of illustration, Table 2.15 provides a projection of the

national budget based on Scenario II for the revenue sharing arrangement. Under this scenario, South Sudan receives 80% of oil revenues, the oil states receive 2% and the Republic of Sudan receives 18%. Non-oil revenues are assumed to grow modestly during 2011-15 and then more strongly during the second half of the decade as the non-oil economy begins to expand more rapidly in response to the rising levels of public and private investment. Non-oil revenues are assumed to rise to about 14% of non-oil GDP by 2020. This ratio compares with an average for all Low Income countries of about 13% during the past two decades, and a ratio of 15% for Lower Middle Income countries in the same period. Recurrent expenditures are currently about 35% of non-oil GDP. As discussed earlier, they are assumed to grow in real terms at 5% a year and as a result they account for about 29% of non-oil GDP by 2020. This compares with the average level of recurrent spending by Low Income developing countries in the past two decades of about 16% of GDP. Capital expenditures are projected to increase from about 8% of non-oil GDP at the present time to about 16% by 2014 and remain in that range for the remainder of the decade.

Full implementation of the proposed capital works program for the public sector as outlined in Table 2.11 is therefore possible. However, the large budget surplus in the short-term declines as the scale of the capital works programs builds up, and by 2018, there is an operating deficit in the national budget. This deficit could be funded from the surplus income of earlier years, or through the issuance of government bonds in the international markets and perhaps the small domestic market. In the event that the revenue sharing arrangement approximated that of Scenario I (in which South Sudan receives 96% of the oil revenues, with the remaining 4% shared equally between the oil producing states and the Republic of Sudan), total oil revenues accruing to South Sudan are larger than in Scenario II by an amount of \$6.5 billion during 2012-2020 – sufficient to meet the full cost of the proposed public works program and at the same time build a wealth fund for future generations.

What emerges from the detailed analysis of these various scenarios in Annex 5 is that if the revenue sharing arrangements are less favorable than Scenarios I and II it would most likely mean that the Government would not be able to build a substantial wealth fund and undertake a major capital works programs that aims to transform the infrastructure services of the country in the decade ahead. Emphasis on a large infrastructure program would then mean little in the way of a wealth fund. Emphasis on a wealth fund would mean continued poor infrastructure and very likely, weak economic growth.

Table 2.15: Projection of National Government Budget Receipts and Expenditures for High Economic Growth Case (In SDG millions at 2010 constant prices and exchange rate)

Indicator	Estimates		Projection								
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Revenues											
Oil	5 630	5 656	11 989	11 028	9 119	7 838	7 535	6 758	6 072	5 470	4 949
Non-oil	127	111	137	288	612	981	1 398	1 884	2 456	2 905	3 414
Total	5 757	5 767	12 126	11 316	9 731	8 818	8 933	8 642	8 528	8 374	8 363
Recurrent expenditures											
Capital expenditures											
Infrastructure program	565	528	668	1 232	1 499	1 551	1 630	1 961	2 449	2 768	2 712
Other programs	526	730	797	833	952	1 012	1 071	1 131	1 190	1 357	1 547
Total	1 091	1 258	1 466	2 065	2 451	2 563	2 701	3 091	3 639	4 124	4 259
Overall budget balance	181	0	5 879	4 283	2 078	780	552	(383)	(1 355)	(2 341)	(2 845)
Memo items:											
Non-oil GDP	12 805	12 098	13 659	14 401	15 298	16 345	17 474	18 835	20 469	22 343	24 386
Non-oil revenues as % non-oil GDP	1.0	0.9	1.0	2.0	4.0	6.0	8.0	10.0	12.0	13.0	14.0
Expenditures as % non-oil GDP											
Recurrent spending	35.0	37.3	35.0	34.5	34.0	33.5	32.5	31.5	30.5	29.5	28.5
Capital spending	8.5	10.4	10.7	14.3	16.0	15.7	15.5	16.4	17.8	18.5	17.5

Source: Annex Table 4.8.



An Infrastructure Action Plan For South Sudan

3 An Infrastructure Action Plan For South Sudan

3.1 Key Principles for the Design of the Infrastructure Plan

As the discussion in Chapters 1 and 2 indicates, the case for a major program of investment in basic infrastructure is compelling. The Infrastructure Action Plan outlined in this Report is comprehensive and ambitious. The design of the proposed program is built around the following five basic objectives for the country:

- Development of the water resources of the country in a manner that is consistent with the objectives of the Nile Basin Initiative for cooperative and sustainable use of the water resources of the ten riparian countries of the Nile Basin.
- Sustainable utilization of the vast natural resources which include land, forestry and fisheries.
- Increased access to basic services, including water and sanitation, electric power, transport and communication in the country.
- Rehabilitate, upgrade and expand the country's basic infrastructure to ensure that the network provides land-locked South Sudan with reliable and cost-effective access to regional and international markets.
- Working with the international donor community and private investors, the Government will use a portion of petroleum revenues to fund the development of a network of basic infrastructure that will provide direct benefits for the existing population and future generations in South Sudan.

3.2 Main Components of the Infrastructure Plan

The key objective of the proposed infrastructure program is to rehabilitate, upgrade and expand the basic infrastructure network of the country in the decade ahead, consistent with the principles outlined in the preceding Section. The main components of the proposed program are as follows:

- Rehabilitate the existing road network and upgrade the national network to provide all-weather access and transport services to major regional and international markets and among the ten state capitals of the country. The development of an all-weather national truck network will be accompanied by substantial improvement and expansion of the feeder road network of the country to facilitate access of farming communities to domestic and regional markets.
- Upgrade and improve basic infrastructure for other modes of transport, in particular water transport and associated port facilities on the Nile River and navigable tributaries, and civil aviation services for domestic and international traffic focusing on upgrading the status of air traffic communications and safety in South Sudan to a standard consistent with the requirements of the ICAO. These initiatives will be complemented by further investigation of the costs and benefits associated with the expansion of the existing railway network to link South Sudan to Uganda and Kenya, and the possible construction of a pipeline to transport oil to an international port in Kenya or Djibouti.

- Substantially increase the power generation capacity within all ten states, starting with a major investment in diesel generation, alongside significant investments in the development of a national transmission and distribution grid. The development of key components of a national transmission grid will then lay the foundations for subsequent development of hydropower generation capacity and gas-fired thermal plants that will make use of the petroleum resources of the South Sudan to meet domestic demand and perhaps provide opportunities for export of electric power to neighboring countries.
- Rehabilitate and expand water and sanitation infrastructure in urban and rural areas to ensure that a majority of the population has access to improved water and sanitation services by 2020. The Report proposes a set of MDG goals for the country that should be met by 2020.
- Develop a national communications grid for ICT, which will be based on a fiber optic network linked to the submarine cable along the eastern seaboard of Africa. This grid will significantly reduce the cost of network connections and enable the citizens of South Sudan access communications services at reasonable costs. The low population density in rural communities will benefit from the network through the design and implementation of a policy of universal access for the country.

The proposed program for development of basic infrastructure assets and services will be complemented by strengthening and reforming relevant institutions in order to bolster capacities for independent regulation of basic infrastructure services, promote private investment in infrastructure assets and services, train and make available the skills required by public sector for effective

oversight and management of the basic infrastructure of the country.

3.3 Program Expenditures and Funding Arrangements

3.3.1 Overview of the Program

Table 3.1 provides summary costs of the proposed infrastructure program for 2011-2020 for capacity building, technical support and studies and capital outlays for rehabilitation of and upgrade of existing infrastructure assets, and construction of new facilities. The total cost is estimated at \$13.8 billion at 2010 constant prices and exchange rate. A high priority is assigned to the development of a national road network in the decade ahead, along with reliable connections to neighboring countries and international ports, and a much expanded rural road network that gives a majority of rural dwellers improved access to services and markets. The total cost of the proposed roads program is \$6.3 billion – 45% of the entire infrastructure program for the decade ahead. The Report proposes an investment of \$2.3 billion in developing a national electric power network that will provide urban areas and the business community with affordable access to a reliable supply of electricity. The other major infrastructure investment program is water supply and sanitation, the total cost of which is estimated at \$1.9 billion. Successful implementation of the proposed program will bring a range of benefits to South Sudan, including improved transport and electricity services with lower costs for service provision. Other key parts of the program will ensure improved access to low cost communications networks, and improved access to safe water and sanitation in both urban and rural areas. These and other benefits are discussed at greater length in Chapter 4.

Table 3.1: Development Expenditures for the Proposed Infrastructure Program
(\$ millions at 2010 constant prices)

Category	Estimate	Projected						Total
	2010	2011	2012	2013	2014	2015	2020	2011-20
Public sector								
Infrastructure general	75.1	35.1	4.0	9.0	11.5	13.0	5.5	118.1
Water resource management	3.4	13.3	24.6	79.2	173.0	222.3	122.2	877.6
Irrigation for agriculture	2.0	4.0	3.0	13.0	17.0	30.0	80.0	435.0
Transport sector								
Roads	262.8	193.8	258.3	486.2	487.7	511.9	1 057.1	6 264.2
River transport and ports	14.2	9.9	9.5	4.7	3.5	9.2	2.8	51.4
Railways	-	1.2	1.8	2.7	3.5	3.0	-	87.2
Aviation	6.4	10.9	31.8	18.6	23.1	26.5	5.5	149.1
Sub-total	283.4	215.9	301.4	512.2	517.8	550.6	1 065.4	6 551.8

Category	Estimate	Projected						Total
	2010	2011	2012	2013	2014	2015	2020	2011-20
Electric power programs	9.4	9.3	33.9	140.6	205.9	138.6	181.7	1 468.2
Water supply and sanitation	30.4	69.4	110.9	109.9	106.6	114.9	209.6	1 386.2
Communications	13.1	9.8	10.8	10.1	9.2	7.6	3.6	66.9
Total	416.7	356.8	488.5	874.0	1 040.9	1 077.0	1 668.0	10 903.9
Government								
Government	231.2	176.5	281.4	523.1	633.4	653.7	1 139.3	7 112.3
Donors								
Donors	185.5	180.3	207.2	350.9	407.5	423.2	528.7	3 791.5
Private sector								
Irrigation for agriculture	-	-	3.0	15.0	30.0	72.0	60.0	600.0
Transport sector								
River transport and ports	-	-	-	-	-	-	2.7	15.5
Aviation	-	-	-	-	-	-	18.8	73.0
Electric power programs	-	-	9.3	199.9	258.7	198.6	59.8	870.4
Water supply and sanitation	-	-	44.8	48.2	49.3	52.0	83.2	554.9
Communications	51.2	52.1	65.1	70.0	74.2	89.2	165.2	1 000.5
Total	51.2	52.1	122.2	333.1	412.1	411.7	389.7	3 114.3
Grand total	467.9	408.9	610.7	1 207.1	1 453.1	1 488.7	2 057.7	14 018.2

Source: Tables 3.5, 3.6, 3.7 and 3.8.

3.3.2 Funding Arrangements for Development Expenditures

As shown in Table 3.2 the plan proposes that the Government provides \$7.13 billion – a little more than half of the total funding required for full implementation of the program, with the donor community providing \$3.75 billion and private investors the balance of \$2.9 billion. About 96% of these expenditures are capital outlays that will rehabilitate and upgrade existing infrastructure and construct new facilities. In 2010, investment expenditures on basic infrastructure were about \$450 million – equivalent to approximately 8.4% of non-oil GDP and this level of investment in infrastructure is already relatively higher than levels in many developing countries. The substantial ongoing program of investment is due in part

to strong donor support to rehabilitate existing assets and private investment in the communications network of the country. But, of course, South Sudan is starting from lower levels of infrastructure development in the country.

As Table 3.2 indicates, full implementation of the proposed program will require investment levels in infrastructure in the range of 20% of non-oil GDP for much of the decade ahead. Investment outlays by the government will rise steadily from current levels of about 4% of non-oil GDP to about 11% by 2020, while donor-funded investment will build up to about 5% of non-oil GDP in the latter part of the decade, after which it will decline to much lower levels relative to non-oil GDP. Private investment, mainly in power and communications, will increase from less than 1% of non-oil GDP at present to about 6% by 2015 and then decline to 3%-4% by the end of the decade.

Table 3.2: Funding of Development Expenditures for Infrastructure Development

Program	Estimate	Projected						Total
	2010	2011	2012	2013	2014	2015	2020	2011-20
Development expenditures (\$ million at 2010 constant prices and exchange rate)								
Capacity building & studies								
Government	-	-	-	-	-	-	-	-
Donors	14.5	17.8	71.9	102.4	88.3	72.3	20.3	505.3
Sub-total	14.5	17.8	71.9	102.4	88.3	72.3	20.3	505.3
Capital expenditures								
Public investment								
Government	237.5	221.8	280.9	517.6	629.9	651.7	1 139.3	7 142.2
Donors	164.7	117.1	135.8	254.0	322.7	352.9	508.4	3 256.4

Program 2010	Estimate	Projected						Total
	2011	2012	2013	2014	2015	2020	2011-20	
Sub-total	402.2	339.0	416.7	771.6	952.7	1 004.6	1 647.7	10 398.6
Private investment	51.2	52.1	122.2	333.1	412.1	411.7	389.7	3 114.3
Total investment	453.4	391.1	538.9	1 104.7	1 364.8	1 416.4	2 037.4	13 512.9
Total development expenditures	467.9	408.9	610.7	1 207.1	1 453.1	1 488.7	2 057.7	14 018.2
Investment expenditures as percent of non-oil GDP								
Public investment								
Government	4.4	4.4	4.9	8.6	9.8	9.5	11.1	
Donors	3.1	2.3	2.4	4.2	5.0	5.1	5.0	
Sub-total	7.5	6.7	7.3	12.8	14.8	14.6	16.1	
Private investment	1.0	1.0	2.1	5.5	6.4	6.0	3.8	
Total investment	8.4	7.7	9.4	18.3	21.2	20.6	19.9	
Memo item:								
Non-oil GDP (\$ mill)	5 380	5 083	5 739	6 051	6 428	6 868	10 246	

Source: Tables 2.15, 3.1 and Annex Table 3.8.

There are two key issues for the design and management of this program. The issue of implementation is discussed later in this Chapter. As discussed in Chapter 2, there are uncertainties about the future level of donor support for South Sudan. Currently, about \$900 million a year of development assistance is allocated to South Sudan – equivalent to about \$95 per capita. For the purposes of this Report, it is assumed that the allocation of development assistance will rise steadily to about \$140 per capita by 2020, which translates into a total annual allocation of roughly \$2 billion by that time. At the levels projected in Table 2.10, the Government will need to have donors allocate 25% of their development assistance to the proposed infrastructure program. This is a modest increase given that allocations to infrastructure programs over 2008-2010 period accounted for about 22% of the total development assistance provided by donors.

Assuming that Government implements programs and policies to improve the operating environment of the private sector in South Sudan, the annual private sector financing of infrastructure assets is projected to increase to \$400 million by 2014-2015. Table 3.1 indicates that the current private investment is largely confined to the communications sector where a number of operators are expanding their voice and data networks. The proposal is to step up private investment in commercial irrigation programs, in power sector generation, and in the development of a fiber optic grid for the entire country. Only small amounts of private investment are anticipated in the transport sector, largely because it will take time to build traffic volumes to attract investors.

The key issue is whether the Government will be able to increase its annual budget allocations for capital outlays on basic infrastructure from the current levels of about

\$200 million to \$650 million by 2015 and \$1 billion or more by 2020. The analysis of the budget outlook and options in Chapter 2 suggests that in the event that the Government receives at least 80% of the oil revenues generated from fields within South Sudan, these proposed levels of funding for the infrastructure program would be manageable. On the contrary, substantially lower amounts of oil revenue as a result of lower international prices, less than anticipated volumes of production or less favorable revenue sharing arrangements would raise serious doubts about the ability of the Government to fund an infrastructure program of this magnitude. As the discussion in Chapter 4 indicates, the implication would be lower levels of growth in the non-oil economy and greater difficulties in creating productive employment opportunities for the labor force.

The Action Plan proposes that \$ 500 million is allocated to capacity building, technical support and studies activities. These activities will be funded by the donor community and in addition to this; donors will also share their invaluable experience in designing and implementing similar programs. Alongside this, the Government should avoid fragmentation of these capacity building and technical support programs among large numbers of donors. Consolidation of technical support and capacity building for each sector should be an important feature of these programs. The Government will therefore need to take the lead in the dialogue with donors about the design of these programs and arrangements for their funding. With the imminent closure of the Multi-Donor Trust Fund (MDTF), there may be merit in creating a special facility for capacity building and technical support that pools donor resources, but gives participating donors a clear role in the design and allocation of funds to such programs.

3.3.3 Maintenance of Infrastructure Assets

Central to the success of the proposed IAP is a strong commitment to maintain the infrastructure assets by national and sub-national governments. Failure to significantly increase budgets for routine maintenance of these assets will result in deterioration of the quality of infrastructure services and in the long-term a substantially higher cost of rehabilitating the assets.

Information on the current level of public spending on

routine maintenance is incomplete. What is clear is that allocations for this purpose in the National budget are modest. Routine maintenance expenditures by state and local governments are not available; nor are maintenance expenditures funded by the international donor community. Anecdotal evidence suggests that total public spending on routine maintenance of the basic infrastructure of the country was estimated in the range of \$20-25 million in 2010 (Annex Table 3.8). Information on private sector spending on routine maintenance of infrastructure assets (mainly on the communications network of the country) is also not available. For the purposes of this Report it is assumed that it will be about \$7 million in 2020.

Table 3.3: Expenditures on Routine Maintenance (\$ millions at 2010 constant prices and exchange rate)

Category	Estimate		Projected		Total 2011-2020
	2010	2011	2015	2020	
Routine maintenance					
Water resource management	0.2	0.6	19.9	34.1	167.7
Irrigation	0.6	0.8	7.6	41.4	155.4
Water supply and sanitation	4.2	6.9	27.5	75.7	355.1
Electric power	2.1	2.5	48.6	93.2	459.6
Roads	10.5	12.4	41.1	108.8	508.9
Ports and waterways	0.2	0.3	2.3	3.5	24.1
Civil aviation	0.2	0.3	7.0	11.3	71.0
Railways	-	-	4.5	7.5	52.8
Communications	10.4	12.8	25.3	51.6	292.5
Unallocated	1.1	1.4	5.7	5.7	52.6
Total	29.6	37.9	189.6	432.8	2 139.7
Public	22.2	28.5	129.0	300.9	1 479.9
Private	7.3	9.4	60.6	131.9	659.8
Capital stock					
Water resource management	6.0	15.7	497.3	852.3	852.3
Irrigation	15.3	19.3	190.8	1 034.8	1 034.8
Water supply and sanitation	106.2	172.4	686.7	1 891.8	1 891.8
Electric power	52.8	61.3	1 216.2	2 330.1	2 330.1
Roads	1 052.8	1 240.7	2 922.9	7 234.1	7 234.1
Ports and waterways	18.0	27.1	41.9	70.9	70.9
Civil aviation	17.3	28.2	119.2	226.2	226.2
Railways	0.5	1.1	2.1	77.1	77.1
Communications	260.2	319.2	632.7	1 289.5	1 289.5
Unallocated	106.9	142.0	142.0	142.0	142.0
Total	1 635.9	2 027.0	6 451.8	15 148.8	15 148.8
Public	1 452.6	1 791.6	4 937.2	11 851.2	11 851.2
Private	183.3	235.4	1 514.6	3 297.6	3 297.6
Maintenance as % capital stock					
Public	1.5	1.6	2.6	2.5	12.5
Private	4.0	4.0	4.0	4.0	20.0
Total	1.8	1.9	2.9	2.9	14.1

Source: Annex Tables 3.8, 3.9 and 3.10.

Table 3.3 provides an estimated value of the end-of-year value of the capital stock of the infrastructure of South Sudan.¹⁴ The value of the capital stock at end 2010 is estimated at \$1.63 billion, including \$1.15 billion of public assets and \$180 million of private assets. The implication is that public spending on routine maintenance in 2010 was equivalent to about 1.5% of the value of the capital stock. It is assumed that private spending was equivalent to 4% of the capital stock. As Table 3.3 indicates, the replacement value of the stock of infrastructure in the country is projected to increase to about \$15 billion by 2020 (at 2010 constant prices and exchange rate). This is a major investment for the country. Since a large portion is basic infrastructure that will be created by the public sector, this will represent a transformation of petroleum assets into financial assets and then into basic infrastructure for the country. Proper maintenance of this important asset will ensure that the current serious infrastructure bottlenecks of the country will be removed and poor quality infrastructure will no longer be an impediment to service provision and economic growth.

The proposed Action Plan calls for an increase in annual spending on routine maintenance to about \$420 million by 2020, \$300 million of this sum will be public sector spending. In addition to this routine maintenance, the proposed program also calls for increased annual levels of spending on periodic maintenance of about \$50 million for the road network. This build-up in annual maintenance spending to around \$500 million by 2020 represents an important opportunity to further develop private sector capacities within South Sudan. The position taken in this Report is consistent with the Government's policy of promoting opportunities for private sector development and a concerted effort should be made in the near- and medium-term to ensure that responsibility

for maintenance work is competitively contracted to the private sector. Successful implementation of such a policy will require substantial technical support to the relevant ministries that have responsibilities for implementation of projects and programs, including in particular, translation of project design into procurement packages for public tender. The manner in which this might be done is detailed in Chapter 4.

3.4 Highlights of the Sectoral Programs

3.4.1 Land and Water Resource Management

Given the significant potential of the agricultural sector, the Action Plan for land and water resource management has seven main components: (i) build capacities at the national, state and local levels for effective administration and management of land resources; (ii) strengthen capacities for protection and management of the extensive bio-diversity of the country; (iii) improve basic information about the water resources of South Sudan; (iv) build institutional capacities for management of the water resources; (v) strengthen capacities for interaction and dialogue with other Nile Basin riparian countries regarding management of use of the Basin resources; (vi) undertake substantial investment in facilities for surface storage and transport of water to meet current and future demand; and (vii) build institutional capacities to ensure full recovery of the costs or supplying raw and treated water for agricultural, household and industrial use.

Table 3.4: Indicative Projection of Land and Water Use in South Sudan

Indicator	2010	2015	2020
Land resources (ha '000)			
Total land area	644 331	644 331	644 331
Cultivated area	2 681	2 991	4 000
Harvested area	1 000	1 320	2 500
Irrigated area	32	132	400
Protected conservation area	155 925	155 925	155 925

¹⁴ By way of comparison, the unweighted average ratio of construction value added to fixed investment is for the following group of countries for 2009-2010 was about 25%: Burkina Faso, Ethiopia, Kenya, Malawi, Niger, Rwanda, Sudan, and Uganda. The average for Sudan, for example, was 22%.

Indicator	2010	2015	2020
Cultivated as % of total area	0.4	0.5	0.6
Harvested as % of cultivated area	37.3	44.1	62.5
Irrigated as % of cultivated area	1.2	4.4	10.0
Conservation area as % total area	24.2	24.2	24.2
Water demand (bill m³)			
Agriculture	0.61	2.06	5.10
Households	0.05	0.08	0.17
Industry	0.01	0.01	0.02
Total	0.66	2.16	5.30
Agriculture use per ha harvested (m ³ per ha)	610	1 562	2 042

Source: Table 2.7, Table 2.10 and Table 5.5.

As Table 3.4 indicates, the cultivated area is expected to increase by about 50% to 4 million hectares by 2020 – equivalent to about 6.2% of the total area of the country. The harvested area will increase from the current 37% of the cultivated area to about 63% by 2020 and the irrigated area will increase from 1% of the cultivated area to about 10% by 2020. The Report puts particular emphasis on strengthening capacities for water resources management and further development of these resources to meet existing and future demand as well as reduce hydrological and climatic vulnerability. The proposed program for management and development of the water resources of the country amounts are estimated at \$880 million over 2011-2020 period, of this amount, \$850 million will be allocated for expansion of water supply, improvement in measures to control floods and protection and access to water ways (at 2010 constant prices and exchange rate).

3.4.2 Irrigation for Agriculture

Presently, only 1% of the cultivated area is irrigated. The proposed Action Plan calls for an increase in the irrigated area from the current 32,000 hectares (ha) to 400,000 ha by 2020. It is anticipated that the smallholder farms will dominate the increase in irrigation and they are expected to account for half of this increase; the remainder will go to medium- and large-scale commercial farming operations. Funding and implementation of these smallholder programs will be supported by the government and development partners. The total cost of the proposed program for irrigation is estimated at \$1 billion, at an average cost of \$2,500 per ha (at 2010 constant prices and exchange rate).

As a first step in development of the irrigation potential, the Action Plan calls for the preparation of a national master plan for development of irrigation programs in the decade ahead. This plan will underpin the design and

implementation of irrigation programs for smallholder farms and medium- and large-scale commercial farming opportunities to promote production of high value crops for domestic and international markets.

3.4.3 Transportation

Development of the road network: Consistent with the SSDP, the Action Plan prioritizes the rehabilitation and upgrade of the road network of the country. The proposed roads program is based on implementation of a eight-point program in the decade ahead: (i) rehabilitate and upgrade of the entire 7,369 km of inter-state trunk roads; (ii) upgrade of the existing 1,451 km of state primary roads to all-weather standard; (iii) upgrade of the existing 3,822 km of secondary roads to all-weather standard; (iv) upgrade of 2,178 km of tertiary roads to all-weather standard; (v) pave an additional 440 km of urban roads and upgrade 300 km to all-weather standard; (vi) strengthen financial and institutional capacities for regular maintenance of the road network and oversight of the road transport industry; (vii) develop urban transport services; and (viii) implement a comprehensive program for road safety.

Implementation of this program will result in a substantial improvement in the connectivity among all ten states as well as South Sudan's links with other countries in the region; this will increase the access to markets by a large portion of the population. A key objective for the program is to significantly lower the current very high cost of transport in South Sudan. A reduction in freight rates from current levels of 20 US cents per ton km to less than 10 US cents per ton km will have a significant impact on the cost structure and on the ability of rural communities and small business to compete with imports of food products and several other consumer goods. Lower freight rates will also lower the current capital cost of construction activity in the country because of its impact on the cost of imported

construction materials. The total cost of the roads program is estimated at \$6.3 billion, including some \$80 million to support capacity building and technical studies, with the balance of the funding coming from the increased national budget allocations to the roads sector programs.

River transport and ports: Portions of the White Nile River and its tributaries offer cost effective transport options for communities along these waterways, especially in the wet seasons when road transport can be severely restricted. The navigable portion of the river network crosses six of the ten states of the country. The proposed Action Plan for these waterways and ports will address three particular sets of concerns associated with the development of this transport mode in the decade ahead: (i) complete bathymetric surveys of all potentially navigable portions of the waterways to identify navigation constraints, map all navigable routes and lay foundations for subsequent detailed river engineering studies that will provide a basis for dredging operations and location of navigation aids; (ii) upgrade the capacities of existing river ports and associated cargo handling and storage facilities; and (iii) support capacity building programs that include staff development and improved institutional capacities to promote and regulate the development of private water transport services. The proposed program for river transport and ports is estimated at \$70 million for the decade ahead, including \$14 million for capacity building in preparation of the detailed marine studies. An amount of \$53 million is proposed for dredging, navigational aids and improvement of port facilities. These estimates are provisional at this stage. Final estimates for the capital cost of the proposed program will be based on the findings of the surveys and detailed engineering studies. Funding for the program will come from the government, the donor community and the private sector.

Railways: The primary focus of the proposed Action Plan for the railways sub-sector will be to develop an appropriate institutional and regulatory framework to further extend the railway network in South Sudan. Key elements of the program include: (i) development of the legal, institutional and regulatory framework for the sector,

including issues related to infrastructure assets ownership; (ii) establish arrangements for management and operation of rail services in South Sudan; (iii) undertake a detailed inventory of the existing track and signaling system; (iv) carryout an assessment of potential demand for traffic on the existing 248 km rail line from the border with Sudan to Wau and prospective traffic for the proposed extension of the line from Wau to Nimule on the border with Uganda; (v) rehabilitate the existing line to Wau; and (vi) carryout a detailed feasibility study for the proposed extension from Wau to Nimule. The cost of the proposed program for the railways sub-sector is about \$90 million, including \$11 million for studies and personnel and institutional capacity building. An amount of \$77 million is proposed for rehabilitation of the existing line. The bulk of the funding will come from the government. No provision is included for a possible extension of the line to Nimule.

Civil aviation: The proposed program for civil aviation includes the following components for action in the short-term: (i) restructure and strengthen institutional arrangements for the civil aviation industry; (ii) working with ICAO, formulate and implement an air transport policy that is consistent with requirements for airspace surveillance and traffic management in the medium-term ; (iii) complete the ongoing upgrade of the Juba domestic and international airport; (iv) upgrade selected airports in the state capitals and other locations; (v) implement a major program of staff development and capacity building consistent with the requirements for compliance with ICAO standards and recommended practices; and (vi) develop an appropriate Public Private Partnership (PPP)-type framework for possible concession agreements with private investors to operate selected airports in South Sudan. The proposed program for the civil aviation sub-sector involves expenditures of about \$223 million in the decade ahead. This will be allocated as follows; roughly \$13 million will go to capacity building, technical support and studies, and about \$210 million will be used to rehabilitate and upgrade of major airports and airspace surveillance and air transport management. The bulk of the funding will come from the government and private concessionaires.

Table 3.5: Selected Indicators for the Electric Power Sector

Indicator	2010	2015	2020	2025	Annual growth rate (%)		
					2011-2015	2016-2020	2021-2025
Electrification rate (% of households)							
Urban	5.2	8.4	51.9	74.5			
National	0.8	1.8	12.3	19.8			
Total consumption (GWh)	238	732	1 961	3 256	25.2	21.8	13.5
Consumption per capita (kWh/person)	25	61	139	188	19.5	18.0	6.2
Required supply(GWh)	317	915	2 308	3 700	23.6	20.3	9.9

Indicator	2010	2015	2020	2025	Annual growth rate (%)		
					2011-2015	2016-2020	2021-2025
Required generation capacity (MW)	56	155	376	583	22.7	19.5	9.2
Memo items:							
System losses (%)	25.0	20.0	15.0	12.0			
Load factor (%)	65.0	67.5	70.0	72.5			
Population ('000)	9 494	12 012	14 079	17 286			

Source: Tables 8.5c, 8.8 and Annex Table 1.4

3.4.4 Electric Power

The proposed Action Plan for the electric power sector has six key components for the decade ahead: (i) undertake a major program of expansion of the generation capacity from the current 50 MW to about 580 MW by 2025 in order to meet the current and projected power demand; (ii) expand the national transmission and distribution grid to link all ten state capitals and to the grids of Ethiopia, Kenya and Uganda; (iii) increase urban households access to electricity from the current 5% to 75% by 2025; (iv) complete a major restructuring of the South Sudan Electricity Corporation (SSEC) and convert it into a fully-fledged, and financially sound, state enterprise with the capacity to enter into take-or-pay contracts with private electric power suppliers; (v) strengthen the enabling environment for private investment in power generation and attract private investors to operate as Independent Power Producers (IPPs) within South Sudan; and (vi) strengthen the existing regulatory arrangements for the electric power sector. Even with this expansion program, the average consumption of electricity in South Sudan will only be expected to increase from a current low of 25 kWh to about 140 kWh per person per year by 2020. Clearly, by 2020 the levels of electricity consumption will still be low because of the very high costs of extending national grid to reach the large numbers of sparsely populated rural households and remote areas. The Action Plan therefore calls for a substantial expansion of off-grid arrangements

to supply energy to these rural households. The program for electric power and rural energy will cost roughly \$2.3 billion, over 2011-2020 period and an additional \$180 million will be spent on the extension of the national network and the rural energy program during 2021-2025. The plan therefore proposes to mobilize about \$870 million of private capital for the expansion of generation capacity, with the government and international donor community providing the balance of the required funding.

3.4.5 Water Supply and Sanitation

Water supply services. The proposed Action Plan for supply of improved water to urban and rural communities is built around the following three sets of activities: (i) rehabilitate very large number of rural water points that are not currently functional, and construction of about 11,000 new water points to provide 65% of rural residents with access to improved water by 2020; (ii) rehabilitate and construct new urban water supply facilities and increase water access from the current 15% to 70% by 2020; and (iii) provide technical support and training that will strengthen capacities to provide water services at the national, state and county levels. The capital cost of the proposed program to improve the water supply is estimated at \$1.1 billion for the period 2011-2020. In addition, \$150 million will be set aside to support capacity building and training in the sector as a whole which will have a direct impact on the quality of water supply services.

Table 3.6: Urban and Rural Access to Improved Water and Sanitation (% of total urban and rural populations)

Indicator	2010	2015	2020	2025	Annual growth rate (%)		
					2011-2015	2016-2020	2021-2025
Access to improved water							
Urban	15	17	19	21	23	27	70
Rural	34	37	40	43	46	49	65
National	31	33	36	38	41	44	66
Access to improved sanitation							
Urban	37	38	39	41	43	45	60
Rural	9	11	13	15	17	20	40
National	14	16	18	21	23	26	45

Source: Annex Table 4.1 and Annex 10.

Sanitation services. The Action Plan for sanitation services proposes to : (i) rehabilitate most of the existing urban and rural sanitation facilities; (ii) construct new facilities in urban and rural areas sufficient to provide 60% of urban households and 40% of rural households with access to improved sanitation by 2020, thereby raising the national average sanitation access levels from a current low of 14% to 45% by 2020; (iii) implement a series of reforms that will strengthen coordination and implementation and expand funding of the sanitation programs; (iv) provide improved sanitation facilities for all health care centers and schools; and (v) develop hygiene education programs for urban and rural communities and introduce similar programs into school curricula. The capital cost of the sanitation services provision is estimated at \$700 million for the next decade. In addition, a substantial portion of the above-mentioned technical support program of \$150 million will be allocated to capacity building, training and hygiene education programs.

3.4.6 Communications

The proposed Action Plan for the communications sector

has six key objectives: (i) establish access to the global communication network of submarine cables; (ii) build a national fiber optic broadband network that is linked to the global network; (iii) improve and expand access to communications throughout South Sudan, including rural communities by implementing the universal access policy; (iv) promote competition among service providers to ensure that costs of service delivery are not inflated; (v) consolidate arrangements for regulation and oversight of the industry; and (vi) expand the range of E-applications that are available to the educational and other institutions and the population at large. Table 3.7 provides a summary of the key targets for communications activities by 2020. The target is to increase access to voice communications from the current 12% to almost half the population by 2020. And have 60%-70% of educational, health and government institutions access ICT services by 2020. The impact of much improved access to low cost communications will be profound. It will lay the foundations for widespread access to information in urban and rural areas, including education and health services in schools and community centers in rural communities. It will also provide improved access to information about market opportunities for farm products and other rural-based production activities.

Table 3.7: Selected Indicators for Access to ICT Services

Indicator	2010	2015	2020
Population covered by mobile phone network (%)	60	90	100
Mobile phone subscribers per 100 people	12	18	40
Internet users per 100 people		3	10
Localities/countries with public internet access (%)		30	50
Households with radio access (%)	25	50	80
Households with telephone (%)	15		
Educational institutions with ICT		30	60
Health institutions with ICT		30	60
Government institutions with ICT		40	70

Source: Table 10.5.

The total cost of the proposed ICT program for 2011-2020 is estimated at \$851 million, including capital expenditures on the ICT network of about \$813 million and roughly \$38 million for capacity building, technical support, development of various e-applications and various studies.

The development of the national communications network will be primarily funded by the private sector, along with modest outlays of public funds for public information centers, postal services, and the public radio and TV networks.

3.5 Building the Enabling Environment for Public and Private Investment

Strengthening institutional capacities in the country is at the heart of the proposed agenda for the infrastructure sector. Experience from several Sub-Saharan countries indicates that overcoming the large infrastructure deficit requires a combination of improving the performance of the relevant infrastructure-related institutions and mobilizing or raising the additional finance. In the past decade, there have been concerted efforts throughout Sub-Saharan Africa to move forward on institutional reform. These experiences are well documented.¹⁵ According to Foster and Briceño-Garmendia (2010), the greatest progress has been made in the telecommunications sector, while the transport sub-sectors lag far behind. In the design of its own program, South Sudan can therefore benefit a great deal from these various experiences.

3.5.1 Overview of the Program

Successful implementation of the proposed Infrastructure Action Plan (IAP) will require that priority is accorded to building institutional and human capacities for the design and implementation of the proposed program. There is a clear need to move beyond the emergency interventions of recent years by the donor community and governments and address the most glaring deficiencies in the basic infrastructure of the country. There has been limited donor coordination of these interventions with other activities within and across sectors.

There are four closely related sets of concerns that are built into the proposed IAP that will require early attention:

- Take initiatives that will strengthen the sector planning capacities of line agencies and government mechanisms for prioritizing project and program interventions in the infrastructure sectors. As the preceding discussion of funding arrangements for the infrastructure program indicates, the reality is that a substantial part of the required funding will continue to come from National Government sources in the decade ahead, with significant parts of the program being implemented through the central government budget rather than by public enterprises. As the discussion below indicates, the Government is aware of existing shortcomings in the planning, selection, and execution of these investment

projects and is taking action to address these concerns. However, much remains to be done.

- Strengthen the roles and capacities of state enterprises that will be responsible for or associated with the provision of infrastructure services in the country. These responsibilities may range from being owner of the infrastructure assets and provider of related services to a partnership with private sector investors in service provision under some form of PPP arrangement.
- Strengthen the policy framework for private investment in infrastructure services under partnership arrangements with a state enterprise or other government entity. Experience in Sub-Saharan Africa in the past decade has led to a more nuanced view of the role of the private sector. Experience suggests that the private sector can make a substantial financial contribution in certain key sectors (mobile telephony, power generation, civil aviation and ports), but its contributions in roads and water distribution have been more limited.¹⁶
- Strengthen the legal, regulatory and administrative environment applicable to the provision of infrastructure-related services. Analysis by Vagliasindi and Nellis (2009) suggest that there are links between the introduction of an independent regulator and subsequent improvement in service performance within sectors. Weak regulatory autonomy and capacity constraints have undermined the credibility of independent regulators. Most Sub-Saharan regulatory agencies are embryonic, lacking funding and in many cases, qualified personnel. Strengthening regulatory capacities is a long-term process; a first priority should be given to those sectors where private participation and competitive pressures can play a significant role in improving service provision.

3.5.2 Central Government Capacities for Infrastructure Planning and Execution

The institutional reform agenda set forth in this Report includes provision for strengthening sector planning capacities in the infrastructure line ministries to ensure that there is a rigorous project screening process in place to ensure that infrastructure investments are selected according to their expected costs and benefits. And that

¹⁵ See for example, Vagliasindi, Maria and John Nellis (2009), "Evaluating Africa's Experience with Institutional Reform for the Infrastructure Sectors." Working Paper 23, Africa Infrastructure Diagnostic, World Bank, Washington DC., 2009; and Foster, Vivien and Cecilia Briceño-Garmendia (2010), Africa's Infrastructure: A Time for Transformation. World Bank, Washington DC, 2010.

¹⁶ Foster, Vivien (2008), "Overhauling the Engine of Growth: Infrastructure in Africa." Africa Infrastructure Country Diagnostic, World Bank, Washington DC, Draft report, September 2008.

these investments are sequenced and synchronized with each other and with broader development plans. For many large infrastructure projects the lead times from project identification to completion are lengthy and extend well beyond the current three-year cycle for national development planning. For this reason, multi-year budgeting frameworks and greater capacity to plan and implement complex procurement processes will help ensure that budget execution ratios increase and projects are completed in time. As noted in Chapter 1 of this Report, in recent years budget completion rates for donor funded programs have been about 75% of the annual amounts budgeted by donors. In the case of the 2010 national budget, the budget completion rate for the infrastructure capital works program was 92%, although there was wide variation among the sectoral agencies concerned. Execution rates ranged from less than 40% for the telecommunications and postal services program and the urban water program, to a high of more than 100% for the information and broadcasting program and the transport sector program.

The Government of South Sudan is taking action to address the current shortcomings in the planning and execution of infrastructure projects and programs. As noted earlier, a major concern has been the highly fragmented nature of donor support for the rehabilitation and upgrade of the country's infrastructure. The Government has therefore proposed a shift towards a more programmatic approach to planning and financing of infrastructure programs in the country. Under this proposed approach, new infrastructure proposals – large and small – will be consolidated into infrastructure priorities programs. These programs will aim to ensure that project design includes linkages with other projects (feeder roads with trunk roads, electricity transmission with distribution, and so on). These sectoral priority programs will be designed with corresponding set of strategies and policy actions for each of the main infrastructure sectors and sub-sectors. The proposed programs will be approved by Sector Working Groups, which will include donors. The programs will include the following information:

- A priority infrastructure strategy that draws on the SSDP and that is translated into prioritized policy actions that can be implemented, with due regard for technical and administrative implementation capacities.
- For each ministry a prioritized portfolio of projects will be prepared based on extensive consultation and rigorous analysis of costs and benefits.

- Individual programs and projects will be prepared according to agreed common technical standards and designs.

These programs will then be translated into implementation plans within the framework of the government's annual planning and budgeting process. During the annual planning process, these programs will be translated into three-year sector investment plans, which will underpin the budget sector plans. The proposed Infrastructure Action Plan outlined in this Report is designed to fit within the Government's evolving framework for the planning, design and implementation of the infrastructure program for the country.

3.5.3 Strengthening the Role of State Enterprises

Responsibility the nation's infrastructure is divided among a range on government entities in South Sudan. Looking ahead, there is little doubt that state corporations will play an important role in the decade ahead and beyond in the development of the country's infrastructure network and provision of infrastructure services.

Currently, there are three entities designated as state corporations that have formal responsibilities for the development, operation and maintenance of particular parts of the infrastructure network of the country. These are the South Sudan Electricity Corporation (SSEC), the South Sudan Urban Water Corporation (SSUWC), and the Nile Petroleum Corporation (NilePet). In addition, there is the recently created South Sudan Roads Authority. At the time of writing this Report, these entities were corporations in name only. Their transformation into legally recognized state-owned corporations has not yet been completed, although it is underway for the SSEC.

Elsewhere in Sub-Saharan Africa, the internal and external governance of state corporations has lagged behind other aspects of institutional development (World Bank, 2010). Most countries have done better on internal governance than on external governance.¹⁷ Building on the experience of other SSA countries, this Report proposes a series of actions aimed at strengthening the role of these infrastructure-related state enterprises, the key elements of which are as follows:

- Legislative action required to provide government "corporations" with the required legal basis for

operating as public companies. African experience with this type of restructuring suggests that the owner of these corporations should be the Ministry of Finance and Economic Planning rather than an independent body.

- Strengthen the financial and operational monitoring of these state owned enterprises (SOEs), with particular attention being given to the financial performance of the SOE. Experience in many SSA countries is that the hidden costs of operations can be high. According to the World Bank (2010), the hidden cost of inefficiency coming from mispricing, unaccounted losses and collection inefficiency and on average it is equivalent to 0.6% of GDP in the water sector and 1.6% of GDP in the power sector for SSA countries' as a whole.
- The SOEs in SSA that have registered sustained good performance (for example, in Botswana and Uganda) have taken a number of additional initiatives that include the following: (i) introduction of boards or directors, selection of board members on a competitive basis rather than direct appointment by line ministries, and introduction of independent directors; and (ii) introduction of independent audits of operational and financial performance on an annual basis.

3.5.4 Private Investment and Public-Private Partnerships

The South Sudan Development Plan places considerable emphasis on the importance of private sector participation in the provision of infrastructure services in the decade ahead. It will be important to ensure that expectations about the possible benefits are kept realistic. According to assessments made by the World Bank (2010), the key lesson from past experience in SSA is that the approach should be applied selectively to those areas of infrastructure where it has a proven potential to contribute. The experience of countries in SSA during the past two decades has been mixed. In mobile telephony, power generation, civil aviation and ports, the private sector has made substantial financial contributions; but in sectors such as roads, power distribution, and water and sanitation services, the contributions have been more limited. In the case of roads, for example, traffic volumes have not been large enough to generate acceptable returns for private investment in the upgrade of trunk roads with toll-type arrangements for cost recovery. Experience has shown that an average

volume of 15,000 vehicles a day is required for financial viability of such tolling arrangements – a traffic volume that is not likely to be met on any trunk roads in South Sudan for quite some years to come.

Presently, private sector provision of infrastructure services is limited to mobile telephony, river transport services, and of course, road transport. (See Chapters 7 and 10 for further discussion of these services.) As the analysis in Part 2 of this Report indicates, in the decade ahead the best prospects for private sector participation in provision of infrastructure services are in telecommunications, power generation, port operations and civil aviation. As Table 3.1 indicates, the Report proposes mobilization of about \$3 billion of private investment during 2011-2020 for the Action Plan for Infrastructure. The largest amounts are for electric power, communications, irrigation and water supply and sanitation. Modest amounts are proposed for river transport and ports, and civil aviation. Among these activities, PPP-type arrangements will be most applicable for the power sector (using take-or-pay type contracts), and water transport, civil aviation and perhaps water supply and sanitation using some form of concession agreements. In the case of communications, private investors will own the assets and provide services direct to the public under an appropriate regulatory framework established by the government. In the case of irrigation, the investors will own and operate these facilities for private production of agricultural products, with government providing oversight on the utilization of these water resources.

International experience indicates that successful PPP programs require good public sector management systems, and especially transparent tender processes and enforceable contracts, the use of transactions advisors, minimal political interference, and a relationship of trust between the public and private sectors. South Sudan can benefit from the experience of other countries in developing successful PPP-type programs. Given the limited experience within South Sudan in negotiating PPP-type contracts, the Government will need to make use of teams of transactions advisors. Depending on the complexity of the proposed projects, these teams may include lawyers, financial specialists and technicians who would advise and assist the Government in the design and negotiation of PPP-related contracts, including take-or-pay contracts for the storage and transport (by pipeline or canal) of water, and power generation, and concession agreements for provision of railway and aviation services. An amount of \$64 million (at 2010 constant prices) is proposed to cover the cost of these teams.¹⁸

¹⁷ Internal governance relates to structures within the service provision utility, such as the extent to which its structure approximates standard corporate forms; the qualifications and autonomy of its senior management and board of directors; the nature, quality, and timeliness of the information it submits to its overseers; and the adoption of accounting and disclosure standards. External governance refers to external market disciplines: being subject to private rather than public sector accounting and auditing systems, contracting out non-core activities to private providers, and being obliged to raise debt or equity funds on domestic or international private capital markets.

¹⁸ Experience from the United Kingdom, which has had a large program of PPP-type private investments, suggests that the cost of these transactions teams are likely to be in the range of 2% of the capital cost of the projects.

3.5.5 Strengthening the Regulatory Environment

Regulation of activities in the various infrastructure sectors is at an early stage in South Sudan. One of the important challenges for the medium-term is to strengthen the regulatory framework of the country. To complement the designing of its regulatory framework initiatives, South Sudan can draw on a rich background of information and analysis of international experience over the past 50 years from both advanced industrial countries and middle and low income developing countries.

Some guiding principles for regulatory reform. International experience suggests that an essential element of an effective regulatory framework for the development of adequate backbone infrastructure in a liberalized competitive environment is to place the responsibility for regulation in an agency with the required independence, autonomy, expertise, and accountability. The agency must protect the interests of both users and investors, and must do so in a fair and transparent manner. The standard recommendations for the creation of such an agency are straightforward and revolve around the following three broad principles: (i) the regulator's sectoral breadth of authority; (ii) the desirable qualities of a regulator; and (iii) the division of labor between the regulator and the government. These principles have provided a basis for

proposals and recommendations related to regulatory reform that are set forth in this Report.

The regulator's sectoral breadth of authority can be industry-specific such as rail and electricity; sector-specific such as transport as in the case of Argentina and Peru; or multi-sectoral with a single regulatory agency for all or most infrastructure sectors as in Australia, Canada, Costa Rica and Jamaica. In the case of transport, it is often the case that a single government ministry is responsible for the sector, in which case a regulatory agency with the same coverage can be appropriate.

In determining the desirable qualities of a regulator, a few minimum requirements must be addressed for regulation to be successful. These include independence with a reasonable amount of discretionary powers; autonomy and expertise; and accountability. Regulators should have an arm's length relationship with ministries and with the business entities in the sectors being regulated and they must have a degree of discretion in making decisions. The rules pertaining to the role and responsibility of the regulator must be clearly spelt out in the charter or contract that establishes the regulatory agency. Autonomy can be facilitated by ensuring that the regulatory authority has access to its own sources of funding, and is not dependent on annual transfers from the national budget. In monitoring compliance and enforcement, the regulatory authority must be able to impose penalties according to clearly defined rules.

Table 3.8: Illustrative Division of Labor Between Regulator and Government

Features	Government	Regulator	Other entities
Legal framework and sectoral policy Planning Privatization design Decisions on taxes and subsidies Concessions and procurement auctions			
Pricing policy Control and penalties Technical regulation			
Quality standards Environmental regulation Safety Health Antitrust policy			

Source: Reported by Estache and de Rus (2000), p.48.

The effectiveness of a regulator also depends on the clarity with which the sector responsibilities have been divided between a regulator and other government agencies. Table 3.8, which was devised by Estache and de Rus (2000), provides some practical guidelines for such division of responsibility. They noted that the suggested framework entails a degree of subjectivity and that adjustments are needed for country-specific circumstances; for example, should the regulatory agency be involved in the design of privatization and concession contracts because it would have the main responsibility for overseeing implementation of these provisions.

Current situation in South Sudan. Table 3.9 provides a summary of the current arrangements for regulation of infrastructure services. With the exception of the newly established South Sudan Roads Authority, responsibility regulatory oversight rests with the same ministries that are responsible for service provision. In the case of water

supply and sanitation these responsibilities are also shared with state and county authorities. The basic findings of this Report are: (i) for the most part there is no clear separation of responsibilities for service provision and regulation; (ii) the legal framework that establishes the basis for regulation of infrastructure services is weak or unclear; and (iii) ministries, and in the case of water supply and sanitation, state and county entities, have little or no capacity to fulfill their regulatory responsibilities. Development of these regulatory capacities poses a major challenge for the country.

Proposed new arrangements. The Government has already embarked on a number of initiatives aimed at strengthening the regulatory framework for infrastructure-related services. The proposed Action Plan set out in this Report builds on these various initiatives and proposes an overall game plan for the further development of these regulatory responsibilities in the decade ahead.

Table 3.9: Existing Institutional Arrangements for Regulation of Infrastructure-Related Services

Sector	Service provider	Entity responsible for regulation			
		Regulatory entity	Governing Board	Autonomy in decision-making	Reporting arrangements
Water re-sources management	Directorate of Water Resources Management		No		Minister of Water Resources and Irrigation
Irrigation	Directorate of Irrigation and Drainage		No		Minister of Water Resources and Irrigation
Electric power	South Sudan Electricity Corporation	Directorate of Regulation	No		Minister of Electricity and Dams
Road transport infrastructure	South Sudan Roads Authority		Yes		Minister of Roads and Bridges
Road transport services	Ministry of Transport		Yes		Minister of Transport
River transport and ports	Directorate of River Transport		No		Minister of Transport
Railways	Directorate of Railways		No		Minister of Transport
Civil aviation	Directorate of Civil Aviation		No		Minister of Transport
Urban water supply	South Sudan Urban Water Corporation & state & county bodies		No		Minister of Water Resources & Irrigation & state & county bodies
Urban sanitation	Ministry of Housing & Physical Planning, & Ministry of Health		No		Minister of Housing & Physical Planning, & Minister of Health

Sector	Service provider	Entity responsible for regulation			
		Regulatory entity	Governing Board	Autonomy in decision-making	Reporting arrangements
Rural water supply	Local government councils		No		State and county bodies
Rural sanitation	Local government councils		No		State and county bodies
Telecommunications & postal services	Ministry of Telecommunications and Postal Services	Directorate of Telecommunications	No		Minister of Telecommunications and Postal Services
Information and broadcasting	Ministry of Information and Broadcasting	Directorate of Southern Sudan Radio and TV, and Directorate of Public Information	No		Minister of Information and Broadcasting

Source: Sectoral chapters in Part B of this Report.

In the case of water resources management there is no clear regulatory framework in place that can govern the use of the country's water resources. A substantial amount of work is needed to establish a sound basis for government oversight of the use of these resources.

As Chapter 5 indicates, authority over water resources at the national and local levels needs to be clarified, and coordination of governance arrangements among public and private entities and local communities needs to be strengthened. As one of the ten riparian countries of the Nile Basin, South Sudan is both an upstream country vis-à-vis Egypt and Sudan, and a downstream country with respect to the other seven riparian states (Burundi, DRC, Ethiopia, Kenya, Rwanda, Tanzania and Uganda). The country is at the heart of the complexities associated with the Nile Basin Initiative (NBI) and the related transboundary water management of the River represents an extraordinary challenge. The recent independence of South Sudan and its ambitious plans for the use of the water resources for irrigated agriculture and for large-scale hydropower projects on the White Nile put it at the center of the ongoing dialogue among the ten riparian countries. At this point there is a serious lack of detailed information about the amount of internal renewable water resources of the country and their annual variability; and the inflow, disappearance and outflow of external water resources associated with the Nile River. The Report therefore proposes that a substantial amount of work be undertaken to assess these water resources as a matter of priority. The results of these assessments can then provide a foundation for proposals for domestic development of these resources in a manner that is acceptable to the other riparian states. The eventual regulatory measures that may emerge from

this work may include, for example, creation of a national water resources regulatory authority with responsibility for the issue of water permits or water rights to various types of users within the country.

In the case of the power sector, a draft Electricity Bill is currently before Parliament. This Bill provides for the creation of the South Sudan Electricity Regulatory Authority (SSERA) that will be responsible for licensing and regulation of the generation, transmission, distribution and supply of electricity within South Sudan. The activities of SSERA will be overseen by a Board of Directors, but SSERA will report to the Minister of Electricity and Dams. Board members will be appointed by the Council of Ministers on the recommendation of the Minister of Electricity and Dams. Measured against the general principles outlined above, the main concern with these arrangements will be the degree of independence of the Board. Consideration could be given to enhancing the independence of the Board. This will avoid potential conflicts of interest between the Ministry of Electricity and Dams as a service provider and SSERA as the regulator also reporting to the Minister. International experience suggests that enhanced independence of the regulator will also enhance the confidence of potential investors and facilitate the mobilization of private investment in power generation.

In the case of the transport sector, the current approach in South Sudan appears to be aimed at creating separate regulatory entities for each sub-sector. This Report calls for a reconsideration of the approach in favor of creating a single regulatory authority that will be responsible for the entire transport sector, including roads, rail, river ports

and civil aviation. Creation of a single regulatory authority for the transport sector is not uncommon: for example, countries as diverse as Brazil, Argentina, Tanzania, and Singapore are served by authorities with broad sectoral responsibilities for regulation within the transport sector. New legislation will be required to create the proposed authority. In the event that the Government decides to set up a single regulatory authority for the transport sector, a detailed business plan will need to be prepared prior to the drafting of new legislation and supporting regulations. The business plan will set forth proposals for the structure of the authority, the specifics of the authority's responsibilities, staffing requirements for various units within the authority, and funding arrangements.

In the case of water supply and sanitation, concerted efforts are needed to develop the overall framework for water supply and sanitation services in the country. As Chapter 9 indicates, in 2011 the Government adopted the Water, Sanitation and Hygiene Strategic Framework, which serves as a roadmap for the further development of institutional arrangements for the sector. The paper recognizes the challenges pertaining to institutional fragmentation within the sector and calls for streamlining the responsibilities of all relevant institutions. It proposes two institutional initiatives: (i) creation of a Water Council to provide advisory services to national, state and country governments; and (ii) creation of a Water Supply and Sanitation Board at the national level to develop and enforce regulations for water supply and sanitation services. A first critical step in developing an appropriate institutional framework for the sector will be the preparation and promulgation of a Water Act for the country.

In the case of the communications sector, the substance of ICT regulation around the world has evolved rapidly in recent decades in response to advances in communications technologies. The liberalization of ICT markets has stimulated cumulative interacting innovations in products, services and technologies with a general convergence or blurring of distinctions between platforms, products and services. In South Sudan, the current thrust at the national level is to retain the current separation of regulatory responsibilities for telecommunications and postal services from that for information and broadcasting. Regulatory responsibilities at the state level are managed separately by state government entities. As Chapter 10 indicates, practice varies among Sub-Saharan countries regarding the design of regulatory responsibilities for ICT services (see Table 10.1). A number of countries, including Malawi and Rwanda, have established a single regulator for

telecommunications and broadcasting services. As noted earlier, the Report suggests that almost \$800 million of new investment by the private sector will be required in the decade ahead to bring ICT services to levels comparable to other countries in the region. Mobilization of this amount of funding will require that the regulatory framework for the sector is transparent and uniform with no duplication and overlap of responsibilities. Given the growing integration of communications services around the world, the proposed regulatory framework in South Sudan will need to promote competition among telecommunications and broadcast service providers.

3.5.6 Technical Support for the Program

Given the current limited capacities in many parts of government, an important part of the proposed program is support for capacity building, supporting technical services, and various technical studies. These activities are designed to improve capacities within the country to plan and implement major infrastructure programs and projects, and strengthen the operating environment for infrastructure-related investment and service provision by the business community. The various components of the proposed program of capacity building for the decade ahead are discussed in previous sections of this Chapter and in the various chapters in Part B of the Report.

Capacity building programs. Table 3.10 provides a summary of the proposed expenditures for capacity building and technical support, the total cost of which is estimated at about \$380 million for the decade as a whole. The bulk of the outlays are for capacity building in the individual sectors, but the Action Plan also calls for a number of initiatives that cut across all of the individual sectors (these are the national government programs referred to in Table 3.10). The details about these initiatives are discussed elsewhere in this Chapter. These include support for capacity building in the review and prioritization of infrastructure related projects and programs that are proposed for funding by the government or by the donor community, support for a major push to restructure and upgrade the performance of existing and proposed new state enterprises, as well as support for building the capacities of existing and proposed new regulatory authorities. In addition, the program makes provision for some \$60 million to finance transaction advisory services.

Table 3.10: Expenditures for Proposed Program of Capacity Building
(\$ millions at 2010 constant prices)

Program	Estimate	Projected						Total
	2010	2011	2012	2013	2014	2015	2020	2011-20
National government programs								
Review of project pipelines & priorities	-		1.0	1.0	1.0	1.0		5.0
Build regulatory capacities			1.5	1.5	1.0	1.0		7.0
Restructure and strengthen state enterprises			1.0	1.5	1.5	1.0	0.5	7.5
Transaction advisory services			0.5	5.0	8.0	10.0	5.0	63.5
Sub-total	-	-	4.0	9.0	11.5	13.0	5.5	83.0
Water resource management	2.7	2.0	2.3	2.0	1.7	1.2	1.2	16.4
Irrigation & agriculture infrastructure	-	-	-	2.0	2.0	2.0	-	10.0
Transport sector								
Roads	5.7	5.3	7.0	5.7	4.0	2.8	2.5	37.6
River transport and ports	-	-	0.6	0.5	0.5	0.5	0.1	3.2
Railways	-	-	0.3	1.2	0.5	-	-	2.0
Aviation	-	-	1.3	2.1	1.1	1.5	0.5	10.2
Sub-total	5.7	5.3	9.2	9.5	6.1	4.8	3.1	53.0
Electric power programs	-	-	3.8	4.7	4.2	3.1	3.0	30.7
Water supply and sanitation	0.7	3.2	19.6	34.5	34.7	30.3	2.0	151.9
Communications	3.9	2.9	7.1	4.8	3.6	2.3	2.3	32.2
Total	13.1	13.3	46.0	66.6	63.8	56.6	17.1	377.2

Source: Estimates by authors for the «National Government programs» and Annex Table 3.5.

As Table 3.10 indicates, the bulk of the spending on capacity building takes place during 2012-2015. A high priority is attached to early action that is required to build capacities at the national and state levels to design and oversee implementation of this ambitious development program for infrastructure. Delays in launching these capacity building programs will inevitably slow the design and implementation of the proposed investment of \$13.3 billion in rehabilitation and expansion of the basic infrastructure network of the country that is proposed in this Report.

Technical studies. In addition to these capacity building and technical support initiatives, the Action Plan proposes a series of technical studies in the various sectors that will collect basic information about the sectors (for example,

available water resources, road and air traffic flows), evaluate options for proposed infrastructure investments and related economic and financial costs and benefits, and fund the early stages of project identification and preparation. The various chapters in Part 2 of this Report provide detailed listings of the studies that will be required. Table 3.11 provides a summary view of the funding that will be required for this part of the program. A total of \$128 million (at 2010 constant prices) will be required for the various technical studies identified in this Report. About \$70 million will be required for the transport sector program, largely for engineering studies and technical design work for the proposed roads program, as well as basic collection such as regular traffic counts on the trunk roads of the country and in urban areas.

Table 3.11: Expenditures for Proposed Program of Technical Studies
(\$ millions at 2010 constant prices)

Program	Estimate	Projected						Total
	2010	2011	2012	2013	2014	2015	2020	2011-20
Water resource management	-	1.6	1.6	2.2	3.4	3.2	-	14.9
Irrigation for agriculture	-	-	0.5	3.5	1.5	-	-	5.5
Transport sector								
Roads	0.3	0.7	9.3	19.0	8.0	6.0	-	45.2
River transport and ports	1.1	0.8	4.0	1.0	2.0	3.0	-	10.8
Railways	-	0.6	1.0	1.0	3.0	3.0	-	8.6
Aviation	-	-	1.5	1.5	-	-	-	3.0
Sub-total	1.5	2.1	15.8	22.5	13.0	12.0	-	67.6
Electric power programs	-	0.8	5.6	4.6	4.6	-	3.0	30.6
Water supply and sanitation	-	-	0.2	1.0	1.5	0.4	-	3.5
Communications	-	-	2.2	1.9	0.6	0.3	0.2	5.9
Total	1.5	4.5	25.9	35.8	24.5	15.8	3.2	128.0

Source: Annex Table 3.5.

As with the capacity building initiatives, the Action Plan calls for an early launch of these technical studies as the information collected will be essential to policy decisions for individual sectors and it will also be central to the conduct of environmental and related assessments, the design of individual infrastructure programs and projects and the subsequent evaluation of the economic and financial costs and benefits of these proposed programs.

3.6 Implementation of the Action Plan

Successful implementation of the proposed infrastructure program will require close attention to the sequencing and coordination of actions across multiple fronts and in a phased manner. Table 3.12 sets out an indicative set of timelines for implementation of the proposed Action Plan.

3.6.1 Overall Management of Program Implementation

Successful implementation of the proposed Infrastructure Action Plan requires a carefully phased approach. There are three sets of priorities for the program:

- The first requirement is early action to strengthen the operating environment within which infrastructure assets will be created with public and private investment

as well as promote the provision of infrastructure-related services by the private sector and by government entities.

- Early action is also required on a wide range of capacity building initiatives related to the policy, regulatory and institutional environment within the public sector at both the national and sub-national level. Of particular importance is the urgent need to build the capacities of government entities to design and implement the proposed infrastructure programs.
- The Infrastructure Action Plan includes a large number of specific programs and projects to be designed and implemented in the decade ahead. Successful implementation of the program requires that there is an early start on the prioritization of these individual projects and programs and that detailed technical studies, where required, are undertaken as soon as possible, followed by feasibility studies and detailed project design and funding arrangements.

Without early progress on all three of these fronts, the risk is that there will be significant delays in mobilizing the required funding from the international donor community and potential private investors. Delays in improving the operating environment, for example, will result in continued uncertainty among potential private investors that will heighten investor perceptions about the risks involved in making major commitments in South Sudan. Comparable opportunities elsewhere in

Sub-Saharan Africa and other regions of the world will be viewed by potential investors as more attractive. Delays in mobilization of these resources will then create problems in the national and sub-national budget processes regarding priorities for public funding of the infrastructure

program. Successful implementation of the proposed program will require a close partnership that involves the national government, state enterprises, state and local governments, the international donor community and the private sector.

Table 3.12: Proposed Schedule for Implementation of the Infrastructure Action Plan

Activity	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Operating environment											
Strengthen regulatory environment											
Restructure state enterprises											
Improve operating environment for private investment											
Design & launch programs to promote domestic supply responses											
Award & implement PPP-related private investment contracts											
Capacity building at national & sub-national level											
Strengthen procurement procedures and capacities											
Strengthen line ministry project design & execution capacities											
Infrastructure development programs											
Technical studies											
Rehabilitation of existing facilities											
Investment in new capacity											
Water resources management											
Irrigation											
Transport											
Roads											
Ports											
Railways											
Civil aviation											
Electric power											
Water supply and sanitation											
Communications											

Source: estimates by authors.

3.6.2 Overview of the Program Implementation Schedule

Table 3.12 provides an indicative set of timelines for implementation of the proposed Action Plan. It provides details for the schedules required for the actions on the operating environment, on capacity building, and on the design and implementation of the proposed investment program. The Report proposes that the improvements in the operating environment are completed by 2015, thereby laying the foundations for a subsequent build-up in private investment in infrastructure assets and related services. It proposes that there is an equally large push on capacity building at the national and subnational levels during 2011-2015. As Tables 3.10 and 3.11 indicate, about \$350 million of the proposed \$500 million of capacity building and technical support – equivalent to 70% of the proposed program – is scheduled for disbursement during 2011-2015.

As Table 3.12 indicates spending on the technical studies needed for project identification and design, environmental assessments and so on will continue through the entire decade. However, the rehabilitation of existing infrastructure assets will be complete by 2015. Investment in new capacity will be an ongoing process for the entire decade, although in some sectors construction activities will only begin after detailed feasibility studies are completed in the next year or two.

A major concern of the Government is that to date the bulk of the infrastructure rehabilitation and upgrading has been funded and implemented outside the institutions of the state. The Government has indicated that increasingly in future investment in infrastructure will be prioritized and coordinated through national and state planning and budget frameworks. Funds for infrastructure programs will increasingly flow through the public financial management systems. As an interim measure, the Government has proposed the formation of the Rapid Infrastructure Development Fund (RIDF) for South Sudan.⁴⁵ The proposed Fund will be designed to channel funds from donors, multilateral banks, foundations and the government's own resources to priority investment programs in energy, water and sanitation, transport and telecommunications infrastructure. The Government proposes that donor funds be pooled in a common fund that will be managed jointly with representatives of the contributors to the Fund. Consideration is also being given to the creation of a Road Fund to finance road maintenance and some investment. The position taken in this Report is that the Road Fund will be managed separately from the RIDF.

Successful implementation of this ambitious program for development of the basic infrastructure of the country will require effective strategies for dealing with the wide range of risks and uncertainties that typically confront a program of this kind. These challenges are detailed in Chapter 4.

¹⁹ See Ministry of Finance and Economic Planning (2011), Development of Aid Instruments in South Sudan: The Rapid Infrastructure Development Fund. Ministry of Finance and Economic Planning Concept Paper, Juba, Revised Draft, December 4, 2011.

4 Economic Impact of the Action Plan and Alternative Scenarios

4.1 The Need for Sustained Strong Economic Growth

The national income accounts for 2010 indicate that the country's economy is dominated by oil (60% of GDP), with a predominantly subsistence agriculture sector and government services each accounting for about 15% of GDP. Industry and other services play a minor role, accounting for the remaining 10% of GDP. The non-oil economy is estimated to have been growing at an average of about 5% a year in real terms in recent years. However, this growth has fluctuated widely as a result of the boost from sharp increases in development spending, large changes in the international price of oil and hence government spending, and the effects of drought on agricultural production.

With current high levels of unemployment and underemployment, and a labor force that is projected to grow at an average of 4.8% a year in the decade ahead, there is little doubt that the country will require an extended period of strong economic growth if it is to succeed in providing productive employment opportunities, reducing the high incidence of poverty and enhancing livelihoods in both urban and rural areas. The issue is not whether such a growth strategy should be pursued, but rather how can it be done?

The position taken in this Report is an extension of that set forth in the South Sudan Development Plan (SSDP) for 2011-2013. The best prospects for an extended period of sustained strong economic growth will come from the development of the vast agricultural potential of the country, first to meet the most pressing domestic needs of the country, and then to exploit opportunities in regional and global markets for export of a wide range of food and other agricultural products. This requires a fundamental transformation from the current system in which the predominantly rural population of the country is engaged in subsistence farming to meet family needs, with little or no production of marketable surpluses of food and other agricultural products. The inability of the farming community to produce surpluses for sale in the market economy stems from a range of shortcomings that are articulated in Chapter 6 of this Report.

As the analysis in Part B of this Report indicates, the current lack of basic infrastructure in the country is one of the most serious obstacles that stand in the country's path to achieve accelerated economic growth. The Report lays out a major program for development of the basic infrastructure of the country in the medium term that, in conjunction with a range of other initiatives, will provide the basis for a transition to economic growth in the range of 9% a year in real terms in the non-oil economy by the latter part of the decade. This proposed outcome is referred to as the High Growth Scenario in this Report. As Chapter 3 indicates the total cost of the program is estimated at \$13.8 billion during 2011-2020 (at 2020 constant prices and exchange rate). A substantial portion of the required funding will come from the allocation by the National Government of a larger share of oil revenues to infrastructure development, from continued strong support from the international donor community and from a major push to attract private investment in infrastructure assets and services, especially in electric power, telecommunications, and irrigation.

4.2 Key Features of the High Growth Scenario

4.2.1 Growth in Production and Incomes

The basic strategy of the High Growth Scenario is to broaden substantially the economic base of the country. This proposed transformation of the economic base is led by a major build-up in public and private investment in infrastructure, thereby addressing one of the most serious constraints to strong economic growth in South Sudan. The build-up in investment in basic infrastructure assets and services is a key driver for the proposed transformation of the economy away from its excessive dependence of the oil sector as the primary source of economic growth. This transformation results in a broader-based pattern of development that provides large numbers of people with opportunities for productive employment and improved livelihood.



Economic Impact of the Action Plan and Alternative Scenarios

Table 4.1: Selected Macroeconomic Indicators for High Growth Scenario (Based on \$ at 2010 constant prices and exchange rate)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Production											
GDP growth rate (% p.a.)	16.4	0.7	(3.1)	(7.9)	(4.4)	1.7	(0.5)	0.9	2.1	3.1	
Non-oil GDP growth rate (% p.a.)	(5.5)	12.9	5.4	6.2	6.8	6.9	7.8	8.7	9.2	9.1	
Non-oil GDP as % GDP	40.3	32.7	39.9	46.0	51.5	54.1	58.6	63.2	67.5	71.5	
Income											
National income per capita (\$)	956	960	744	725	705	711	724	745	774	805	
Non-oil GDP per capita (\$)	567	506	542	544	555	591	617	650	688	728	
Memo items:											
Petroleum value added (\$ mill)	7 968	10 452	9 903	9 109	7 532	6 473	5 582	5 016	4 518	4 088	
Non-oil GDP (\$ mill)	5 380	5 083	5 739	6 051	6 428	6 868	7 914	8 600	9 388	10 246	
Gross domestic product (\$ mill)	13 349	15 536	15 642	15 159	13 960	13 341	13 496	13 616	13 906	14 334	
National income (\$ mill)	9 077	9 646	7 886	8 058	8 174	8 431	9 276	9 863	10 561	11 339	
Population, mid-year ('000)	9 494	10 048	10 594	11 116	11 589	12 012	12 819	13 232	13 652	14 079	
Labor force ('000)	4 231	4 499	4 771	5 040	5 296	5 537	6 023	6 277	6 538	6 805	

Source: Annex Tables 4.7 and %.

Table 4.1 provides a summary of the projected increase in GDP, non-oil GDP and national income under the High Growth Scenario for the period 2011-2020. The key features are as follows:

- The growth rate for non-oil GDP rises steadily from a projected 6% in 2013 to a little more than 9% a year by the end of the decade.
- Because of the projected decline in oil production in the decade ahead, value added by the petroleum sector declines by about 50% in real terms by 2020.
- As a result, the total GDP of South Sudan declines from a peak of US\$15.7 billion in 2012 to US\$13.4 billion by 2015, after which the strong growth in the non-oil economy offsets the decline in the petroleum sector and total GDP increases by about 3% a year by 2020.
- By 2020, non-oil GDP accounts for almost three-quarters of total GDP, compared with about one-third at the present time – a major structural transformation of the economy towards a broad-based pattern of growth and development. As the discussion in Chapter 2 indicates, by 2020 industry and services sectors other

than government account for almost 30% of GDP.

- With sustained strong growth in the non-oil economy, non-oil GDP per capita increases by almost 40% in real terms in the decade ahead, from an average of \$535 in 2010-2011 to \$740 by 2020. This implies a sustained improvement in average productivity of the labor force.

However, the combination of the decline in value added in the oil sector, continued outflows of investment income to the international companies involved in oil production in South Sudan and oil revenue sharing payments to the Republic of Sudan, results in a stagnation of the national income of South Sudan at about \$11.5 billion a year for much of the decade ahead. It is only in the latter part of the decade that the strong growth in non-oil GDP offsets these other pressures; as a result, the growth in national income recovers to an average of 3% a year in real terms during 2016-2020. The implication is that national income per capita declines from a peak of \$1,130 in 2012 to about \$900 by 2018. This decline may result in a reclassification of South Sudan by the World Bank from a Lower Middle Income country at present to a Low Income country in the coming years.

Table 4.2: Investment Indicators for High Growth Scenario (As % of total GDP)

Indicator	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Public non-oil investment											
Infrastructure	3.0	2.2	2.6	5.0	6.7	7.3	6.9	8.3	10.1	11.2	10.9
Other	1.6	1.5	1.7	1.9	2.5	2.8	3.4	3.8	3.9	4.1	4.3
Sub-total	4.6	3.7	4.3	7.0	9.2	10.2	10.2	12.0	14.0	15.4	15.2
Private non-oil investment											
Infrastructure	0.4	0.3	0.8	2.1	2.7	2.5	1.3	1.5	2.0	2.3	2.3
Other	2.6	2.4	2.7	3.3	4.3	5.4	5.9	7.6	8.0	9.2	9.1
Sub-total	3.0	2.7	3.4	5.4	7.0	8.0	7.2	9.2	10.0	11.5	11.4
Total non-oil investment											
Infrastructure	4.6	3.7	4.3	7.0	9.2	10.2	10.2	12.0	14.0	15.4	15.2
Other	4.2	3.9	4.3	5.2	6.7	8.3	9.3	11.4	11.9	13.4	13.4
Total	8.8	7.5	8.7	12.2	15.9	18.4	19.5	23.4	25.9	28.7	28.6
Petroleum sector investment											
Private investment	8.0	7.6	5.7	5.6	5.7	5.5	5.1	4.8	4.6	4.3	4.0
Total investment											
Infrastructure	4.6	3.7	4.3	7.0	9.2	10.2	10.2	12.0	14.0	15.4	15.2
Other public	1.6	1.5	1.7	1.9	2.5	2.8	3.4	3.8	3.9	4.1	4.3
Private	10.6	9.9	8.3	8.9	9.9	11.0	11.0	12.5	12.6	13.5	13.1
Total	16.7	15.1	14.3	17.8	21.6	24.0	24.6	28.3	30.5	33.0	32.6
Memo items:											
GDP (SDG millions)	31 769	36 975	37 227	36 079	33 225	31 751	32 287	32 121	32 406	33 095	34 116
Non-oil investment as % non-oil GDP	18.8	19.4	21.1	30.9	35.2	35.2	32.3	36.1	37.9	39.8	37.3
Total fixed investment (\$ mill)	2 075	2 159	2 101	2 721	3 050	3 159	3 061	3 512	3 885	4 340	4 393

Source: Annex 4.

4.2.2 Role of Infrastructure Investment in Accelerating Economic Growth

Infrastructure plays a key role in economic growth and poverty reduction. The lack of infrastructure leads to increased production and transaction costs. This lessens the competitiveness of businesses, and therefore the possibility of implementing economic and social development policies. As Chapter 2 indicated, the acceleration in the growth of the non-oil economy is to be achieved by raising the current non-oil investment rate from about 20% of non-oil GDP to an average of 35% during 2014-2020. In terms of total GDP, the overall investment rate needs to increase from 15.5% of total GDP at the present time, to about 25% of GDP by 2015 and about 33% of GDP by the end of the decade (Table 4.2). The cumulative amount of non-oil investment required during 2011-2020 to raise the economic rate to about 9% a year by the latter part

of the decade is about \$25 billion at 2010 constant prices and exchange rate (Annex Table 4.2). The key driver of this increase in aggregate investment is the proposed infrastructure investment program of some \$13.3 billion (Table 3.2). It accounts for 53% of the total investment required in the decade ahead

As Table 4.2 suggests, the increased investment in infrastructure is led by the public sector (National and state governments and the international donor community). The sustained public sector commitment to a much improved national infrastructure network lowers business operating costs and improves service delivery, thereby addressing one of the major concerns of potential private investors. Reinforced by the range of other measures to improve the operating environment for private investment that are outlined in Chapters 2 and 3, non-oil private investment begins to rise sharply from 2014-2015. By 2020, non-oil private investment is projected to be at a level equivalent to 16% of GDP, compared with an average of about 3% at the present time.

Table 4.3: National Budget and Donor Funding for Infrastructure in High Growth Scenario (As % of total GDP)

Indicator	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
National budget											
Oil revenue	17.7	15.3	32.2	30.6	27.4	24.7	23.3	21.0	18.7	16.5	14.5
Non-oil revenue	0.4	0.3	0.4	0.8	1.8	3.1	4.3	5.9	7.6	8.8	10.0
Total revenue	18.1	15.6	32.6	31.4	29.3	27.8	27.7	26.9	26.3	25.3	24.5
Recurrent spending	14.1	12.2	12.8	13.8	15.7	17.2	17.6	18.5	19.3	19.9	20.4
Capital spending											
Infrastructure	1.8	1.4	1.8	3.4	4.5	4.9	5.0	6.1	7.6	8.4	7.9
Other	1.7	2.0	2.1	2.3	2.9	3.2	3.3	3.5	3.7	4.1	4.5
Total	3.4	3.4	3.9	5.7	7.4	8.1	8.4	9.6	11.2	12.5	12.5
Total expenditures	17.6	15.6	16.8	19.5	23.0	25.3	26.0	28.1	30.5	32.4	32.9
Overall budget balance	0.6	0.0	15.8	11.9	6.3	2.5	1.7	(1.2)	(4.2)	(7.1)	(8.3)
Public funding for infrastructure											
Donor funding	1.2	0.7	0.9	1.6	2.2	2.4	1.8	2.2	2.5	2.9	3.0
Total public funding	3.0	2.2	2.6	5.0	6.7	7.3	6.9	8.3	10.1	11.2	10.9
Memo items:											
GDP (SDG millions)	31 769	36 975	37 227	36 079	33 225	31 751	32 287	32 121	32 406	33 095	34 116
Government share of infrastructure (%)	59.3	66.2	67.8	67.7	67.1	66.7	73.5	73.8	75.0	74.5	72.7

Source: Annex Table 4.8.

20 In the High Growth Scenario, it is assumed that South Sudan receives 80% of net oil income during 2011-2020. One of the alternative scenarios reviewed later in this Chapter and in Annex 5 is one in which South Sudan receives 96% of net oil income.

4.2.3 Financing the Build-up in Infrastructure Investment

As the discussion in Chapter 3 indicates, the rapid build-up in investment in infrastructure in the near- and medium-term will have to come from a substantial increase in public investment that is driven by a close partnership between the National Government and the international donor community. The proposed Action Plan for Infrastructure calls for public investment to increase from about 2.5% of GDP at the present time to almost 6% of GDP by 2015 and 7% of GDP by the end of the decade (Table 4.3). At the present time, the National Government is funding about 70% of the public investment in infrastructure investment that is taking place. For the decade ahead, the Government will continue to fund 70% of the proposed new public investment. This financing scenario is based on the assumption that the National Government receives at least 80% of the oil revenues generated within South Sudan. At a share of oil revenues of 80%, the National budget runs an overall deficit equivalent to 3.5% of GDP by 2020, after having generated large surpluses during 2012-2018. For the purposes of this Report, it is assumed that these surpluses are placed in the proposed wealth fund for the benefit of future generations. The budget deficit in 2019-2020 could be funded by withdrawals from the wealth fund of by the issue of long-term bonds by the National Government.

The level of donor funding for the infrastructure program peaks at the equivalent of 2.5% of GDP in 2015 and then declines to the equivalent of 1.5% of GDP for the remainder of the decade. As the discussion in Chapter 3 indicates, the proposed funding arrangements for the donor community will require that 25% of the total amount of development assistance that is projected to be available during 2011-2020 will have to be allocated to the infrastructure program. This represents a small increase over the average of 22% that has prevailed in recent years.

4.3 Key Economic and Social Benefits of the Proposed Program

4.3.1 Overview of the Benefits

There are four broad sets of benefits that would flow from successful implementation of the proposed Infrastructure Action Plan. These are as follows:

- Improve access to basic services for large numbers of residents in urban and rural areas that, in turn, facilitates access to health and education services, improve access to information including market opportunities, and improve opportunities for sale of produce in domestic and regional markets.
- Lower the costs of infrastructure services such as road transport and electric power and thereby improve the competitiveness of domestic business vis-à-vis imports and in export markets in the region and internationally.
- Provide a substantial range of new business opportunities for the private sector within South Sudan.
- Contribute to job creation in two ways: (i) create direct employment opportunities in the implementation of these infrastructure development programs that, in turn, can produce multiplier effects at the local and national level; and (ii) the availability of more reliable basic infrastructure such as roads, river ports and transport, power and telecommunications at lower cost will provide the type of operating environment that is needed for increased production in agriculture, industry and trade.

4.3.2 Improved Access to Basic Services and Markets

The proposed program has a significant impact on the number of people in the country with access to basic services. At the present time, about 18% of the rural population and 7% of the cultivated land area are within 2 km of a road, although as Chapter 7 indicates, many of these roads are impassable for six months a year due to rains and flooding. Implementation of the proposed program to upgrade close to 11,000 km of trunk and rural roads to paved or all-weather standard in the decade ahead would improve substantially the access of rural communities to markets and services. As a result of this program about 70% of the rural population and 50% of the cultivated land area would be within 5 km of an all-weather road by 2020. This transformation in rural connectivity, in turn, improves farm access to basic inputs such as fertilizers and pesticides. The improved roads also contribute to lower transport costs for inputs and for produce destined for local and international markets. The improvement in rural connectivity plays an important role in creating the conditions required for growth in agricultural production of 6% a year by the later part of the decade ahead.

Table 4.4: Increase in Population with Access to Basic Services

Type of service	Share of population (% of total)		Population with access ('000)		
			(total)		(increase)
	2010	2020	2010	2020	2010-2020
Improved water supply					
Urban	15	70	261	2 560	2 299
Rural	34	65	2 637	6 774	4 137
National	31	66	2 898	9 334	6 436
Improved sanitation					
Urban	37	60	643	2 194	1 551
Rural	9	40	698	4 169	3 471
National	14	45	1 341	6 363	5 022
Electric & solar power					
Urban (electric)	5	52	90	1 898	1 807
Rural (solar)		17	-	1 750	1 750
National	1	26	90	3 648	3 557
Communications					
Mobile cellphones	12	40	1 139	5 631	4 492
Internet users	1	10	95	1 408	1 313
Coverage of cell network	60	100	5 696	14 079	8 382
Memo items:					
Total population ('000)					
Urban			1 737	3 656	1 919
Rural			7 757	10 422	2 665
Total			9 494	14 079	4 585

Source: Table 3.5, Table 3.6 and Table 3.7.

The proposed program also improves access to basic services for a large part of the population. As Table 4.4 indicates, full implementation of the program will result in an additional 6.4 million people having access to improved water supplies and an additional 5 million having access to improved sanitation. In urban areas, a little more than 50% of the population will have continuous access to electricity supplied from the partial national grid in place by 2020. And as a result of the proposed rural energy program, about 1.75 million rural residents will have access to some form of solar energy (including solar panels, pumps and cookers). In the case of communications 100% of the population will be covered by cell phone networks, with 40% of the population having the use of cell phones, compared to only 12% at the present time. This represents an increase of 4.5 million people with access to cell phones. An additional 1.3 million people will have internet accounts.

4.3.3 Lower Costs for Infrastructure Services

As the discussion in Chapter 1 and in the Chapters in Part B of this Report indicate, the costs of basic infrastructure services in South Sudan are high. As Table 1.11 indicates, it costs \$9,420 to import a standard container from Mombasa to Juba. This compares with \$3,700 for Burundi, \$4,100 for Rwanda and \$3,000 for Uganda for container transit from Mombasa.²¹ The average transit time for these three landlocked countries is 10 days compared with 60 days for Mombasa to Juba. In the case of exports it takes 52 days and costs \$5,025 to transport a standard container from Juba to the port of Mombasa. The average cost for Burundi, Rwanda and Uganda is about \$2,350 and the average transit time is six days. Road freight rates in South Sudan are typically in the range of 20 US cents per ton km,

more than twice that of rates in neighboring countries such as Kenya and Uganda. With heavy dependence on small diesel plants in most state capitals the cost of electric power is also high, ranging from 20 to 50 US cents per kWh.

Successful implementation of the IAP will have a significant impact on these high infrastructure service costs. In the case of road freight, for example, a reasonable expectation is that the cost of road freight would decline to less than 10 US cents per ton km –perhaps in the range of 8 US cents per ton km. The potential economic benefits of this reduction are large. There are no reliable data for the amount of international freight that comes into and leaves South Sudan. In the case of Burundi, a much smaller landlocked country, the total tonnage of imported freight was equivalent to about 240 tons per \$1 million of GDP in 2008 and about 255 tons in 2010. Applying these indicators to South Sudan for the High Growth Case for non-oil GDP in 2020, gives an estimate of 2.5 million tons of imported freight for that year. Of course, given that the Burundi economy is one fifth the size of the South Sudan non-oil economy, these illustrative freight volumes may be much too low for the \$10 billion economy projected for 2020. Nonetheless, a reduction from 20 to 8 US cents per ton km would represent a saving in freight costs of about \$360 million a year at this very conservative estimate of the level of freight imports for 2020.²² It is the prospect of achieving these types of savings in freight costs that makes the large proposed investment in the trunk network of the country attractive. It offers a substantial improvement in the costs of doing business in South Sudan that will also benefit small farmers through reduced costs for fertilizers and other key inputs, as well as cheaper access to local and regional markets.

4.3.4 Business Opportunities that Flow from the Program

As noted earlier, full implementation of the proposed IAP will involve expenditures in the range of \$13.8 billion (at 2010 constant prices and exchange rate) during 2011-2020. Given the size and importance of the program, a significant number of business opportunities will emerge. The fundamental issue then is the extent to which the domestic business community and labor market will benefit from these opportunities and the extent to which the benefits will accrue primarily to offshore suppliers of these goods and services. The position taken in this Report is that Government, with the support of the donor community, will need to take early action on the design and implementation of complementary programs of support for local business. The types of programs that will need to be considered are discussed later in this Chapter.

Table 4.5 provides a very rough estimate of the composition of the proposed \$13.78 billion of development expenditures. About \$4.75 billion will be spent on labor services and \$5.81 billion on construction and other materials; about \$3.22 billion of equipment will also be required for the program. In addition, as Table 3.3 indicates, the required level of spending on routine and periodic maintenance to keep the infrastructure assets in good working order is estimated at about \$2.57 billion (also at 2010 constant prices and exchange rate) in the decade ahead.²³ Thus, the proposed IAP will generate about \$16.35 billion of spending on development and maintenance during 2011-2020, about \$5.60 billion of which will be for labor services, \$7.53 billion will be for materials and spare parts, and \$3.22 billion will be for capital equipment.

Table 4.5: Composition of Sectoral Expenditures by Type of Expenditure, 2011-2020
(\$ millions at 2010 constant prices and exchange rate)

Sector	Capacity building & technical services		Capital expenditures			Total expenditures			
	Technical services	Goods & equipment	Materials	Services	Equipment	Services	Materials	Equipment	Total
Infrastructure general	58.1	24.9	15.8	10.5	8.8	68.6	15.8	33.7	118.1
Land & water resource management	21.9	9.4	380.8	253.9	211.6	275.8	385.5	216.3	877.6

²² The basis for this indicative estimate is as follows: assuming the current cost of freight from Mombasa to Juba is \$260 per ton based on about 20 US cents per ton km, a reduction in freight rates from 20 to 8 US cents per ton km reduces the total freight cost to about \$105 per ton. As a result, the total cost of transporting 2.5 million tons of imports declines from \$625 million to about \$265 million – a reduction of some \$360 million a year.

²³ About one-third of these maintenance expenditures would be for labor services (\$850 million), with most of the remaining \$1.72 billion used for spare parts and supplies.

²¹ See African Development Bank (2009), An Infrastructure Action Plan for Burundi: Accelerating Regional Integration. African Development Bank, Tunis, September, 2009.

Sector	Capacity building & technical services		Capital expenditures			Total expenditures			
	Technical services	Goods & equipment	Civil works		Equipment	Services	Materials	Equipment	Total
			Materials	Services					
Irrigation	10.9	4.7	458.8	305.9	254.9	316.7	461.1	257.2	1035.0
Water supply and sanitation	108.8	46.6	535.7	625.0	625.0	733.8	559.0	648.3	1941.1
Electric power	42.9	18.4	797.1	455.5	1024.8	498.4	806.3	1034.0	2338.7
Roads	58.0	24.8	3090.7	2472.5	618.1	2530.5	3103.1	630.6	6264.2
River transport and ports	9.8	4.2	15.9	15.9	21.1	25.7	18.0	23.2	66.9
Civil aviation	9.2	4.0	83.6	56.4	68.9	65.6	85.5	70.9	222.1
Railways	7.4	3.2	7.7	7.7	61.3	15.1	9.3	62.9	87.2
Communications	26.7	11.4	463.2	257.3	308.8	284.0	468.9	314.5	1067.4
Total	353.7	151.6	5849.1	4460.5	3203.3	4814.2	5912.4	3291.5	14018.2

Source: Table 3.9, Table 3.10 and Table 3.11 and estimates by authors.

Materials for civil works. The civil works component of the infrastructure program is estimated to be about \$10.14 billion (at 2010 constant prices and exchange rate), largely because of the substantial program of road works for the decade ahead. Expenditures on materials are estimated at about \$5.74 billion for the decade as a whole. The latter represents an important opportunity for development of domestic business opportunities for the supply of construction materials such as quarried materials for roads and other construction, cement, asphalt, rebars, lumber, a wide range of fixtures for buildings, and other materials. More work is needed to assess these opportunities and to promote the development of domestic suppliers at costs that are competitive with imports. The discussion in the next section addresses some of these basic issues.

Capital equipment. The simple assumption here is that there is little or no domestic capacity for supply of capital equipment required for the IAP. In this case, total imports of capital equipment for the infrastructure program will be in the range of \$3 billion during 2011-2020.

Labor services. Labor services for the proposed program are estimated at \$4.75 billion for the decade as a whole. These include technical services for capacity building and related activities (estimated at about \$350 million), and labor for construction activities (estimated at \$4.4 billion). In the case of capacity building and technical services (for studies, transaction advisory teams for PPPs, etc), the estimated outlay of some \$354 million translates into an average of about 120 person years of advisory services per year during 2011-2020.²⁵ Given the nature of the work, almost all of these services will come from consultants and advisers with extensive international experience. Nonetheless, there will be need to promote opportunities for joint ventures between international providers of these types of services and local business interests.

In the case of labor services for construction activities, a wide range of skills will be required, including large amounts of unskilled labor in road works, as well as substantial semi-skilled and skilled labor in all sectors. A large portion of the semi-skilled and skilled labor will be

in the area of trade skills such as surveyors, electricians, heavy equipment operators, plumbers, welders and so on. More work is needed on issues related to the extent to which labor intensive methods will be used for road construction and other activities and on the likely numbers of skilled and semi-skilled workers that may be needed for such a program. Key policy issues for development of skills in the labor force include actions to be taken to train electricians, equipment operators, and other trade skills within South Sudan. Lack of action on these issues will mean that a large portion of these skill requirements will be imported, with South Sudan supplying only the unskilled labor.

4.3.5 Promoting a Strong Domestic Supply Response

A number of initiatives can be taken to promote business opportunities for domestic firms and entrepreneurs. These actions include: (i) improvements in the business environment and information about business opportunities that flow from the proposed program; (ii) programs to ensure that small and medium business entities in South Sudan are able to benefit from the program; (iii) measures needed to promote the development of technical skills in the labor market; and (iv) development of contracting arrangements for domestic supply of goods and services for the program.

Improving the business environment. As the discussion in Chapter 1 indicates, the country currently has limited capacity for providing institutional support to the domestic business community. The recent report on Doing Business in Juba 2011 (IFC, 2011) indicates that Juba ranked 159th out of 183 economies on the ease of doing business. The report indicates that a number of fundamental laws and institutions are still missing. In addition, there is a need to clarify existing laws, streamline existing procedures and

improve the efficiency of existing institutions. According to the survey, the cost of business start-up and operation in Juba is high. For starting a business and registering a property, entrepreneurs must pay high fees to different state and local authorities. For dealing with construction permits, since few entrepreneurs have access to water pipes and power cuts are frequent, entrepreneurs must drill boreholes and buy expensive generators to secure their water and electricity.

The National Government, state governments and counties (payams) can identify key areas for improvement and take specific action to address these bottlenecks.²⁶ The Government of South Sudan can follow a path that is similar to that of these other successful reformers in Sub-Saharan Africa (e.g., Ghana, Mali, Mozambique, and Rwanda); the latter usually have a long-term agenda and push forward continuously. Their programs typically include all relevant stakeholders in the process, set specific goals, institutionalize the reform effort, and regularly monitor progress. The benefits can be substantial. Business reforms expand the reach of regulation by bringing firms and employees into the formal sector. Businesses pay taxes. Products are subject to quality standards; and in addition, formal firms have greater access to bank credit to fund expansions and courts to resolve disputes.

Support for small and medium business. A range of initiatives can be taken to promote and development of small and medium business entities in the country. A widely used approach in other developing countries relies on the use of a network of business development centers (BDCs) throughout the country. The programs of these centers typically include training and support for small and medium entities to bid on and implement construction and or maintenance contracts. Such training programs include preparation of tender documents, support for preparing applications to the banking sector for working capital loans, arrangements for lease of equipment, and bookkeeping and record keeping.

Box 4.1: Support for Small and Medium Business by UNOPS

The United Nations Office for Project Services (UNOPS) works closely with Government and state employees at all levels, sharing project implementation experience and technical knowledge to build capacity for future development. The program supports local contractors and laborers by providing training in international procurement standards, by repackaging tenders into smaller units and by offering onsite technical support, including for example, onsite training programs in road maintenance. It helps local contractors by assisting with the preparation of bids. UNOPS procurement officers break tenders down into small packages to give experience to a larger number of construction companies of all sizes where possible and suitable. It ensures building designs are based on local materials and expertise while maintaining international standards for safety. It is also working to build the capacity of a number of Government ministries, through direct training and close partnership during implementation. Source: www.UNOPS.org.

²⁴ As Table 4.5 indicates, specific assumptions have been made about the proportion of capital expenditures in each sector are used for civil works and capital equipment. The assumptions about the split between these two types of expenditures vary among the sectors. There is a lot of civil works in road construction, whereas in the power sector the share of capital equipment is typically much larger.

²⁵ The assumed fully-loaded average cost for international consultants with extensive experience is assumed to be \$300,000 a year.

²⁶ The IFC report indicates that 27 of 46 Sub-Saharan economies have implemented reforms aimed at improving their business environments. Rwanda was identified as one of the top improvers globally. Since 2005 Rwanda has implemented 22 business regulation reforms in areas measured by the Doing Business surveys of the IFC. Other countries such as Ghana and Mali have initiated similar programs.

Improving the supply of technical skills for the labor market. As the preceding discussion indicates, the proposed Infrastructure Action Plan will generate a large demand for a wide range of skilled and semi-skilled workers, as well as creating job opportunities for large numbers of unskilled workers. Equipment operators will be required in the construction industry, for example, along with electricians, welders, mechanics, and others. The key policy issues here will be the manner in which these people are trained, by whom and at what cost. In the case of equipment operators, it is not unusual for the successful contractor to assume responsibility for hiring and training the personnel required. To meet the demand for skilled trades people such as electricians, surveyors, welders, the issue is the extent to which South Sudan can build accredited training institutions whose programs meet specific standards that are consistent with international practice. Closely related to these concerns is the actual accreditation of those training institutions whose programs conform to agreed standards for the industry. In the absence of agreed standards and an accreditation process, donor support for such capacity building may be considered. In the event that the development of these domestic capacities is slow, consideration might be given to support by donors for skills training of South Sudanese at appropriate qualified institutions in neighboring countries.

Procurement policies and programs for the domestic market. A range of initiatives can be taken to ensure that a reasonable share of the infrastructure-related procurement by government, donors and private investors is awarded to qualified domestic suppliers of goods and services. Procurement policies for various parts of the infrastructure program will need to address the following types of issues: (i) the choice of standards for civil works and goods and materials; (ii) to what extent can local materials be used and do their technical specifications comply with contract requirements; (iii) the number, size and type of contracts to be tendered and the extent to which locally bid contracts will be geared to contractor capacities within the domestic market. A key issue going forward is the extent to which domestic suppliers of materials will be able to meet specific product standards required for these programs. If it doesn't already exist, South Sudan will need to develop a uniform set of internationally accepted standards for domestic production of construction materials. Without these types of standards, there is strong prospect for the award of contracts external contractors for supply of materials that can comply with specifications in procurement notices.

Further work is needed on these types of issues to develop a clear set of policies for procurement. Early consideration could, for example, be given to awarding maintenance contracts to qualified local firms in various infrastructure sectors, initially for a year or less. As capacities of these

firms increase, consideration could be given to the competitive award of multi-year or so-called "period" contracts for routine maintenance. Such contracts might start at say, \$100,000 a year. The size of such contracts could be increased, consistent with the further growth of local capacities. Longer-term contracts that are implemented according to standards required can help reduce the cost of asset maintenance, and will also permit contractors to purchase necessary equipment and meet the costs of staff training. These types of techniques were used with great success in a number of countries in East Asia several decades ago to build small domestic firms into major construction companies that were able to compete effectively with international suppliers of such services.

4.4 Risks and Uncertainties: Alternate Scenarios for the Decade Ahead

4.4.1 Review of Major Risks and Uncertainties

This Report calls for the design and implementation of a major program of infrastructure development in the decade ahead. It does so in the full knowledge that there are many possible outcomes for growth and development in South Sudan in this period and beyond. The wide range of risks and uncertainties include major political risks such as deterioration in internal security in the country and or civil disturbances in neighboring countries that affect conditions in South Sudan and its attractiveness as a destination for foreign investment or require deployment of financial resources from development programs to increased spending on security. There are also risks that stem from the international environment, including sharply higher food and raw material prices, or weak growth international demand for the types of agricultural products and other raw materials that are potential exports from South Sudan. The financing capacities of the National Government could also be adversely affected by a weakening oil prices in the decade ahead, or lower than estimated levels of oil production. Yet another set of issues relates to the extent to which South Sudan will be able to use the waters of the Nile Basin for development of its very large potential for irrigated agriculture and the hydropower potential of particular sites on the White Nile that are located in South Sudan. Development of this potential will require some form of agreement with the other nine Nile Basin riparian states.

For the purposes of this Report, the risks and uncertainties of greatest interest at this stage relate to the design, funding and implementation of the proposed Infrastructure Action Plan. It is therefore assumed that internal security in South Sudan continues to improve and that there is social and political stability for the decade ahead and

that the Government continues to adhere to sound macroeconomic policies. It is also assumed that there are no new oil finds that affect production in the decade ahead, and no assumptions are made about the very real possibility that improved oil recovery (IOR) may boost production from existing fields within the decade ahead.

Table 4.6: Aggregate Non-oil Fixed Investment During 2011-2020 for Each Growth Scenario
(In \$ billions at 2010 constant prices and exchange rate)

Scenario Description	Total non-oil investment			Infrastructure investment			Infrastructure % of total		
	Public	Private	Total	Public	Private	Total	Public	Private	Total
A High Growth Scenario (RoSS receives 80% of oil income)	14.2	10.6	24.8	10.0	2.5	12.5	70.4	23.7	50.4
Alternative Outcomes for Net Oil Income									
B RoSS receives 96% of oil income	14.2	10.6	24.8	10.0	2.5	12.5	70.4	23.7	50.4
C RoSS receives 69% of oil income	14.2	10.6	24.8	10.0	2.5	12.5	70.4	23.7	50.4
Alternative Outcomes for Private Investment									
D Private infrastructure investment 50% of Scenario A	14.2	9.4	23.6	10.0	1.3	11.3	70.4	13.7	47.8
E Same as D, but increase public investment to offset cut in private	15.4	9.4	24.8	11.2	1.3	12.5	72.8	13.7	50.4
F Total private investment 50% of Scenario A	14.2	5.7	23.6	10.0	1.3	11.3	70.4	13.7	47.8
Alternative Outcomes for Total Investment									
G Total investment 75% of Scenario A	10.8	8.1	18.8	7.6	1.3	8.9	70.2	15.9	47.0
H Total investment 50% of Scenario A	7.6	5.7	13.3	5.3	1.3	6.5	68.8	22.7	49.2

Source: Annex Tables 4.9 through 4.16.

Table 4.6 provides a summary of eight possible scenarios for investment and economic growth in South Sudan in the decade ahead. Scenario A is the High Growth Case discussed earlier in this Chapter. In this scenario, the Government's share of oil revenues is 80% of total net income and the full Infrastructure Action Plan (IAP), as proposed in this Report, is implemented during 2011-2020. As discussed elsewhere in this Chapter, the scenario is built on the assumption that the vision articulated in the SSDP will be realized over the medium- and long-term. South Sudan makes steady progress in the next five years in building the enabling environment for broad-based private investment and in providing the internal security that is required for sustained strong development.

For the purposes of this Report, the economic impact of two alternative scenarios for the level of net oil income received by South Sudan have been examined (Scenarios B and C in Table 4.6), along with five alternative scenarios for the level of fixed investment and its distribution between the public and private sectors (Scenarios D, E, F, G and H in Table 4.6).

4.4.2 Uncertainties about the Level of Net Oil Income for Sudan

At the time that this Report was drafted, there was no agreement between the Republic of South Sudan and the Republic of Sudan on the arrangements for sharing income from oil fields currently in production. Annex 5 sets out a range of possible outcomes to illustrate the effect of various sharing arrangements on the net oil income of South Sudan. In the High Growth Case (Scenario A) discussed earlier in this Chapter it is assumed that South Sudan receives 80% of the net oil income, as per the assumptions set out in Annex 5. As Table 4.3 above indicates, with full implementation of the proposed IAP,

the overall national budget balance turns from surplus in 2019 to a small deficit. As Table 4.7 indicates, for 2011-2020 as a whole the cumulative budget surplus is projected to be \$6.1 billion under the High Growth Case (Scenario A). Allocation of this surplus to a wealth fund, while at the same time closing the infrastructure gap of the country, would represent a significant achievement.

The following two alternative scenarios for net oil income and the overall balance of the national budget have been included in Table 4.7:

- In Scenario B, it is assumed that the National Government receives 96% on the net oil income, with 2% going to the oil producing states and the remaining 2% to the Republic of Sudan. With full implementation of the IAP, the cumulative national budget surplus is projected to be \$12.6 billion during 2011-2020 – a substantially larger build-up in the proposed wealth fund of the country than projected in Scenario A, for example.
- In Scenario C, it is assumed that the National Government receives only 69% of the net oil income, with 2% going to the oil producing states and 29% going to the Republic of Sudan. Again, with full implementation of the IAP, the overall balance of the national budget shrinks to \$1.7 billion for the period 2011-2020. By the latter part of the decade, full implementation of the IAP results in a very large overall deficit in the national budget that may be difficult to finance. In this scenario, therefore, it is very likely that the IAP would have to be scaled back quite substantially. In all likelihood, the proposed roads program would have to be implemented over a much longer period of time and the ability of the country to meet growing demand for electric power from a national grid may also be in doubt.

Table 4.7: Summary of Alternative Growth Scenarios for 2011-2020
(\$ at 2010 constant prices and exchange rate)

Scenario	Description	Non-oil investment average 2011-20 (% of non-oil GDP)	Net oil income total 2011-20 (\$ billion)	Non-oil GDP 2011-20 (% p.a.)	Gov't budget surplus total 2011-20 (\$ billion)	Non-oil GDP per capita 2020 (\$)
A	High Growth Scenario (RoSS receives 80% of oil income)	32.5	35.6	6.8	2.8	728
Alternative Outcomes for Net Oil Income						
B	RoSS receives 96% of oil income	32.5	42.0	6.8	9.2	728

Scenario	Description	Non-oil investment average 2011-20 (% of non-oil GDP)	Net oil income total 2011-20 (\$ billion)	Non-oil GDP 2011-20 (% p.a.)	Gov't budget surplus total 2011-20 (\$ billion)	Non-oil GDP per capita 2020 (\$)
C	RoSS receives 69% of oil income	32.5	31.1	6.8	-1.6	728
Alternative Outcomes for Private Investment						
D	Private infrastructure investment 50% of Scenario A	31.4	35.6	6.5	2.8	709
E	Same as D, but increase public investment to offset cut in private	32.5	35.6	6.8	1.6	728
F	Total private investment 50% of Scenario A	27.8	35.6	5.6	2.8	655
Alternative Outcomes for Total Investment						
G	Total investment 75% of Scenario A	26.9	35.6	5.3	5.6	636
H	Total investment 50% of Scenario A	19.3	35.6	4.9	8.1	611

Source: Annex Tables 4.9 through 4.16.

4.4.3 Uncertainties about Availability of Funding

Successful mobilization of the funding required for the IAP will require a strong partnership involving the National Government, the international donor community and the private sector. During 2008-2010, the Government, donor community and the private sector spent a total of \$1.24 billion on the rehabilitation and development of the infrastructure assets in South Sudan and on related capacity building and technical support. The average level of spending on these activities in this three-year period was about \$415 million a year. The National Government accounted for 65% of these outlays, the donor community funded 22%, and the private sector accounted for the remaining 13% (Annex 3). Actual disbursements by donors were 71% of the amount budgeted in those three years. And actual disbursements by donors for the infrastructure program were 22% of the total development assistance program (excluding humanitarian assistance) of donors during 2008-2010 (Table 2.12).

As indicated earlier, implementation of the Action Plan requires a total of \$13.8 billion for the ten-year program. The proposed annual levels of spending are substantially larger than during 2008-2010. The program calls for mobilization

of \$7.13 billion of funding from the resources of the Government of South Sudan (52% of the total required), an allocation of \$3.75 billion to the IAP by the international donor community (27% of the total requirements), and mobilization of \$2.9 billion of investment capital in the private sector (equal to 21% of the total required). There are major uncertainties about the availability of the financing on this scale from these three sources.

Availability of donor funding. During 2008-2011, ODA allocations for basic infrastructure were about 22% of total development assistance. For the purposes of this Report, it is assumed that allocations for basic infrastructure would account for 25% of total development assistance during 2011-2020. Allocations for infrastructure are therefore projected to rise from about \$185 million in 2010 to about \$525 million a year by 2020. Given the preferences of bilateral donors for this type of assistance, it is assumed that a substantial portion of this support would go to urban and rural water supply and sanitation, development of rural and feeder road networks, and irrigation programs that raise productivity and incomes of small-scale farmers. The multilateral financial institutions such as African Development Bank and the World Bank, on the other hand, may play a substantial role in supporting the development of Sudan's infrastructure connections with other countries in the region.

A basic assumption used in this Report is that allocations of ODA to South Sudan will rise steadily in the decade ahead from \$104 per capita in 2010 to about \$140 per capita by 2020. This translates into a total allocation of \$14.5 billion for development assistance in the decade ahead for the High Growth Case. It is possible that the international donor community may not be able to expand resource allocation by this amount. Reasons for smaller allocations may vary. Donors may have difficulty in justifying an increasingly large allocation per capita for South Sudan, especially if implementation performance of aid-supported programs is slow to develop. Alternately, donors may choose to reduce their allocation to basic infrastructure in favor of increased support for say health and education programs. In the event that donors keep their per capita allocation of development assistance at \$100 for the decade ahead, the total amount of development assistance will amount to \$11.9 billion. Assuming the allocation for infrastructure remained at 25% of total development assistance, donor support for infrastructure will be reduced by \$650 million in the decade ahead. This will require the national government to fund a somewhat larger share of the public investment program for infrastructure, or defer some investments.

Mobilization of private investment. The current amount of private investment in basic infrastructure assets in the country is very modest and is estimated to be in the range of \$200 million. It is concentrated in communications and private diesel generation plants for electricity supply in state capitals. The High Growth Scenario used in this Report proposes that about \$2.9 billion of new private investment should be mobilized in the decade for investment in basic infrastructure assets and that \$600 million of private investment is mobilized for development of irrigation services for commercial farming operations. The expected areas that will be attractive to private investors will be power generation, inland water transport, airport concessions, communications and water storage and irrigation for large-scale commercial agriculture. Under the assumption that the overall debt: equity ratio for this private investment is a conservative 70:30, the implication is that potential investors would aim to mobilize about \$1 billion of equity funding and \$2.5 billion of debt financing from their internal resources or from international financial markets. As the discussion in Chapter 3 indicates, successful mobilization of this amount of commercial debt may require the involvement of government guarantees or other enhancements that would address potential investor concerns about risk sharing arrangements.

The underlying assumption in the High Growth Case (Scenario A) is that the Government will make a concerted

effort in the near- and medium-term to improve the operating environment for private investment. In that connection, the Government will need to address a number of potential concerns of private investors in advance of its launch of a major international program of investment promotion. In that connection, it will be useful to make a clear distinction among the various types of private investments that are to be mobilized. These include the following: (i) investments that would be undertaken under some type of PPP arrangement, such as investment in power generation under take-or-pay contracts with a government entity for the supply of electric power to a national or local grid; (ii) concession agreements in which the government retains ownership of the basic infrastructure and awards one or more concessions to private investors for the operation of these assets and provision of related services (e.g., concessions for operation of airports, river ports, and railway services); and (iii) investments in infrastructure assets that would be used directly by the investor for the manufacture of a product (e.g., investment in irrigation for commercial agriculture), or provision of a service (e.g., telecommunications services from a national grid developed by one or more private investors).

In each of these cases, private investors will have a range of concerns that will need to be addressed by the government. To mobilize some \$3.5 billion of private investment for basic infrastructure and irrigation, the government will need to develop effective capacities to address concerns of potential investors in a timely manner. An inability to address such concerns may result in potential investors shifting their attention to other countries where the risk-reward relationship is more attractive. There is typically a wide of concerns that potential investors will have in assessing the risk-reward framework for a country such as South Sudan.²⁷ These range from concerns about force majeure to political risks (such as changes in the regulatory environment), environmental risks and the current status of environmental laws and regulations in South Sudan, currency exchange risks especially in those cases where substantial amounts of debt financing are used and are denominated in a currency other than that of the bulk of the revenues generated under the project, and social risks where a project may have important impacts on local communities. Unsatisfactory arrangements regarding land tenure or use of local water resources, for example, can lead to significant local opposition to a project that may in turn result in delays in project completion, increased completion costs, or even undermine project viability.

Apart from building capacities within Government to address these types of investor concerns, the Government will also need to give close attention to other aspects

of the operating environment for private investment. Investors will be concerned about the adequacy of the legal framework for PPP-type investments (such as take-or-pay contracts in power, and concession agreements for civil aviation, railways or river transport and ports) and about the extent to which there is clarity in the regulatory framework. As noted in Chapter 3, development of the regulatory framework is at a rather rudimentary stage at this time; much of what is required is not yet in place. Successful mobilization of these private funds will also depend on early progress on these institutional arrangements and the development of financially viable public entities that will enter into these partnerships.

Delays in addressing these types of concerns may result in potential private investors deferring decisions about particular investment proposals. Table 4.7 includes three different scenarios in which the proposed level of private investment is not realized because of uncertainties about the operating environment or about the risk-reward characteristics of particular projects. These three alternative scenarios are as follows:

- In Scenario D, the government is unable to mobilize the proposed \$2.9 billion of private investment for the infrastructure program and the \$600 million for commercial irrigation because of uncertainties about the environment and the quality of projects available. In this scenario it is assumed that only half of the required amount is mobilized (that is, about \$1.75 billion). It is further assumed that the unfunded projects, primarily in the power, telecommunications and water supply and sanitation sectors, are postponed. This results in a somewhat slower expansion infrastructure related services, and with a lower level of investment somewhat slower growth. As Table 4.7 indicates, the average growth rate for non-oil GDP during 2011-2020 drops from about 7% a year in the High Growth Scenario A to 6.5% a year.
- In Scenario E, it is assumed that the national government steps in and funds the \$1.75 billion shortfall in private investment in basic infrastructure. As a result, the non-oil GDP growth rate remains at an average of about 7% for the decade as a whole; but with a higher level of government spending the cumulative budget surplus for 2011-2020 declines from \$6.1 billion to \$4.4 billion. This scenario underscores the fact that there may be a trade-off between building the wealth fund and building basic infrastructure for the country.
- In Scenario F it is assumed that the obstacles to mobilization of private investment are more severe

than in Scenarios D and E above. In this case, the overall level of private investment in the economy, and not just in infrastructure, is only 50% of what is assumed in the High Growth Case (Scenario A). In this case, the government does not step in to offset the weak private investment response. As a result, the average investment rate in the economy declines to about 27% of non-oil GDP, compared with 32% in Scenario A, and the non-oil GDP growth rate drops to an average of 5.7% a year for 2011-2020 as a whole.

The key point about these alternative scenarios for private investment is that in the event that private investment is not forthcoming, the Government faces difficult decisions about the allocation of its own financial resources or those of the international donor community, among competing demands for infrastructure development and whether to draw down the resources of the wealth fund to compensate for the weak private investment response.

4.4.3 Slow Development of Implementation Capacities

The final outcome for the decade ahead will also be shaped by the extent to which there is a rapid build-up in implementation capacities for civil works programs and related installation of capital equipment. Efforts to improve implementation capacities will center on developing the required skills in the labor force, or importing these skills required, and on the development of key domestic industries, including fabrication of goods and equipment, construction activities, transport and communications. Strategies for developing these domestic capacities are discussed earlier in this Chapter and in Chapters 2 and 3. The underlying assumption in the High Growth Case (Scenario A) is that with the help of the international donor community, the Government continues to make steady progress in building effective internal capacities for the implementation of development programs in general.

Scenarios G and H in Table 4.7 above look at the impact of slower progress in building these implementation capacities in the public sector and in promoting the development of domestic business activities. The key findings in these two alternative scenarios are as follows:

- In Scenario G, it is assumed that public and private investment in the decade ahead is only 75% of that in the High Growth Case. In other words, instead of an aggregate level of investment in the economy of about \$25 billion in the decade ahead, a weak implementation

²⁷ A detailed discussion of the issues related to private investor concerns about risks is beyond the scope of this Report. For a comprehensive review of these issues in the context of PPP-type investments see, Delmon, Jeffrey (2009), *Private Sector Investment in Infrastructure: Project Finance, PPP Projects and Risk*. Kluwer Law International, The Netherlands, 2009.

and operating environment results in total investment of about \$18 billion for the decade as a whole. The result is that the average investment rate declines to about 27% of non-oil GDP and the latter grows at an average of only 5.5% a year.

- In Scenario H, it is assumed that public and private investment in the decade ahead is only 50% of that in the High Growth Case. The implication in this scenario is that the proposed IAP program of almost \$14 billion is reduced to a total of \$7 billion for the decade ahead, thereby prolonging the difficulties faced by many residents in getting access to basic services and markets at reasonable cost. In this scenario, non-oil GDP grows at an average of only 4.7% a year – the same as the labor force – and the aggregate investment rate remains at the current level of about 20% of non-oil GDP.

These two slow growth scenarios underscore the importance of early action to lay the foundations for sustained strong economic growth. In these two scenarios, non-oil GDP per capita is the same as or lower than the average of about \$535 for the period 2010-2011. With the non-oil economy growing at the same rate as the labor force, or at a rate that is only marginally higher, there is little prospect for creating productive employment for all the new entrants into the labor force and of reducing the current very high unemployment and underemployment levels. The implication is that the current high levels of poverty would continue. In these circumstances, the risk is that internal security may become a matter of concern, further compounding the difficulties associated with attracting foreign investment to the country. Moreover, with substantially lower levels of public investment, the overall budget balance rises. In Scenario H, for example, the cumulative increase is \$11.5 billion for the decade as a whole. In a setting in which there was weak economic growth and high unemployment and underemployment, the political pressures to spend the resources of the wealth fund on welfare programs for the existing population would be considerable and may be difficult to ignore.

4.4.4 Adverse Macroeconomic Impact of the Program

The importance of a stable macroeconomic environment is discussed at some length in Chapter 1 in the context of South Sudan's continuing dependence on very large inflows of financial resources from abroad, including oil revenues and development and humanitarian assistance from the international donor community. Full implementation of the IAP could add to these pressures with the proposed

large inflow of private investment capital as well. The rapid development of the non-oil economy in the decade ahead will help lessen some of the potential strains that can stem from instability in the inflow of these resources from abroad. For example, non-oil revenues in the national budget are projected to account for almost 40% of total revenues by 2020, compared with about 2% in 2010. This diversification of public revenues, along with the development of a substantial wealth fund and access to international financial markets via the issue of public bonds by the National Government, will all contribute to reducing the current high potential for instability that stems from the heavy dependence of the economy on oil revenues. Nonetheless, there is a continuing risk of upward pressures on the exchange rate as a result of the projected large inflow of these resources from abroad. Mechanisms for dealing with these pressures center on early development of a sovereign wealth fund that can compensate for boom and bust cycles in oil prices and production, in conjunction with well-coordinated management of monetary and fiscal policy. These initiatives will be essential in providing the government with the required tools for dealing with these pressures.

There is also a risk that the levels of investment spending proposed in the High Growth Case may impose other types of macroeconomic strains on the economy, including for example, shortages of skilled and semi-skilled labor that translate into inflationary wage pressures, and crowding out of private investment in areas unrelated to the proposed Infrastructure Action Plan. Given the very limited development of the domestic banking and financial market, demand for working capital loans by the construction industry, for example, may pose serious constraints on the availability for such funds for other types of business activity. There are no quick and easy answers to these types of pressures. Cost push inflation can be moderated through the use of imported labor and materials; however, the development of the domestic financial market will take time. As Chapter 1 indicates, the domestic savings rate is low and at this time, only a relatively small portion is in the form of financial assets. (Much larger amounts of domestic savings occur in the form of livestock herds, for example). The Government will need a clear plan for the development of the domestic financial market that can be a reliable and growing source of funding for the domestic business activity. The plan will need to encourage residents to hold larger shares of their savings as financial assets in the banking system. To the extent that the domestic banking system is dominated by branches of foreign banks, the South Sudanese authorities will have to ensure that these savings are not then transferred out of the country by the banks concerned for lending elsewhere. Building the capacities of the central bank for regulation and oversight

of the domestic financial market will be an essential part of a well-managed macroeconomic policy framework. To some extent, strong growth in demand for working capital

loans and investment loans from the domestic banking system can also be met with lines of credit provided by the multilateral development institutions.

Part B

Action Programs for Key Infrastructure Sectors

Chapter 5 : Lands and Water Resource
Management

Chapter 6 : Development of Agriculture
in South Sudan

Chapter 7 : Transport Services and
Infrastructure

Chapter 8 : Provision of Electric Power

Chapter 9 : Water Supply and Sanitation

Chapter 10 : Creation of Communication
Network

5 Lands and Water Resource Management

Lands and Water Resource Management

5.1 The Setting

It is clear that sustained development in South Sudan, including reduction in poverty and improved food security, depends on secure access to the substantial land and water resources of the country. Moreover, successful implementation of an ambitious infrastructure program along the lines outlined in this Report to support this growth depends on sustained progress in dealing with these basic issues related to land and water rights and access. Continued conflict over and or uncertainty about these rights will result in delays in infrastructure investment decisions and implementation and lower overall economic growth.

At the time that the CPA was signed, the Government of National Unity (GNU) and the Government of Southern Sudan (GOSS) recognized the need for development of land policy, and related legislation, institutions, and supporting services. In the subsequent period, rights of access to agricultural land for cultivation of crops and livestock production, water for irrigation, forest products, and petroleum reserves for export revenues have been contested at national, regional and local levels. Conflicts among competing groups for access to and control over land and water are common in South Sudan. The decades of war, prevalence of weapons, and numbers of people with combat experience have increased the likelihood of disputes turning violent. Establishment of an effective, integrated, socially legitimate system for resolution of disputes over land, water and other natural resources is critical to South Sudan's future. While progress has been made in addressing these problems, the reality is that issues of access to land and natural resources and security for the population continue to demand urgent and sustained attention.

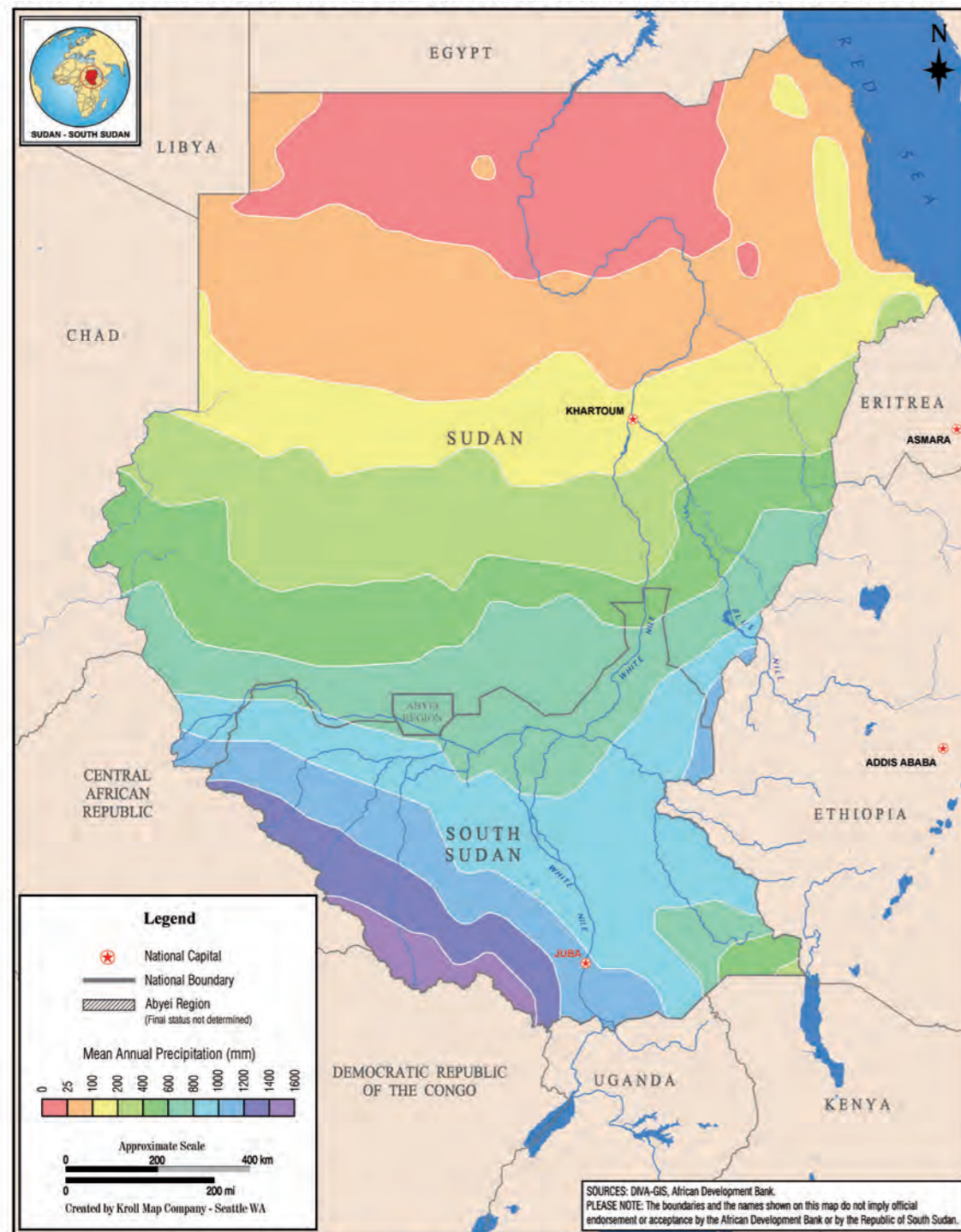
5.2 Climate and Ecological Zones

Altitudes in South Sudan range from 600 to 3,000 meters above sea level. Most of the geographical parts of the country have a sub-humid climate. Rainfall is favorable, with Western Equatoria and the highland parts of Eastern Equatoria receiving 1,200 to 2,200 mm of rainfall annually. The lowland areas of Eastern Equatoria, Jonglei, Upper Nile and Bahr el Ghazal receive between 700 and 1,300 mm of rainfall annually. The south-eastern tip of Eastern Equatoria receives the least rainfall, about 200 mm annually. Map 5.1 indicates the rainfall patterns for Sudan and South Sudan.

For Sudan as a whole, Harrison and Jackson (1958) described five major ecological zones based on floristic composition, rainfall and soil types.²⁸ The ecological classification now most commonly used is a modified version of the classification by Harrison and Jackson. It delineates six major divisions and a number of subdivisions. South Sudan is classified as savannah woodland (high and low rainfall), flood region, montane zone, and semi-desert. The savannah woodland is subdivided into low rainfall savannah and high rainfall savannah. Low rainfall savannah occurs mainly in the north and is only represented in the south by a small area in the northern parts of Upper Nile State. High rainfall savannah covers most of the country with the exception of the floodplain around the Nile and the montane region of Didinga and Imatong Mountains. High rainfall savannah woodland is further divided into two sub-zones – savannah woodland and savannah woodland recently derived from rainforest.

²⁸ Harrison, M. N. and J. K. Jackson (1958), Ecological Classification of Vegetation of Sudan. Bulletin No.2.1-45 Forest Department, Khartoum.

MAP 5.1: Average Annual Rainfall in South Sudan and Sudan



Temperatures are typically above 25°C and can rise above 35°C, particularly during the dry season, which lasts from January to April. For pastoralists, the hot, dry conditions trigger seasonal human and livestock migration to more permanent water sources, which serve as dry season grazing pasture. It also reflects on the escalation of conflicts among the pastoralists in search for water. For some ethnic groups, such as the Dinka, they also serve as fishing grounds. At the onset of the main rains (April

to June), people and cattle return to upland wet areas. Seasonal movements are less pronounced in the more agricultural areas such as the Hills and Mountains Zone and are almost non-existent in the exclusively agricultural Greenbelt Zone. These two zones have two rainy seasons, April to July and August to December. However, there is evidence that points to a decline in rainfall as a result of climate change.²⁹

29 This brief outline of climatic conditions draws on information provided in Southern Sudan Livelihood Profile of 2006. See Southern Sudan Centre for Census, Statistics, and Evaluation (2006), "Southern Sudan Livelihood Profiles." Written in collaboration with Save the Children UK and USAID Famine Early Warning Systems Network, draft, January 2006.

5.3 Land Resources of South Sudan

South Sudan is in the midst of a transition from decades of civil war to a peaceful country. Land tenure and property rights issues could undermine that transition by hampering a productive agricultural sector and long-term economic growth. In 2010, USAID reported that rural people contest the right of the GOSS to hold and manage land in trust on their behalf, claiming that land "belongs to the people."³⁰ Ongoing conflicts, many violent, erupt among pastoralists and between pastoralists and farmers. Customary claims to land in peri-urban areas are routinely ignored, fueling conflict. Laws and state institutions for land administration and conflict mediation are weak, and there is confusion over which laws take precedent – statutory or customary?

5.3.1 Land Tenure and Ownership

Customary law has governed the use of land in the country for centuries, with each ethnic group applying its own laws relating to land and land rights within its own geographical setting.³¹ With the imposition of foreign rule over Sudan more than a century ago, various attempts were made to change this regime. The first serious attempt to control customary land was by the Anglo-Egyptian regime through the Land Ordinance of 1906. This made all land in Sudan the property of the government. In practice, however, land in South Sudan remained under the control of communities through the practices of customary laws and principles. In the post-independence period, the Unregistered Land Act of 1970 provided that any land not registered in accordance with the 1925 Land Settlement and Registration Ordinance was considered to belong to the Government of Sudan. Although the law was opposed and challenged by most communities in Southern Sudan, the government used it for the diversion of water through the construction of the Jonglei Canal and oil prospecting projects. This unilateral decision to exploit the natural resources of the South, with scant attention to human security, land rights and livelihoods, contributed to the outbreak of conflict in 1983. On the whole, land laws enacted by governments in Khartoum throughout the colonial and post-colonial periods have not seriously affected the customary land tenure system in South Sudan. During peace negotiations in Machakos and Naivasha, land was the main point of contention between the Government of Sudan and the SPLM. The result was the

insertion of the concept of "Land belongs to the people" in the CPA and inclusion in the Interim Constitution of Sudan and Interim Constitution of Southern Sudan.

The CPA provided for the creation of the Southern Sudan Land Commission (SSLC), which came into existence in 2006. Its first major responsibility was the drafting of a new land law for Southern Sudan. The Land Act was promulgated in 2009; its main features are as follows:

- All land is owned by the people of South Sudan, and the Government of South Sudan is responsible for regulating use of the land.
- The Act provides for registration of land in South Sudan; all land, whether held individually or collectively, shall be registered and title granted.
- Public land is land owned collectively by the people of South Sudan and held in trust by the Government of South Sudan. Public land includes land used by government offices, roads, rivers and lakes for which no customary ownership is established, and land acquired for public use or investment.
- Community land is land held, managed, or used by communities based on ethnicity, residence, or interest. Community land can include land registered in the name of a community, land transferred to a specific community, and land held, managed, or used by a community.
- Private land includes registered freehold land, leasehold land, and any other land declared by law as private land. Freehold land can be held in perpetuity and includes the right to transfer and dispose of the land. Leaseholds can be obtained for customary and freehold land. Leases can be granted for periods of 99 years or less. Leases of more than 105 hectares of customary land must be approved by two local government bodies.
- The Land Act outlines a decentralized plan for land administration with County Land Authorities and Payam Land Councils.
- Foreigners cannot own land in South Sudan, but can lease land for periods up to 99 years. For agricultural investments, leases are up to 30 years and are renewable; for forestry purposes, land can be leased for up to 60 years and are renewable. Prior to the grant of a lease, a consultation with affected communities is required as is an environmental impact assessment.

30 USAID (2010), "Land Tenure and Property Rights: Sudan." www.usaid.com, USAID Program Brief, January 2010.

31 See Bior et al. (2006), Land Tenure Study in Southern Sudan. Summary Report, Nairobi. February 2006; and USAID (2010), Scoping Paper: Land Tenure and Property Rights in Southern Sudan. United States Agency for International Development, Washington DC, December 2010.

5.3.2 Institutional Responsibilities for Land Resources

The SSLC is responsible for establishing land policy within South Sudan, enforcing land law, resolving land disputes, assessing compensation for land acquisitions, studying and recording land-use practices in areas where natural resources development occurs, and conducting hearings and formulating rules of procedure. A land registry has been established in the Ministry of Housing and Physical Planning with coordinated registries maintained at the state level. Other institutions developing new land administration systems and laws include the Ministry of Legal Affairs and Constitutional Development and the Land Policy Steering Committee, which includes representatives from 13 ministries, commissions and boards. The Ministry of Agriculture and Forestry (MAF), which was formed in October 2005, is responsible for policy guidance, planning, assessment, resource allocation, regulation, and oversight of agricultural and forest land. At the state level, the Ministries of Agriculture, Animal Resources, and Irrigation (MAARIs) were instituted with a wide sectoral mandate and with the counties holding responsibility for implementation. These newly formed institutions have been slow to develop. In many cases, the new institutions lack clear mandates, regulatory frameworks, necessary levels of funding, and the human capacity to operate effectively.

The SSLC is now working on implementation of the Land Act, as the Government of South Sudan aims to develop, distribute and implement a land policy and related legislation and regulations by 2013. One of the major challenges is to develop policies that would resolve differences among various interests in land at both the horizontal and vertical levels of governments and communities in South Sudan. This involves development of a land policy and the central and local institutions necessary to govern and administer land rights. Consultations were undertaken during 2010 in all 10 states of Southern Sudan.³² A draft land policy was then prepared and has been available since February 2011. Key elements of the draft land policy are as follows:

- Resettlement of returning refugees and IDPs.
- Measures required strengthening the rights of women to land and property.
- Opportunities for potential commercial investment in land, including development of oil and other natural

resources.

- The need to set aside land for the development of infrastructure, public projects, and urban areas.
- The need to address conflicts over competing claims to land and other natural resources.

Once these land policy issues are finalized and adopted, the Government expects to revise the Land Act to ensure consistency with the land policy.

5.3.3 Land Use in South Sudan

The total area of the country is reported by the National Bureau of Statistics (NBS) to be 644,330 km². The waters of the White Nile and its tributaries flow down from the highlands of Uganda, DRC, the Central African Republic and Ethiopia into the low clay basin that constitutes much of South Sudan, forming the world's largest contiguous swamp.

The FAO is currently updating estimates of land use in the country.³³ This assessment gives a picture of land use patterns in the latter part of the previous decade. The results of the assessment are summarized in Table 5.1. Key findings in this update of land use are as follows:

- Only 4.3% of the land area is cultivated for production of food and agricultural raw materials. Much of this area is cultivated periodically rather than continuously. Many of the large number of subsistence farmers of the country practice some form of shifting cultivation in the absence of use of fertilizers, pesticides and herbicides. According to the World Bank, the actual area cultivated in any one year in South Sudan has ranged from a minimum of 1% to a maximum of 2% of the total land area – that is, from 0.65 million to 1.3 million hectares.³⁴
- Forest areas cover about one-third of the country with Western Bahr el Ghazal and Western Equatoria accounting for about 56% of the forest cover. Areas covered with shrubs account for about 39% of the land area, with Jonglei, Eastern Equatoria and Upper Nile accounting for about 58% of this form of land cover.
- Grasslands account for about 23% of the land cover, with Upper Nile, Jonglei, Eastern Equatoria and Unity states accounting for about two-thirds of the grasslands in the country.

- The survey finds that urban/industrial areas account for only 34,188 hectares (or 341.88 km²). With an urban population of 1.29 million in 2008 (Annex Table 1.1), this suggests an average urban population density

of 3,770 person per km². – a density that is only found in the megacities of Sub-Saharan Africa.³⁵ A portion of the low density urban areas may have been included under grassland and or land covered with shrubs.

Table 5.1: Land Use in South Sudan, circa 2007-2008
(Distribution in % by type of land cover or use)

State	Agriculture	Trees	Shrubs	Grasslands	Urban & industrial	Bare rock & soil	Water bodies	Total
Upper Nile	17.6	4.8	12.2	22.4	23.0	8.3	7.4	12.3
Jonglei	11.5	7.6	30.4	21.2	2.8	0.5	21.9	19.9
Unity	4.6	0.9	7.7	10.2	18.7	1.5	7.4	6.0
Warrap	15.7	3.0	5.6	6.4	4.1	0.7	1.7	5.3
Northern Bahr el Ghazal	8.8	7.6	2.0	3.9	3.5	1.1	19.8	4.7
Western Bahr el Ghazal	4.8	34.7	4.5	4.3	10.3	18.8	24.0	14.5
Lakes	6.7	7.5	6.8	6.3	5.2	11.5	4.3	6.9
Western Equatoria	12.4	21.1	8.3	7.0	5.1	49.5	3.8	12.4
Central Equatoria	13.8	7.6	7.2	4.2	24.6	6.4	2.6	6.9
Eastern Equatoria	4.1	5.1	15.4	14.0	2.8	1.8	7.0	11.1
South Sudan	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Memo item:								
Total area (hectares ('000)	2 760	20 742	25 032	14 522	34	159	462	63 712
Share of total (%)	4.3	32.6	39.3	22.8	0.1	0.2	0.7	100.0

Source: Annex Table 6.1.

5.3.4 Land Classification by Livelihoods in South Sudan³⁶

Livelihood patterns are determined by the agro-ecological conditions as well as the culture and traditions of the various tribes. The Livelihood Profile prepared by SSCSE in 2006 states that Southern Sudan's traditional livelihood systems are a combination of cattle rearing, crop production, fishing, wild food collection, hunting and trade. For most households in South Sudan, cattle-keeping is the fundamental basis for wealth and social status. Crop production plays an important complementary role, but is generally perceived as a less important activity more for cultural than agro-ecological reasons, especially among the Nilotic tribes (Dinka and Nuer). Access to food is highly seasonal and location-specific and in some parts of the country a majority of households move around to exploit seasonal patterns of rainfall. Mobility is crucial and food insecurity often arises where inter-tribal clashes and other conflicts constrain this mobility. The Livelihoods Profile (2006) defines seven distinct livelihood zones in Southern Sudan (see Map 5.2).

Greenbelt Zone. This zone includes Western Equatoria and parts of Central and Eastern Equatoria. It benefits from a bi-modal rainfall pattern which enables two planting seasons. The main livelihood is subsistence agriculture with the potential for surplus production. The main crops cultivated are root crops (cassava, sweet potatoes), maize, millet, groundnuts and finger millet. Poor infrastructure and related lack of access to markets are a major disincentive for farming households to increase their outputs. Despite the fact that there has been a reduction in new displacements, fear of attacks of the Lord Resistance Army continue to interrupt agricultural production in parts of Western Equatoria, in particular in Ezo, Tambura and Nagero counties and selected payams in Nzara and Yambio counties.

Hills and Mountains Zone. This zone covers parts of Jonglei, Central and Eastern Equatoria. It is characterized by reliance on agriculture and pastoralism. Reliance on casual labor and selling of charcoal, firewood, bamboos, poles and grass are common coping strategies in times of distress; for example, this was one of the areas worst affected by the 2009 drought. Most vulnerable

³² See, for example, USAID (2010), Land Policy State Consultation –Bor, Jonglei State. Washington DC. Workshop Report prepared under the USAID Sudan Property Rights Program, February 2010.

³³ FAO et al (2011), Land Cover Atlas of South Sudan. Food and Agriculture Organization, Rome, draft, 2011.

³⁴ World Bank (2007), Final Proposal for a Multi-Donor Trust Fund Grant to the Government of Southern Sudan for the Support to Agriculture and Forestry Development Project (SAFDP), Washington DC, August 2007.

³⁵ According to World Bank data, the megacities of Sub-Saharan countries have about 3,600 persons per sq. km., about 1,280 per sq. km in secondary urban areas, and about 90 persons per sq. km. in periurban areas. See Foster and Briceño-Garmendia (2010).

³⁶ The discussion in this Section draws heavily on the reports of USAID (2007) and FAO/WFP (2010).

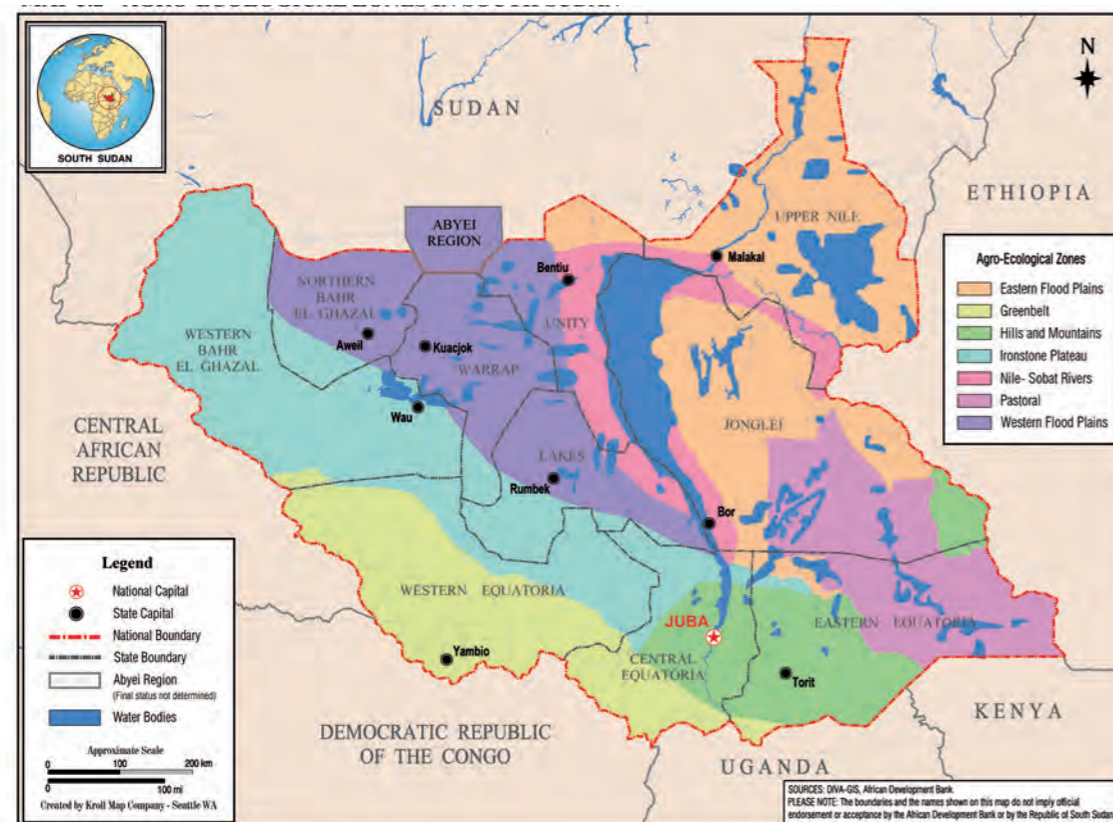
were communities in the lowlands who engage in the production of short- and long-term sorghum, while communities in the mountains who cultivate cereals, pulses and vegetables were less affected because of more favorable rain conditions at these higher altitudes. The high reliance in 2009 on the production of firewood and charcoal contributed to a further decline in woodland and forest resources around towns and in more populated areas, forcing households (mainly women) to walk longer distances to fetch firewood.

Pastoral Zone. This zone lies in the arid south-east corner of South Sudan and encompasses parts of Eastern Equatoria and Jonglei. A nearly pure form of pastoralism is common and there is almost exclusive reliance and livestock trade for food. In this zone, seasonal migration in search of water and pasture for livestock is the predominant livelihood activity. (See Map 5.3 below for the annual pastoral migration routes in South Sudan and Sudan.) The

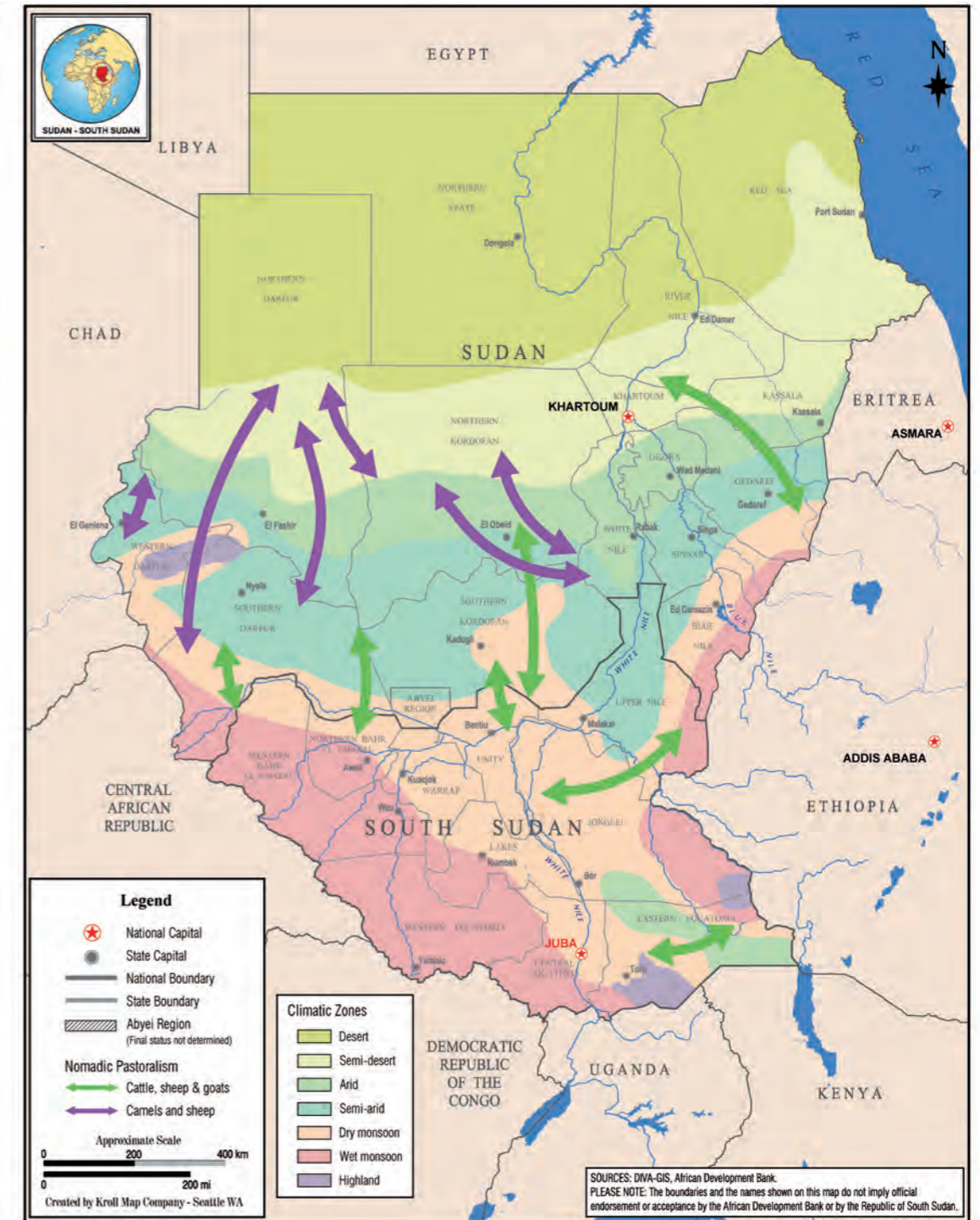
2009 drought limited pastoralists' access to pasture and water resources, forcing them to migrate long distances. There are also reports of increased artisanal gold mining in some areas in 2010 in response to the poor livestock and harvest conditions the previous year.

Ironstone Plateau Zone. This zone covers parts of Lakes, Warrap, Northern and Western el Ghazal, Western and Central Equatoria. Households in this zone are heavily dependent on crop production, mainly sorghum, groundnuts, sesame and tobacco. In some areas, honey production is also an important supplementary activity. Households in this zone are usually well-placed to access food surpluses in the neighboring Greenbelt Zone. However, despite generally improving conditions for agricultural production in the past year, Western Bahr El Ghazal is affected by poor road conditions linking Wau and Juba due to several broken bridges, which has limited trading activities with the southern states.

MAP 5.2: Agro-Ecological Zones in South Sudan



MAP 5.3: Annual Pastoral Migration Routes in South Sudan and Sudan



Nile and Sobat Rivers Zone. The Western and Eastern Plains are separated by the Nile and Sobat River Zone. Apart from crops and livestock, wild foods and fish contribute significantly to household consumption in this zone. The latter items are collected in varying quantities depending on the season and household location.

Western and Eastern Flood Plain Zones. These two zones cover Upper Nile and parts of Unity, Jonglei, Warrap, Northern Bahr el Ghazal and Lakes. The primary livelihood activity is agro-pastoralism supplemented by fishing,

wild food gathering and to some extent hunting in the Eastern Flood Plains. Livelihoods are highly dependent on changing water levels. Seasonal flooding increases the yield of pasture for livestock, fish and wild foods, but can affect agricultural production and cause displacements. Other economic activities in this region include the oil fields in Unity State and mechanized farms around Renk in Upper Nile, but benefits for the local population are generally limited to improvements of the local road infrastructure for which the 2% direct share of oil revenues is mainly used. In 2010, above normal rainfall and higher water

levels in rivers flowing from Ethiopia caused localized flooding in parts of Upper Nile, Unity, Jonglei and Northern Bahr El Ghazal resulting in destruction of crops and displacements of affected households. The situation was exacerbated by the often inadequate drainage in the newly constructed roads. Insecurity caused by inter-tribal/clan clashes prevented flood-affected households from accessing remote cropping areas on higher lands which remained flood free.

Given the current configuration of transportation infrastructure, Unity State, and to a slightly lesser degree, Upper Nile and the Northern parts of Jonglei, are almost exclusively dependent on Sudan for their market supply. Also Northern and Western Bahr el Ghazal depend largely on trade of cereals from the North.

5.4 Water Resources of South Sudan

According to the National Environmental Action Plan (NEAP), South Sudan has substantial water resources, but they are unevenly distributed across the region and vary considerably from year to year (Mohamed, 2007). The hydrologic variability, coupled with no investment in storage structures, has made South Sudan hostage to periodic floods and droughts. However, details about the supply of water available to South Sudan from internal and external sources and consumption of water by households and agricultural and industrial users, are not currently available from the FAO Aquastat database. Nonetheless, it is clear that domestic and commercial demand for water has been growing rapidly in recent years, and that trend is expected to continue, thereby placing increased pressure on water availability within the country.

5.4.1 Wetlands and Water Resources

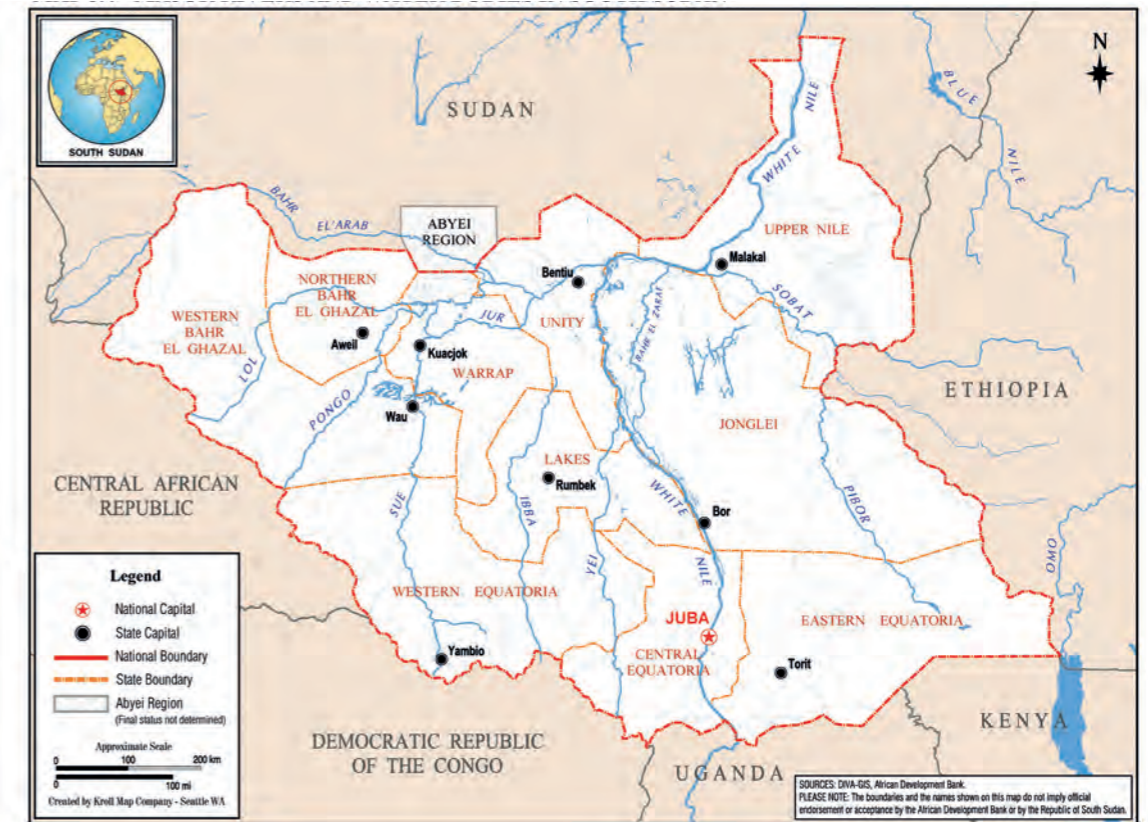
The Nile is the world's longest river of some 6,800 km. The Nile Basin is estimated to be about 3.1 million km² and includes the following 11 riparian countries: Rwanda, Burundi, Democratic Republic of the Congo (DRC), Tanzania, Kenya, Uganda, Ethiopia, Eritrea, South Sudan, Sudan and Egypt. South Sudan is located entirely within the Basin, and accounts for approximately 20% of the total area of the Basin. While the Nile and its tributaries are vital sources of water throughout the Basin, dependence of these countries on the water resources of the Basin varies considerably. Egypt and Sudan are heavily dependent on the Nile system, whereas the Nile is a very minor part of the water resources of the DRC, which depends much more heavily on the drainage basin of the Congo River. Map 5.4 provides information on the main rivers of South Sudan.

South Sudan's major water resources are the White Nile, its tributaries, and aquifers. An estimated 28 billion cubic meters, representing 30% of the flow of Nile water, passes through South Sudan to Sudan and on to Egypt. The country has three major river basins of Bahr el-Ghazal, Bahr el Jebel and the river Sobat (and 23 sub-basins). The river Sobat, which is formed by the confluence of the Baro and Pibor rivers, discharges about 14 billion m³ per annum into the White Nile. The Bahr el Jebel basin discharges about 30 billion m³ per annum, but only 14 billion m³ per annum passes into Lake No. The Bahr el Ghazal basin, which discharges about 12 billion m³ per annum loses 11.4 billion m³ per annum of its flow to the Sudd wetland leaving only 0.6 billion m³ to flow into Lake No. Hence the average discharge of the White Nile at Malakal is 28 billion m³ per annum. About 50% of the flow into the White Nile is lost in the wetlands of South Sudan, due primarily to evaporation and transpiration.

A large part of South Sudan is covered by wetlands as well, the most important of which is the Sudd. The Sudd is an inland delta of the White Nile and is made up of lakes, swamps, marshes, and extensive flood plains. It is also one of the largest wetlands in the world, averages in size at about 30,000 square kilometers and covers about 5% of the area of South Sudan. The Sudd has been declared a Ramsar site, which confers global recognition and importance to this wetland. There are many other wetland systems throughout South Sudan, some of which are quite extensive. However, wetlands in South Sudan are only protected if they are part of national parks, game reserves or forest reserves. As a result, many of the wetlands in South Sudan are at risk from exploitation.³⁷ Estimates show that wetlands comprise 7% of the total area of South Sudan. The location of the main surface water resources of South Sudan are shown in Map 5.5.

The bulk of South Sudan's groundwater resources are found in the Um Ruwaba Formation and basement complex which is characterized by unconsolidated clays and gravels with low to high permeability. The basement complex prevails in parts of Western Equatoria, Eastern Equatoria, Central Equatoria as well as in Western Bahr el-Ghazal states and is characterized by poor water bearing formation. However, fractures and weathered zones provide water of good quality and quantity. The Um Ruwaba formation is recharged by seasonal rainfall and river flooding. In South Sudan, ground water is the principal source of drinking water, but very little work has been undertaken to determine the distribution and extraction levels of these resources. Hence, the full extent of the aquifers and related characteristics is unknown at this time. There are compelling reasons to undertake ground water analytical studies as soon as possible.

MAP 5.4: Major Rivers and Water Bodies in South Sudan



MAP 5.5: Location of Surface Water Resources of South Sudan

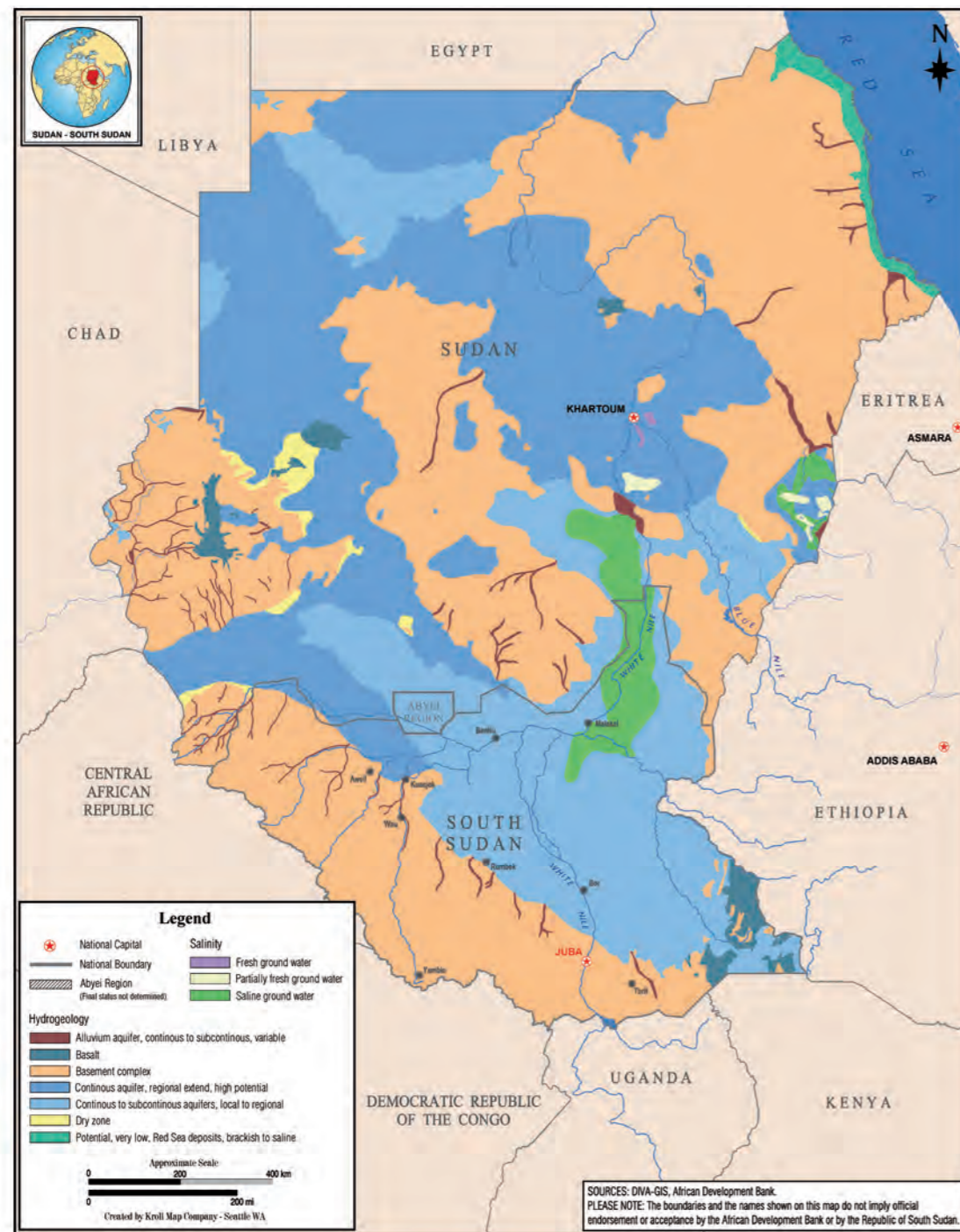


³⁷ For a more discussion of these risks, see USAID (2007).

Map 5.6 provides an overview of the hydrogeological zones of South Sudan. Salinity levels exceeding allowable limits have been observed in Jonglei and Unity states making ground water unsafe in some areas of these states. While higher concentrations of fluoride, sulphate and nitrates have been observed in a few states, overgrazing and deforestation has also affected water resources quality increasing turbidity and siltation in water structures. Other

issues include the need to monitor ground water quality around oil exploration sites in Unity State and undertake assessments of the impact of the effluent from the waste stabilization and oxidation ponds around Juba. The MWRI has developed a national water quality guideline, but the major concern will continue to be undertaking periodic monitoring and enforcement of regulations related to water use.

MAP 5.6: Hydrogeological Map of South Sudan and Sudan



5.4.2 Institutional Responsibilities for Water Resources

Institutional framework. The Ministry of Water Resources and Irrigation (MWRI) has overall leadership in the water sector. In the water resources sub-sector, the Ministry has responsibility for the following: (i) drafting and overseeing the implementation of policies, guidelines, master plans and regulations for water resources development, conservation, and management in South Sudan; (ii) encouraging scientific research into the development of water resources in South Sudan; (iii) overseeing the design, construction, and management of dams and other surface storage infrastructure for irrigation, human and animal consumption and hydroelectricity generation; (iv) setting tariffs for water use; (v) creating policy on rural and urban water resource development and management; (vi) initiating irrigation development and management schemes; (vii) protecting the Sudd and other wetlands from pollution; and (viii) advising and supporting the states and local governments in building their capacity to assume all functions vested by the Constitution and government policy. The three key directorates responsible for the sub-sector are Water Resources Management, Irrigation and Drainage, and the Hydrology and Survey.

Policy framework. The MWRI has adopted a water policy in 2007 and a strategic framework in 2011.³⁸ The overall goal of the water policy is to promote effective management of the quantity, quality and reliability of available water resources in order to maximize social and economic benefits while ensuring long-term environmental sustainability. Key guiding principles for water resources management are as follows: (i) water is a shared resource and appropriate legal frameworks shall be established to govern all aspects of water use; and (ii) water resources planning shall involve all relevant stakeholders and will be undertaken on the basis of natural hydrologic boundaries. The policy discusses aspects of water use in fisheries, navigation, livestock, forestry, industries, environment, wildlife and tourism development. However, it postpones the development of policies on irrigated agriculture to a future date, awaiting progress in the development and usage of water for irrigation uses and purposes. (Section 5.6.3 provides rough estimates of current and projected demand for water.)

The water sector strategic framework of 2011 discusses, among other things, South Sudan's challenges pertaining to water resources management, the complexities that arise from the transboundary nature of its water resources

and the priority assigned to integrated water resources management. Underscoring the roles played by several institutions and appreciating the need to integrate the decision-making process, the strategic framework recommends establishment of a Water Council to act as the principal multi-stakeholder advisory body for the water sector. The Council would also provide relevant support services to the Presidency and the Cabinet on approval of new and amended legislation and policies pertaining to all water related issues. In addition, the strategic framework recommends establishment of a Water Resources Management Authority to enforce regulatory functions on the management and use of water resources.

In August 2011, the Government announced establishment of the Ministry of Electricity and Dams. At the time of drafting this Report, details on the ministry's duties, functions and inter linkages with the MWRI had not yet been clarified. In particular, institutional responsibilities on management of multipurpose dams and accompanied regulatory arrangements need to be worked out to minimize gaps and avoid duplication of efforts. While the scope of water resources touches most sectors and ministries, the Ministry of Electricity and Dams, Ministry of Agriculture and Forestry, Ministry of Animal Resources and Fishery as well as the Ministry of Local Government will continue to play major roles in the development and management of water resources activities in the country. In addition, due to the transboundary nature of the water resources and anticipated negotiations with other riparian states, the engagement of the Ministry of Foreign Affairs and International Cooperation will continue to be crucial.

At the state level, there are water resources management departments coordinated under the water and sanitation directorates. While these directorates are administratively accountable to their respective state ministries, they are technically accountable to the MWRI. The directorates lack clear mandates, regulatory frameworks, necessary levels of funding, and the human capacity much needed to operate effectively. Limited skilled manpower, coupled with lack of capacity, has made some of these directorates dysfunctional. A majority of the states don't have designated staffs to coordinate water resources management programs. The experience of other sub-Saharan countries has been that development and adoption of a Water Act has helped to streamline institutional responsibilities and address overlaps and gaps in institutional responsibilities. So far, South Sudan has not developed a Water Act and as matter of high priority it needs to develop and adopt it. The proposed program of support outlined in this Report includes provision for such assistance.

³⁸ See Government of Southern Sudan, water policy, MWRI, 2007 and Water, Sanitation and Hygiene Strategic Framework, MWRI 2011.

5.5 Major Challenges in Land and Water Resource Management

5.5.1 Land Tenure Arrangements

As noted earlier in this Chapter, most rural residents in the country rely on customary land tenure systems, but these are under pressure from violence, insecurity, refugees and IDP resettlement. According to the IS Academie (2011), implementation of the Land Act of 2009 is slow.³⁹ In the meantime, large-scale land acquisitions are ongoing, but lack transparency, and may lead to more conflict over water and land. There is a detailed agenda of concerns about the status of land tenure arrangements for the country. These are clearly articulated in a series of reports prepared under the auspices of the USAID-funded Sudan Property Rights Program.⁴⁰ The list of concerns includes the following:

- Relations between traditional authorities on the one hand, and national and state governments on the other, regarding land.
- Management of land in urban areas.
- Arrangements for resettlement of returnees and IDPs.
- Restitution of land and property to rightful owners.
- Facilitation of access to land and property among vulnerable groups in South Sudan society.
- Women's rights to access land and property.
- Domestic and international investors' access to land.
- Conflicts among rural communities over access to resources such as water and grazing lands.

In the case of land policy related to private investment – an issue of particular importance for the strategy for agriculture set out in Chapter 6 – a baseline survey of large-scale land-based investment in South Sudan has recently been prepared with support from Norwegian People's Aid.⁴¹ The report presents data on 28 foreign and domestic investments planned or underway across the ten states of South Sudan. In the four year period 2007-2010, foreign interests sought or acquired a total of 2.64 million hectares of land (26,400 km²) in the agriculture, forestry and bio fuel sectors alone – a land area that is equal to the entire

cultivated area of South Sudan at the present time and an area that is larger than the entire country of Rwanda. After allowing for domestic investments, some of which date back to the pre-war period, and investments in tourism and conservation, the report estimates that these private investments would account for 5.74 million hectares (57,400 km²), or 9% of South Sudan's total land area. The concern of the report is that this influx of investment could provide development opportunities for rural communities, but without the appropriate procedures in place there is a danger that it will serve to undermine livelihoods and create further internal tensions.

Resolution of these issues is central to the on-going efforts of the National Government to ensure that South Sudan is able to use its mineral wealth and agricultural potential to promote an extended period of sustained strong economic growth that is broad-based and creates income and employment opportunities for a majority of the population. Continued substantial support from the international donor community will be required to build capacities at the national, state and local levels for effective administration and management of land-related issues. However, the outline of a detailed strategy for provision of such support over the medium-term is beyond the scope of this Report.

5.5.2 Riparian Rights and Use of Water in the Nile Basin

One of the most important challenges for the country is to strengthen capacities for effective management of its water resources. Authority over water resources needs to be clarified at national and local levels and governance of water resources needs to be coordinated among public and private entities and communities.

The Nile River represents the country's biggest water management challenge, as well as its biggest opportunity. As noted earlier, the country is both an upstream country vis-a-vis Sudan and Egypt and a downstream country with respect to the rest of the riparian countries. The country is at the heart of the complexities associated with the Nile Basin Initiative (NBI), and the related transboundary water management of the River presents an extraordinary challenge. South Sudan's independence adds to these issues by raising questions about the use and allocation of the Nile waters between Sudan and South Sudan.

The proposed program for development of commercial agriculture outlined in Chapter 6 includes a substantial

increase in the use of irrigation to expand crop production. The longer-term development of the electric power sector is also built around the utilization of the Nile's hydropower potential. But these interventions will raise questions among other riparian states about ownership and origin of the waters. At the present time, there is no clarity on how the water rights will be allocated now that South Sudan is an independent country. There is a compelling case for joint management of these water resources to avoid political tensions over shared resources and sub-optimal use of the resources.

The history of hydro-politics in the Nile is complex and has significant ramifications for South Sudan and for development throughout the northeastern region of Africa. Over the years, states within the Nile Basin have put agreements and treaties in place to avoid conflict over access to these water resources⁴². At the present time, Egypt and Sudan have primary control over the Nile waters. The current arrangements stem primarily from the following treaties: (i) the 1929 Agreement between Egypt and Anglo-Egyptian Sudan, which gave Egypt complete control over the Nile during the dry season when water was most needed for agricultural production, put substantial limits on the amount of water allocated to Sudan, and provided no water rights to any of the other riparian states; and (ii) the 1959 Nile Agreement between Sudan and Egypt for full control and utilization of the Nile waters. This agreement allowed the entire average annual flow of the Nile (estimated to be about 84 billion cubic meters measured at the Aswan High Dam) to be shared between Egypt and Sudan at 55.5 and 18.5 billion m³ respectively. Included in the agreement was an assumption that the remaining 10 billion m³ is accounted for by losses due to evaporation and related factors. The Agreement granted Egypt the right to construct the Aswan High Dam (which can store the entire annual Nile River flow of a year) and granted Sudan the right to construct the Rosaries Dam on the Blue Nile and to develop irrigation and hydroelectric power generation until it fully utilizes its Nile share.

The contemporary challenge facing the Nile Basin countries is how to establish a legal framework for the utilization of its waters that is acceptable to all the riparian states. The basic issue has been that seven of these countries contribute to the waters of the Nile (Burundi, DRC, Ethiopia, Kenya, Rwanda, Tanzania and Uganda), but have no formal rights to the use of these waters. Several studies have shown that, the tributaries of Ethiopia supply an estimated 86% of the waters of the Nile.⁴³ In the case of Egypt, FAO data indicates that for 2009 about 97% of the actual renewable

water available to Egypt comes from external sources (i.e., the Nile River). The current situation for South Sudan and Sudan is not clear as the FAO water resource data refer to pre-independence Sudan.⁴⁴

There have been efforts deployed by some countries to bring about cooperation over the Nile waters. Negotiations for creation of a Cooperative Framework Agreement (CFA) started in 1997, but have not yet been concluded. The CFA seeks to establish a permanent Nile River Basin Commission through which member countries would act together to manage and develop the resources of the river. In February 1999, the Nile Basin Initiative (NBI), which is a partnership among the Nile Riparian states, was formally launched by the then nine countries that shared the resources of the River.⁴⁵ The NBI is led by a Council of Ministers from the member states in charge of Water Affairs (Nile-COM) with the support of a Technical Advisory Committee (Nile-TAC). It has been set to promote sustainable economic development and stability across the basin. The NBI "seeks to develop the river in a cooperative manner, share substantial socioeconomic benefits, and promote regional peace and security." With support from the World Bank, African Development Bank and other donors, the NBI has launched a substantial program aimed at building capacities among member states and making investments in water resource development and management. The NBI provides an historic opportunity to manage the Nile for the good of the peoples of the basin and to use it as a vehicle for change for the better. Within the framework of the NBI, the Nile states are exploring major cooperative investments in: power generation, transmission and interconnection, irrigated agriculture, navigation; fisheries, and related investments in land management, watershed protection and environmental conservation. These projects are a first phase of a long-term investment program that will support economic development and integration in the sub-region. While South Sudan was not a major beneficiary of these programs, some activities have been undertaken in collaboration with the NBI.

- Technical staff from the MWRI have received training through the Applied Training Program (ATP) component of the shared vision program.
- Lau and Aswa integrated watershed management projects are under implementation.
- Baro-Akobo-Sobat multipurpose water resources study project is under preparation

39 IS Academie (2011), South Sudan: Food Security and Land Governance Factsheet. Maastricht University, The Netherlands, 2011.

40 See USAID (2010), Land Tenure Issues in Southern Sudan: Key Findings and Recommendations for Southern Sudan Land Policy. Report prepared by Tetra Tech ARD for the USAID, December 2010.

41 See Deng, David K. (2011), The New Frontier: A Baseline Survey of Large-scale Land-based Investment in Southern Sudan. Based on research by GADET-Pentagon and the South Sudan Law society. Norwegian People's Aid, March 1, 2011.

42 See, for example, Waterbury, John (1979), *Hydropolitics of the Nile Valley*. University of Syracuse Press, 1979; Tvedt, Terje (2004), *The Nile: An Annotated Bibliography*. I.B. Taurus, 2nd edition, January 17, 2004; Chatterji et al. (2002), *Conflict Management of Water Resources*. Hampshire, Ashgate Publishing Ltd. 2002.

43 See International Peace Institute (2010), *Issue Brief: A Political Storm Over the Nile*. New York, December 2010.

44 In the case of Sudan, the FAO reports that about 54% of the actual renewable water resources came from external sources in 2009.

45 At the time the NBI was launched there were nine member countries: Burundi, DRC, Egypt, Ethiopia, Kenya, Rwanda, Sudan, Tanzania, and Uganda. Eritrea, which also lies within the river basin, is not an official member of the NBI, but it does hold observer status. Prior to independence in July 2011, Southern Sudan had observer status in the NBI. Shortly after independence, the Republic of South Sudan applied for full membership of the NBI.

Notwithstanding these developments, there has been continuing tension among NBI countries over what constitutes an equitable utilization of water. These tensions stem from an increased need of water for various purposes such as irrigation and other multi-purposes uses of water resources. While the NBI, which is a transitional arrangement, has succeeded in bringing the riparian states together for a common purpose, engaged in capacity building and led the implementation of some investment programs, establishment of a permanent institutional arrangement is still work-in-progress. In the past two years, seven upper riparian states launched the Nile Basin Cooperative Framework Agreement (CFA) in a bid to establish a permanent organizational structure and ensure an equitable utilization among all the riparian states of the Nile. The CFA was opened for signature on May 14, 2010 for a period of one year until May 13, 2011. Article 42 of the draft Cooperative Framework Agreement provides for its coming into force upon ratification by at least six members. So far six riparian states have signed the Agreement. (DRC, Sudan and Egypt have not yet signed the agreement.) The tenth riparian country, Eritrea was an observer and didn't participate directly in the negotiations. The lack of agreement among all the riparian states indicates that the utilization of Nile waters will continue to pose a challenge at least for a foreseeable future. In the mean time, South Sudan should endeavor to meet the needs of its population by addressing the pressing water management and resource issues facing this new country.

5.6 Development Programs for Land and Water Resources

The major thrust of the proposed program for development of land and water resources in the decade ahead centers on three sets of interventions: (i) building human and institutional capacities for the management of the land resources of the country, with particular attention to the agenda spelled out above in Section 5.5.1; (ii) strengthen the institutional framework for water resource management at national and state levels within South Sudan and support the design and implementation of a policy framework for equitable water use on a regional basis by the riparian states of the Nile basin; and (iii) improve substantially the infrastructure required for effective management of water resources within the country, including regular monitoring of water resources and withdrawal of these resources for agricultural, commercial and domestic use and investment in additional capacities for surface storage of water to meet growing demand. The proposed program

also calls for a series of strategic and analytical studies that will streamline mandates and responsibilities and attract much needed private investment into the sector.

5.6.1 Building Institutional Capacities for Water Resource Management

Strengthening the institutional framework. Since 2004, and with the support of the international donor community, South Sudan has made some progress in creating an institutional framework for water resource management and has initiated essential sector strategic assessments and feasibility studies to rehabilitate dilapidated infrastructure and improve management of its water resources. A new National Water Policy was endorsed by the government in 2007, and the Ministry of Water Resources and Irrigation was established in 2008 with defined mandates and responsibilities. Building on these initiatives, action is now required on two fronts:

- Development of a Water Act: South Sudan doesn't have a legal framework for the management of its water resources. As a result, delineation of institutional responsibilities in regulations as well as in service delivery has been masked with gaps and sometimes with overlaps. In addition, responsibilities for setting pricing policy for domestic as well as non-domestic uses has not been clearly defined creating confusions among responsible institutions. Thus, there are compelling reasons to develop and adopt a Water Act as a matter of high priority.
- Training program: South Sudan needs to build capacity of its' sectoral institutions in development and management of water resources. The country has applied for membership with the Nile Basin Initiative (NBI) and its capacity in negotiations and conflict resolution needs to be enhanced to the fullest extent. A series of short-, medium- and long-term training programs are necessary to build the capacities of key government institutions, civil society and other entities.

Improving basic information about the water resources of the country. The lack of data on physical and natural resources has constrained the country's ability to harness its rich ground and surface water resources potential. There are no major studies about the water resources in

South Sudan. A three-pronged program is proposed for this component of the Action Plan outlined in this Report:

- Rehabilitation and expansion of the water resource data collection network in the country: Most of the meteorological and hydrological data collection network was destroyed during the civil wars, and only minimal capacities for these activities are now in place. Surveys indicate that out of 29 meteorological stations in the country, only five are currently operational. In addition, of the estimated 113 hydrological stations installed several years ago, about 10 are currently operational leaving the country with paucity of data much needed in water resources management and early warning forecast systems.⁴⁶ The technical and institutional capacities for these activities are also quite limited. A substantial effort is required as soon as possible to build these technical and institutional capacities for water resources management.
- Integrated river basin master plan studies: Given the country's urgency to implement large-scale infrastructure projects for irrigated agriculture, hydropower and other multi-purpose use projects, there are compelling reasons to undertake integrated river basin master plan studies as a matter of priority. This Report recommends undertaking integrated river basin master plan studies on Bahr el Jebel as well as Bahr el Ghazal basins. These studies will help in the following ways:
 - o Preparation of water allocation and utilization plan with different scenarios and to generate data, information and knowledge on ground and surface water resources in the country.
 - o Development of the resources in the basins with respect to occurrence, distribution, quality and quantity of water resources for the next 20-40 years.

- o Identification and prioritization of a list of development projects and preparation of physical plan for the basins.
- o Formulation of policy framework for the development of the basins in line with the government's policies in planning and managing natural resources in hydrologic boundaries.
- Water quality and soil testing laboratories: Apart from a small water quality laboratory within the MWRI, there are no other laboratories for the sector. Given the expected large investment in the water sector, there is a need to undertake water quality monitoring activities in both ground and surface water resources sources of the country. In particular, the increased use of ground water resources for domestic and non-domestic uses pose water quality problems and such laboratories will help in analyzing the problems. Further, the design and construction of storage structures such as dams and irrigation structures necessitate conducting soil tests and analysis. The Report thus recommends constructing and equipping of water quality as well as soil testing laboratories. These facilities will also support much needed regulatory activities in the decade ahead.

Building capacities for construction and maintenance of facilities. The MWRI, through its directorates, carries out dyke construction as well as river cleaning works using its own staff. This Report recommends use of independent construction entities outside of the MWRI to undertake periodic and routine maintenance works on the water resources infrastructure. As the discussion Chapter 4 indicates, there is substantial scope and need for concerted efforts to build the capacities of local companies to undertake construction and maintenance of these types of facilities. The proposed program therefore makes provision for initiatives that can be taken by the Government to build these capacities in the private sector.

⁴⁶ Annex Table shows the location of all hydrological stations in South Sudan along with the required costs needed to upgrade the systems.

Table 5.2: Ongoing and Proposed Program of Capacity Building and Technical Support for the Water Resources Sector (In \$ '000 at 2010 constant prices and exchange rate)

Program	Estimate		Projected					Total
	2010	2011	2012	2013	2014	2015	2020	2011-20
Capacity building & technical support								
Ongoing								
Develop legal and institutional framework	678	83	167	83				333
Training programs and capacity building	2 035	1 908	1 858	750				4 516
Proposed								
Technical advisers for MWRI			150	500	500			1 150
Training programs and capacity building			100	100	150	150	150	1 250
Establish water quality & testing laboratory					200	200		1 400
Upgrade hydrological stations				500	500	500	1 000	6 000
Strengthen water information management system				100	100	100		300
Establish water resources management institute					200	200		1 400
Total	2 713	1 991	2 275	2 033	1 650	1 150	1 150	16 349
Technical studies								
Ongoing								
Mapping assessment & water management		1 633	1 470	876				3 979
Proposed								
Development of the Water Act			50	150	150	50		400
Integrated river basin studies								-
Bahr el Ghazal				500	1 500	1 500		5 000
Bahr el Jebel				500	1 500	1 500		5 000
Sudy of regulatory and institutional linkages			50	100	100			250
Water pricing & tariff studies				100	100	100		300
Total	-	1 633	1 570	2 226	3 350	3 150	-	14 929
Grand total	2 713	3 624	3 845	4 259	5 000	4 300	1 150	31 278

Source: Date for ongoing programs from SSDP and MWRI. Projections are those of authors.

Proposed program of capacity building and technical support. The program proposes substantial support for institutional capacity building of sectoral institutions as well as undertaking various technical studies to streamline institutional responsibilities and attract much needed investment into the sector. The proposed program includes training activities, upgrading and rehabilitation of hydrological stations, construction of water quality and soil testing laboratory and establishment of a water resources management institute. In addition various technical studies including highly prioritized integrated river basin master plan studies and development/adoption of a water Act will be undertaken. Institutional studies, including regulatory and service delivery functions as well as linkages with other line ministries, will be undertaken to ensure efficient sectoral performance. Development of an irrigation policy will also be carried out as a priority.

Table 5.2 provides a summary of ongoing and proposed new capacity building programs and technical studies for the water resources sector. Almost \$9 million of support

is ongoing at the present time, including \$4.8 million for capacity building, mainly related to mapping and water resource management, and \$4 million for mapping and water resource assessments. Table 5.2 provides a detailed list of the proposed programs for the decade ahead, which includes \$11.5 million for further capacity building, and about \$11 million for technical studies.

5.6.3 Expansion of Water Supply Capacities to Meet Anticipated Demand

As noted earlier, the FAO Aquastat database does not provide separate estimates for water resource supply and consumption for South Sudan. As a result, there is no complete baseline data from which projections of demand can be developed. For the purposes of this Report, an indicative estimate has therefore been made for water

consumption for 2010 from which demand projections have then been developed. These estimates are no more

than indicative of possible trends, given the uncertainties about the base level of consumption for 2010.

Table 5.3: Estimation of Household Demand for Water (Billion liters per year)

Indicator	2010	2011	2012	2013	2014	2015	2020
Consumption of improved water							
Urban population	1.9	3.1	4.6	6.5	8.8	12.6	74.7
Rural population	19.3	22.9	26.9	31.3	36.1	41.3	74.2
Total	21.2	26.0	31.5	37.9	44.9	53.9	148.9
Consumption of unimproved water							
Urban population	5.4	6.6	7.9	9.1	10.3	11.1	8.0
Rural population	18.7	18.6	18.3	18.1	17.7	17.2	13.3
Total	24.1	25.2	26.2	27.2	28.0	28.3	21.3
Total consumption							
Urban population	7.3	9.7	12.5	15.7	19.1	23.7	82.7
Rural population	37.9	41.4	45.2	49.4	53.8	58.5	87.5
Total	45.2	51.1	57.7	65.1	72.9	82.2	170.2

Annex Table 6.2.

Household demand for water. As Table 5.3 indicates, total household consumption of water in 2010 is estimated at 45.2 billion liters per year (equivalent to 45.2 million m³ per year). About 47% of this total household water use is improved water. Based on the targets for expanding access to improved water in the decade ahead that are outlined in Chapter 9, total household consumption of

water is projected to increase to about 140 million m³ by 2020, 88% of which would be improved water. (See Annex 6 for an explanation of the basis for these estimates.) If these targets for household access to improved water are realized, the implication is that there will be a fivefold increase in demand for improved water in the decade ahead.

Table 5.4: Agricultural Water Use in Selected Comparator Countries, 1998-2002

Country	Area cultivated (ha '000)	Cultivated area irrigated (% of total)	Agriculture water use (bill m ³ p.a.)	Agriculture share of total (%)	Water use per hectare (m ³ p.a.)
Burkina Faso	4 700	0.50	0.69	70.1	147
Burundi	1 351	1.58	0.22	77.1	164
Ethiopia	10 604	2.70	5.20	93.6	491
Kenya	5 518	1.80	1.01	79.2	183
Malawi	2 970	1.90	0.81	83.6	273
Rwanda	1 385	0.61	0.10	68.0	74
Sudan & South Sudan	16 644	11.20	36.07	97.1	2167
Uganda	7 700	0.12	0.12	36.4	16
Memo item:					
South Sudan	1 000	3.21	0.62	92.5	620

Source: Authors estimates for South Sudan; FAO Aquastat database for comparator countries.

Agriculture sector water demand. In the absence of data for South Sudan, a highly indicative estimate of agricultural demand for 2010. Table 5.4 compares the results of this baseline estimate with FAO data for selected comparator countries. As the Table indicates, total water use by agriculture is closely linked to the total area cultivated and in particular to the cultivated area that is irrigated. As noted in Chapter 6, the actual area cultivated in South Sudan in any one year varies from 650,000 to 1.3 million hectares, with only 32,100 hectares that is irrigated, which implies that somewhere between 2.5% and 5% of the actual cultivated area is irrigated. Given the relatively small area that is cultivated, the share of irrigated land is somewhat higher than that for comparator countries, except for Sudan. For the purposes of this Report, it is assumed that the amount of land actually cultivated in 2010 was 1 million hectares, equivalent to the average of the range reported by the World Bank for recent years. The other issue related to agricultural demand for water concerns the livestock sector. As Chapter 6 indicates, South Sudan has almost 40 million cattle, goats and sheep. These animals are an important source of livelihood for large number of rural families. Based on data for comparable countries it is assumed that this livestock population consumed about 0.23 billion m³ in 2010. Total agricultural demand for water was estimated to be about 0.62 billion m³ in 2010, equivalent to consumption of about 390 m³ per hectare (not including livestock consumption).

Annex 6 provides a detailed description of the basis on

which the demand for water was projected to 2020. The scenario for expansion of cultivation and irrigation outlined in Chapter 6, proposes a total cropped area of 2,500 ha by 2020, 400,000 ha of which would be irrigated mainly for production of high value fruits and vegetables and other cash crops. As Table 5.5 indicates, agricultural demand for water increases to about 5 billion m³ by 2020 – an eightfold increase over the estimated level of use in 2010.

Information on the **industrial use of water** in South Sudan is not available at this time. Currently, the primary source of industrial water use would be the petroleum sector. A notional amount of 0.01 billion m³ was assumed for industrial use in 2010.

Aggregate demand for water. The resulting very rough estimate for water withdrawal in South Sudan is about 0.67 billion m³ in 2010. As Table 5.5 indicates, demand for water is projected to increase to about 5.3 billion m³ by 2020. Agriculture accounts for about 96% of total water use, households account for about 3%, with industrial use accounting for the balance. The agricultural sector would continue to be the dominant source of demand for water for the entire decade, driven by the large investment in commercial agriculture and irrigation. Particular attention will also have to be given to meeting the needs of the livestock industry. Lack of water at critical times in the year can be an important cause of conflict among local communities. Additional water facilities will be needed to meet the needs of the industry.

The issue then is the extent to which this demand can be met in a sustainable manner from aquifers and river flows and the extent to which this source of supply must be met from stored surface water. South Sudan's substantial lack of water storage capacity has made it vulnerable to periodic drought and flooding problems. In the case of agriculture, uncertainties about rainfall in some parts of the country have a detrimental effect on farmers' willingness to expand production to meet local market requirements. A substantial amount of additional work is required to assess the supply possibilities for various parts of the country to determine whether urban water and agricultural demand can be met in part from additional stored surface water. A start has been made on building stored water capacities in South Sudan. In 2008, the MWRI awarded five contracts worth \$38 million for feasibility studies for the construction of three medium-sized dams in Wau and the rehabilitation of the Maridi Dam and Water Station. Rehabilitation of the Maridi dam was completed in 2010 and it currently provides about 3,000 m³ of water per day to the inhabitants of Maridi town. However, it is the only dam of any size in the country.

For the purposes of this Report, it is assumed that the Sue Dam would go ahead as proposed in the SSDP with design and construction completed during 2013-2015. It is assumed that a second large dam will be constructed during 2018-2020 to meet further growth in urban demand in the following decade. The cost of these facilities is notionally put at \$400 million and \$250 million respectively. At a

capital cost of \$400 per thousand m³, these facilities will provide about 1.6 million m³ of stored water capacity. Assuming both are multipurpose dams, they would meet growth in household and industrial demand for water and depending on their location, provide some water for irrigation of high value fruits and vegetables as proposed in Chapter 6.

5.7 Expenditure Programs for Water and Land Resource Management

5.7.1 Expenditure Programs of Government and Donors

Ongoing programs. Table 5.6 provides a summary of the on-going development programs related to water resource management. Through the support of MDTF and other NGOs, construction of water storage structures such as hafirs and ponds are underway in a few states. In addition, the GOSS allocates budget for rehabilitation of water conveyance structures such as canals and irrigation structures. The Egyptian Government supports studies on Wau multipurpose dam project as well as rehabilitation of hydrological stations. These ongoing programs amount to about \$34 million.

Table 5.5: Estimation of Total Demand for Water (Billion m³ per year)

Indicator	2010	2011	2012	2013	2014	2015	2020
Agriculture							
Cropland	0.38	0.42	0.48	0.72	1.20	1.80	4.80
Livestock	0.23	0.23	0.24	0.25	0.25	0.26	0.30
Sub-total	0.61	0.65	0.72	0.97	1.45	2.06	5.10
Households							
Improved water	0.02	0.03	0.03	0.04	0.04	0.05	0.15
Unimproved water	0.02	0.03	0.03	0.03	0.03	0.03	0.02
Sub-total	0.05	0.05	0.06	0.07	0.07	0.08	0.17
Industry	0.01	0.01	0.01	0.01	0.01	0.01	0.02
Total	0.66	0.71	0.79	1.04	1.54	2.16	5.30
Memo items:							
Harvested area ('000 ha)	1 000	580	1 020	1 070	1 160	1 320	2 500
Irrigated area (% of total)	3.2	3.3	3.6	5.0	7.4	10.0	16.0
Water use per ha (m ³ p.a.)	610	1 126	706	904	1 254	1 562	2 042

Source: Authors estimates for South Sudan; FAO Aquastat database for comparator countries.

Table 5.6: Ongoing and Proposed Program of Capital Works for the Water Resources Sector (In \$ '000 at 2010 constant prices and exchange rate)

Program	Estimate 2010	Projected						Total 2011-20
		2011	2012	2013	2014	2015	2020	
Ongoing								
Increase supply of water	709	4 839	6 865	1 383				13 087
Open rives and dykes		3 267	6 367	4 367				14 001
Mapping assessment & water management		1 588	2 497	3 147				7 232
Proposed								
Construction of hafirs			4 000	4 000	6 000	5 000	5 000	44 000
Construction of microdams			3 000	3 000	3 000	3 000	3 000	27 000
Construction of multipurpose dams				50 000	150 000	200 000	100 000	650 000
Equipment for flood control works				1 000	1 000	2 000	2 000	14 000
Flood and dyke protection works			3 000	3 000	3 000	3 000	6 000	42 000
Clearing of blocked waterways				5 000	5 000	5 000	5 000	40 000
Total	709	9 694	25 729	74 897	168 000	218 000	121 000	851 320

Source: Date for ongoing programs from SSDP and MWRI. Projections are those of authors.

Proposed new programs. The South Sudan Development Plan (SSDP) calls for new expenditures of some \$453 million on programs related to water resource management during 2011-2013. The bulk of the funds are proposed for investment in additional capacities to supply fresh water, including \$400 million for construction of the proposed Sue multipurpose dam. Only \$5 million is proposed for capacity building and technical studies in this period.

The Action Plan for water resource management set out in this Report calls for new capital outlays of about \$820 million, in addition to the ongoing program of \$34 million. The bulk of the funds would be used to finance the construction of two more multipurpose dams that would provide water for household and industrial use, and depending on further analysis and site investigations, also provide additional water for agricultural use. An amount of \$650 million is included for these two dams. Preliminary information obtained from the MWRI indicates that the proposed dam will store about 1-2 billion m³. It would supply water for electricity generation and meet the water

demand of the Wau town. In addition, it would be used as a source of supplemental irrigation during the dry periods sufficient to cultivate about 40,000 feddan (16,800 hectares). The SSDP made a notional allocation of \$400 million for this project, which implies a capital cost of \$200-\$400 per thousand m³. A feasibility study on the Wau multi-purpose water resources project is currently underway. Given the size of the scheme, the MWRI, along with other line ministries and stakeholders, will need to establish a panel of experts to review the results of the assessment and evaluate economic costs and benefits.

Because the country is prone to flooding, the Report also recommends procurement of earth moving machineries to support dyke construction works much needed for flood protection works or contracting to the private sector for such work. Another important component of the program is the construction of water harvesting structures such as hafirs, ponds and cisterns. These structures are critical for the livelihood of the population in the arid zones, as well as for the large number of livestock in South Sudan.

5.7.2 Financing Arrangements for the Program

Table 5.7 provides a summary of the proposed funding arrangements for the land and water resources program. Total funding requirements for the decade ahead amount to about \$880 million (at 2010 constant prices and exchange rate). The program would be funded by the National and state governments and by the donor community. South Sudan would fund two-thirds of the cost of the

program, with the donor community meeting the rest. One important qualification to the foregoing financing arrangement is that it may be possible to attract private funding from international investors who are attracted to business opportunities in the agricultural sector for one or both of the large scale dams proposed for the decade ahead. This would involve the mobilization of about \$200 million of private equity and \$450 million of debt financing from commercial sources. Once the detailed feasibility study for the Wau project is completed, a transaction advisory team can be retained to assess the prospects for mobilizing such funding.

Table 5.7: Sources of Funding for the Water Resources Program
(In \$ '000 at 2010 constant prices and exchange rate)

Program	Estimate 2010	Projected						Total 2011-20
		2011	2012	2013	2014	2015	2020	
Capacity building & technical studies								
Government								
Ongoing								-
Proposed	-	-	35	255	500	430	115	2 245
Donors								
Ongoing	2 713	3 625	3 495	1 709	-	-	-	8 828
Proposed	-	-	315	2 296	4 500	3 870	1 035	20 205
Total	2 713	3 625	3 845	4 260	5 000	4 300	1 150	31 278
Capital expenditures								
Government								
Ongoing	709	4 839	6 865	1 383	-	-	-	13 087
Proposed	-	(0)	2 500	49 813	111 950	144 065	79 283	571 900
Donors								
Ongoing	-	4 855	8 864	7 514	-	-	-	21 233
Proposed	-	-	2 500	16 186	56 050	73 935	41 718	245 100
Total	709	9 694	20 728	74 897	168 000	218 000	121 000	851 320
Total program								
Government								
Ongoing	709	4 839	6 865	1 383	-	-	-	13 087
Proposed	-	(0)	2 535	50 068	112 450	144 495	79 398	574 145
Donors								
Ongoing	2 713	8 480	12 359	9 223	-	-	-	30 061
Proposed	-	-	2 815	18 482	60 550	77 805	42 753	265 305
Total	3 422	13 319	24 573	79 156	173 000	222 300	122 150	877 598

Source: Annex tables 6.7 and 6.8 and estimates by authors.



Development of Agriculture in South Sudan

6 Development of Agriculture in South Sudan

6.1 Current Status of Agriculture, Fisheries and Forestry

6.1.1 The Setting

Agriculture is the backbone of the economy of South Sudan. Estimates on value addition by agriculture, forestry and fisheries accounted for 36% of non-oil GDP in 2010 (see Annex Table 2.4). It is evident that about 80% of the population lives in rural areas, with agriculture, forestry and fisheries providing the primary livelihood for a majority of the households in each state (Map 6.1). Much of the rural sector activity is currently focused on low-input low-output subsistence agriculture instead of production for markets. Among the significant reasons for this are: (i) the need for improved agricultural inputs and techniques such as seeds and fertilizers, storage facilities and advisory services, and irrigation development; (ii) the difficulties faced by farmers in accessing markets due to the poor road network, lack of other transport modes and nuisance taxes and charges, including bribes; (iii) the lack of a critical mass of farmer and rural producer associations as a means of entering the market place with the aim of minimizing the cost of inputs, accessing loan finance at affordable rates and influencing farm-gate prices; and (iv) uncertainties pertaining to property rights and access to land.

Two and a half decades ago, the country was net exporter of agricultural product to regional markets; due to war-related destruction, poor infrastructure and lack of investment in the agriculture sector, South Sudan is now a net importer of food. It currently imports as much as 50% of its needs, including 40% of its cereals from neighboring countries, particularly Uganda and Kenya. Total food imports are estimated to be in the range of \$200-300 million a year.

While the country produces and consumes a wide range of agricultural commodities, with the passage of time some commodities have become prominent in the national pattern of consumption. Cereals, primarily sorghum and maize, millet and rice are the dominant staple crops in South Sudan. According to the 2009 National Baseline Household Survey (NBHS) more than 75% of rural households consume cereals. At the state level, the percentage ranges from a low of 28% in Upper Nile state

to 62% in Western Bahr el Ghazal and to as much as 95% in Northern Bahr el Ghazal. For the country as a whole, cereal consumption accounts for about 48% of total basic food consumption in term of value. Livestock accounts for approximately 30%, fish 4%, roots 2%, seeds about 3.8% and other non-cereal crops combined, 12.7%.

Sorghum is the main crop cultivated with a wide range of local landraces. It is the main staple food in all states, except for the three Equatorias where the local diet is also based on maize flour (largely imported from Uganda) and cassava (mainly in the Green Belt). In Northern and Western Bahr el Ghazal, Warrap and Lakes, sorghum is often intercropped with sesame and millet. Maize is normally cultivated in limited areas, close to homesteads and often used for green consumption. In some locations such as Upper Nile, maize is cultivated in larger plots, instead of sorghum, provided the soil is suitable. Minor cereal crops such as bulrush millet, finger millet and upland rice are also cultivated in certain locations. Groundnut is cultivated on sandy soils in most locations and makes an important contribution to the household diet. It is the main cash crop which contributes to farming household income at certain periods of the year. In parts of Central and Western Equatoria, sweet potato, yam, coffee, mango and papaya are commonly grown. Okra, cowpea, green-gram, pumpkin and tobacco are also widely grown around homesteads. Vegetables such as onions or tomatoes are not commonly grown in rural areas, but are increasingly cultivated near cities to supply urban markets.

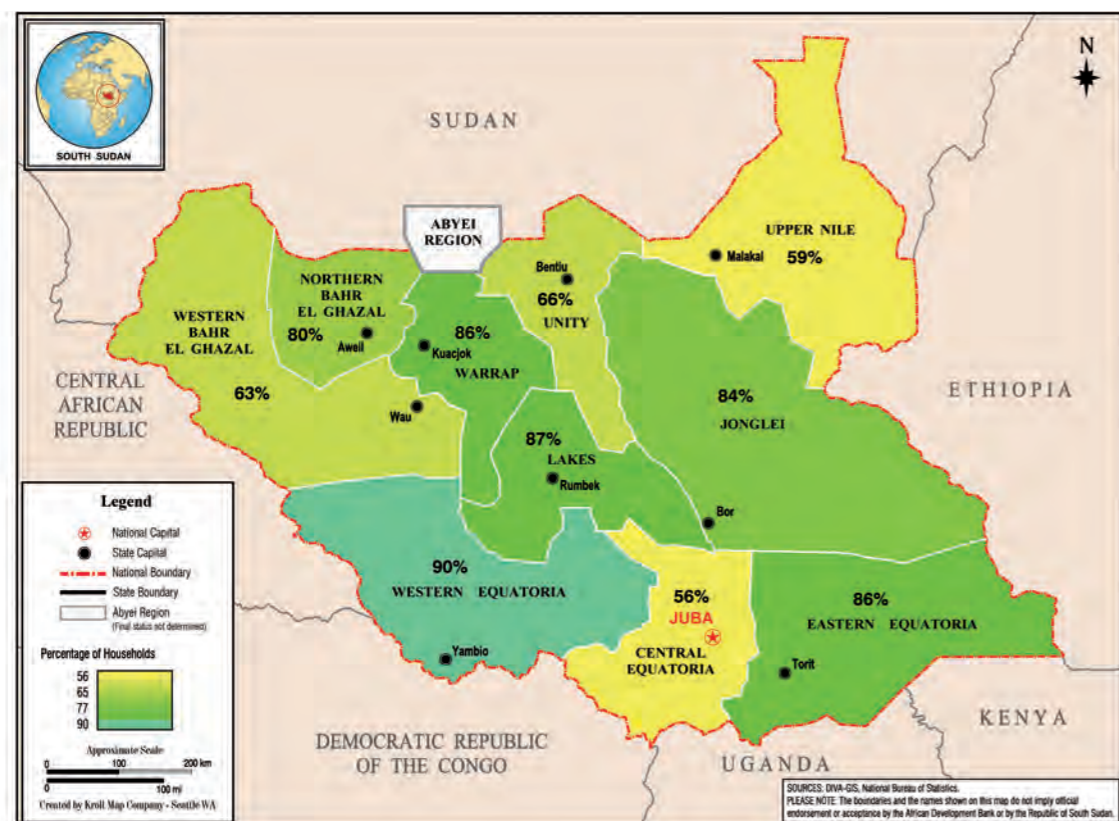
Livestock provides the main source of livelihood for a substantial portion of the population, with herds (mostly cattle) concentrated primarily in western parts of Upper Nile state, and in East Equatoria, Jonglei and Bahr El-Ghazal states. Livestock are raised by nomads and semi-nomads and are entirely dependent on access to grazing land and watering points. However, the increasing number of sedentary farmers is reducing the amount of grazing land available, and as noted in Chapter 5, that is a source of internal conflict in the country.

With over 95% of agricultural production being rain-fed, weather variability is a major factor in determining crop performance. In lowland areas, flooding is a normal occurrence, but variability of the water levels affects harvested area and yields. Agriculture is, for the most

part, based on small, hand-cultivated units often farmed by women-headed households. Despite land availability for farming, manual land preparation limits the area households can cultivate. Making use of animal traction would allow household to cultivate larger plots and plant in line to ease weeding. The GoSS, FAO and NGO-based extension agents make efforts to promote animal traction on a small-scale in Central Equatoria, Western Equatoria,

Lakes, Warrap and Bahr el Ghazal States. In addition to social and cultural barriers, lack of spare parts and skills to maintain mould-board ploughs and adaptability of ploughs model to local soil conditions are the main constraints. Mechanized farming is practiced mainly in the Upper Nile counties of Renk, Melut and Wadakona and to a limited extent in Malakal and Bentiu in Unity State.

MAP 6.1: Share of Households Depending Primarily on Agriculture and Livestock



6.1.2 Institutional Arrangements for the Sector

At the national level, primary responsibility for agriculture, forestry and fisheries rests with two ministries: the Ministry of Agriculture and Forestry (MAF), and the Ministry of Animal Resources and Fisheries (MARF). In addition, the Ministry of Cooperatives and Rural Development and the Ministry of Water Resources and Irrigation have significant responsibilities for particular aspects of agricultural development.

The mandate of the Ministry of Agriculture and Forestry

is to transform agriculture from traditional subsistence farming to achieve food security through scientific, market oriented, competitive and profitable agriculture without compromising the sustainability of natural resources for future generations. The mandate of the Ministry of Animal Resources and Fisheries is to promote, regulate and facilitate animal production and fisheries, value-added addition and access to credit and regional and international markets for food security, poverty alleviation and socio-economic development.

A series of policy papers were prepared during 2006-2007 for food and agriculture, forestry, animal resources, and fisheries.⁴⁷ In 2010, the FAO sponsored a review of these

various policy papers that, in turn, has led to the drafting of a comprehensive food and agricultural development policy framework for the country.⁴⁸ A major ongoing concern for policy makers is that most of the food sold in the market in South Sudan is imported and a significant proportion of food insecure people rely on imported food aid. An important focus of the ongoing review of the food security policy and related framework has been the following:

- Development of production support services, with particular emphasis on how the private sector can be harnessed to provide various services including input delivery and mechanization.
- Expansion of agricultural markets, value chain development and finance, with special emphasis on agribusiness development.
- Inter-relationships between food security, social development and climate change.

The draft policy statement is to be presented to the Council of Minister of South Sudan and if approved, it will become

the official policy document for guiding agricultural development in the country.

6.2 Agricultural Land Use in South Sudan

6.2.1 Estimates of the Cropped Area

The country lies entirely within the River Nile Basin and is covered by grassland, swamps and tropical forests. As noted in Chapter 5, 75% of the country's land area is suitable for agriculture while, approximately 330,000 square kilometers, or about half of the total land space, is estimated to be suitable for cultivation. With its high potential for agricultural production, some expert observers have said that, with the development of appropriate and adequate infrastructure, South Sudan could become the bread basket of Africa.⁴⁹

Table 6.1: Land Use in South Sudan (In hectares)

Category	Area	Share (%)
Cultivated	2 760 131	4.3
Trees	20 742 243	32.6
Shrubs	25 032 308	39.3
Herbaceous	14 522 385	22.8
Urban/industrial	34 188	0.1
Bare rock & soil	159 106	0.2
Water bodies	462 105	0.7
Total	63 712 466	100.0

Source: Annex Table 6.1.

In spite of having 50% of its arable land mass as prime agricultural land only 4% of this area is cultivated continuously or periodically. The very low ratio of cultivated to total land compares with 28% in Kenya and 8% in Uganda. Most of this land use in South Sudan is accounted for by smallholder subsistence farmers that, in the absence of fertilizers, pesticides and herbicides, practice some form of shifting cultivation. As Table 6.1 indicates, the total area that is cultivated on a shifting basis is estimated at about 2.8 million hectares. Areas covered with trees and shrubs account for 72% of land use, with grasslands accounting for about 23% of the total area.

The Western Flood Plains livelihood zone has the most cropland (34% of national cropland). Greenbelt and Eastern Flood Plains zones are the other two important crop production regions, accounting for, respectively, 18% and 26% of national cropland. Altogether, these three livelihood zones account for 78% of national cropland. Five states account for 70% of the national cropland (and 56% of the national territory): Upper Nile, with 19% of total cropland; Warrap, 15%; Jonglei, 14%; Western Equatoria, 11%, and Central Equatoria with 11%. Almost all irrigated crops (mainly rice) are in Upper Nile; rice on flood land is all in Northern Bahr el Ghazal while fruit trees

47 See the following papers prepared by the Ministry of Agriculture and Forestry: Food and Agriculture Policy Framework (FAPR), November 2006; MAF Strategic Plan 2007-2011, June 2007; MAF Forest Policy Framework (2007) and Strategic Plan 2007-2011. In the case of the MARF, the following papers were prepared: Animal Resources Sector Policy and Strategic Plan (2006-2011) and Fisheries Sector Policy and Strategic Plan (2006-2011).

48 See Mengistu, Diress (2010), "A Review of Selected Sector Policies of the Government of Southern Sudan to Identify Gaps in Food Security Policy." Report submitted to the Food and Agriculture Organization of the United Nations/Sudan Institutional Capacity Programme: Food Security Information for Action, Southern Sudan, Subprogramme, June 2010.

49 Source: Several assessments by FAO; Huliq "US envoy on South Sudan's economic potential" February 2007; and, BBC "Sudan, one country or two?" May 27 2011

and tree plantations are exclusively in Green Belt Zone encompassing Western, Central, and Eastern Equatoria which have the longest LGP in South Sudan.

According to the World Bank, the actual area cultivated in any one year in South Sudan has ranged between a minimum of 1% and a maximum of 2% of the total land area – that is, from about 650,000 to 1.3 million hectares.⁵⁰ According to FAO-WFP reports, about 1 million hectares were put under cultivation in 2008. Cereals typically account for 80% or more of the cultivated area each year; for example, the area under cereals that was harvested in 2008 was about 850,000 hectares. Sorghum is the main cereal, followed by millet and maize. The average area cultivated by these household is typically in the range of 1-4 feddans (0.4-1.7 hectares).

6.2.2 Rainfall, Land Use and Population Densities

Agriculture is predominantly rainfed with the level of annual rainfall rising from north to south and from east to west. As noted in Chapter 5, it ranges from less than 500 mm/year in the semi-arid lands of Eastern Equatoria to about 1,800 mm/year in the Green Belt zone. South Sudan experiences unimodal and bimodal rainfall regimes, the bimodal areas covering much of Greater Equatoria (Western, Central and Eastern Equatoria) while the unimodal areas characterize the rest of the country. Agricultural performance consequently varies considerably from place to place and from year to year, ranging from the possibility of two harvests per annum in Greater Equatoria between Tambura and Kejo-Keji, to one harvest in the unimodal areas further north.

The length of growing period (LGP) ranges from 280-300 days per annum in the southern parts of South Sudan to 130-150 days in the northern parts.⁵¹ More than 70% of South Sudan has a LGP longer than 180 days and is, therefore, suitable for crop production, but as noted earlier, only a very small percentage of this area is actually cultivated each year. Classifying the aggregated land use by LGP shows that 27% of cropland in South Sudan is located in areas where agricultural potential is high (an LGP more than 220 days) and another 42% in areas with medium agricultural potential (an LGP between 180 and 220 days). The implication is that there is tremendous potential to

expand and scale up agricultural production by bringing more of the arable land into cultivation by smallholder and commercial farmers, introduction of appropriate modern farming technology and the use of higher yielding seeds.

As discussed in Chapter 1, the vast majority of the population lives in rural areas with low population densities. Even though the density varies widely, the average population density for South Sudan is estimated at 13 people per km² compared to 166 in Uganda, 70 in Kenya, 83 in Ethiopia, and 36 people per km² for Sub-Saharan Africa in 2009. Two states have a population density of less than 10 people per km²: Western Bahr el Ghazal (3 per km²) and Western Equatoria (8 per km²), while five states have a density that lies between 10 per km² and 20 per km². Of these, Upper Nile has the largest cropland area nationally, but a population density of 13 per km². Three other states – Warrap, Northern Bahr el Ghazal and Central Equatoria – also have relatively high shares of the national cropland, but they have population densities of more than 20 persons per km².

A recent World Bank study finds that areas in South Sudan that have “high” and “medium” production potential based on the LGP have the highest population density.⁵² According to Boserup (1965 and 1981), 50 people per km² is a threshold population that indicates the possibility of promoting agricultural intensification.⁵³ Map 6.2 sets out the spatial distribution of areas with high, medium and low agricultural potential and high, medium and low population densities. In South Sudan, there are high to medium population densities in areas of high and medium agricultural potential: the high agricultural potential areas have a population density of about 66 persons per km² while areas with medium agricultural potential have a population density of 54 persons per km². Although these areas presently have low per capita cropland values, they are likely to generate quick wins in terms returns from new public and private investments leading to expansion of cropland and increased agricultural production.

With assistance from USAID and World Bank, the National Government has formulated strategies for expansion of the areas under cultivation that takes into account the assessments of the agricultural potential in various parts of the country.⁵⁴ The objective of these assessments is to identify geographic areas in the country that can have a high payoff in terms of their development impact. Typically, the criteria used in identifying such

areas include agricultural potential, access to markets, and density of population. For the purposes of this Report, this ongoing analysis has provided the basis for an indicative estimate of the prospects for expansion in cultivated areas in all 10 states. The results are set out in Table 6.2 below. The analysis suggests that the livelihood zones with large potential are the Green Belt, Ironstone Plateau and Hills and Mountains; the relevant states

are Western Bahr el Ghazal, the three Equatoria states, Warrap, Upper Nile and Jonglei. As Table 6.2 indicates, the Western, Central and Eastern Equatoria states would account for almost 60% of the proposed increase in cultivated areas. Large amounts of additional land (26% of the proposed increase) would also be brought under cultivation in Jonglei, Warrap, and Western Bahr el Ghazal.

Table 6.2: Current and Proposed Additional Cropland for the Medium and Longer-Term
(In hectares '000)

State	Cropland			Share (%) of additional cropland	Cropland as % of state total	
	Current cropland	Additional cropland	Total cropland		Current cropland	Total cropland
Upper Nile	504.9	178.8	683.7	5.0	6.6	8.9
Jonglei	373.6	262.5	636.1	7.3	3.1	5.3
Unity	119.5	48.4	167.9	1.3	3.2	4.5
Warrap	405.4	318.2	723.6	8.9	9.4	16.7
Northern Bahr Ghazal	247.6	146.5	394.1	4.1	8.4	13.4
Western Bahr Ghazal	73.1	373.9	447.0	10.4	0.7	4.4
Lakes	248.2	183.0	431.2	5.1	5.7	9.9
Western Equatoria	317.0	977.7	1 294.7	27.3	4.1	16.6
Central Equatoria	313.9	878.4	1 192.3	24.5	7.3	27.6
Eastern Equatoria	77.6	219.1	296.7	6.1	1.1	4.1
Total	2 680.8	3 586.5	6 267.3	100.0	4.1	9.7

Source: Annex Table 7.1 and estimates by authors. Note: current cropland includes 10% of «grass with crops» and «trees with crops.»

An important unresolved practical issue at this juncture is the pace at which this land can be developed. The answer depends to a considerable extent on the extent to which the Government, with assistance from the donor community and private investors, address the existing constraints to agricultural expansion in South Sudan.

hectare in Egypt where the bulk of the cereals are grown under irrigation. These low cereal yields in South Sudan stem from a range of problems faced by smallhold farmers. A survey undertaken in 2006 by Ministry of Agriculture and Forestry, with support from FAO and the WFP, asked

6.3 Key Challenges for the Sector

There are a number of major constraints to agricultural and rural development in South Sudan, in addition to those discussed in Chapter 1. In order to achieve sustained and broad-based economic development, these challenges/constraints must be addressed. Infrastructure improvement, provision of public goods and access to extension and veterinary services will be a crucial aspect of the Government's strategic response to these challenges. Notwithstanding the range of crops produced, agricultural production in South Sudan remains largely traditional with low yields. In the cereal subsector, for example, it is widely acknowledged that the vast majority of farmers do not use high yielding seeds nor do they use any synthetic fertilizer or herbicide. As Table 6.3 indicates, South Sudan's average yield is low relative to most other countries in the region, averaging only 0.97 tonnes per hectare during 2005-2009; it is far below the average of 7.64 tons per

Table 6.3: Cereal Yields (Tons per hectare)

Country	Average 2005-2009
Burundi	1.31
Chad	0.78
DRC	0.78
Djibouti	1.64
Egypt	7.53
Ethiopia	1.49
Kenya	1.54
Malawi	1.58
Rwanda	1.11
South Sudan	0.94
Uganda	1.53
Tanzania	1.19

Source: FAO database and Table 6.5.

⁵⁰ World Bank (2007), Final Proposal for a Multi-Donor Trust Fund Grant to the Government of Southern Sudan for the Support to Agriculture and Forestry Development Project (SAFDP), Washington DC, August 2007.

⁵¹ The length of growing period (LGP), defined as the number of days when both moisture and temperature conditions permit crop growth, is often used as a proxy for an area's suitability for farming. For example, an area with LGP 120 days per year (a dry or semi-arid area) may allow for no crops or for only one crop per year while an area with a LGP between 180 and 220 days per, (e.g., Green Belt Zone) may have multiple crops grown sequentially within one year.

⁵² World Bank (2011), "Strategic Choices of Realizing South Sudan's Agricultural Potential." World Bank, Washington DC, October 2011.

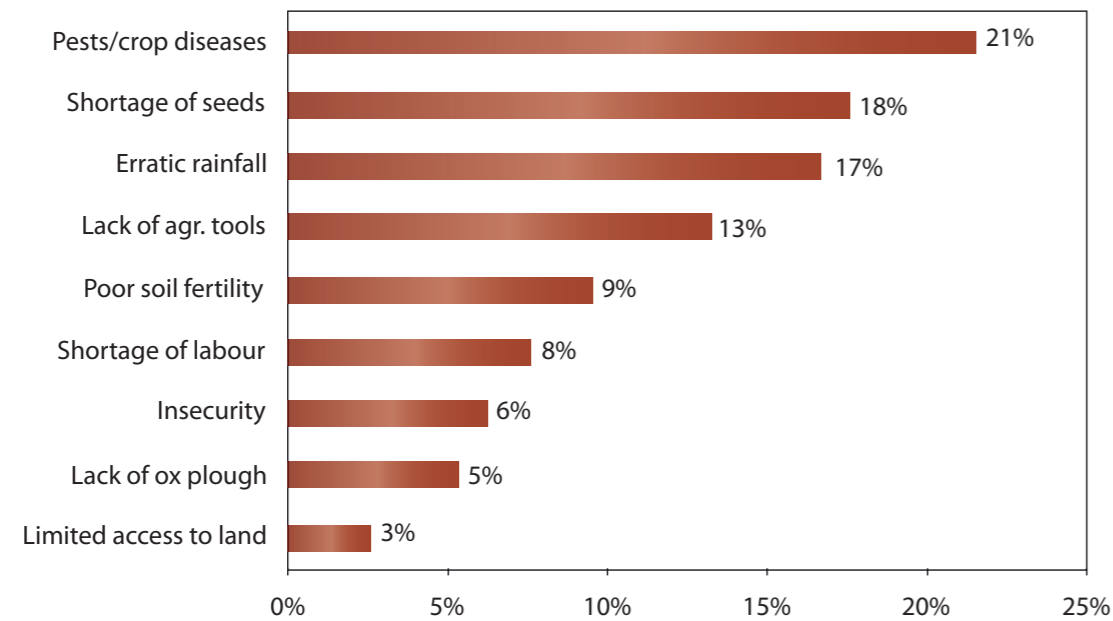
⁵³ Rural population density varies positively with land productivity but only up to the point where overcrowding leads to land degradation.

⁵⁴ See World Bank (2011) and USAID (2011), "Achieving Agricultural Growth and Food Security in South Sudan." Report prepared for USAID by McKinsey & Company, Discussion document, September 2011.

farmers what were their primary constraints to improving crop production. As Figure 6.1 indicates, pests and crop

diseases, shortage of seeds and erratic rainfall were the three most important concerns.

Figure 6.1: Constraints for Crop Cultivation in South Sudan



Source WFP-FAO-MAF (2006).

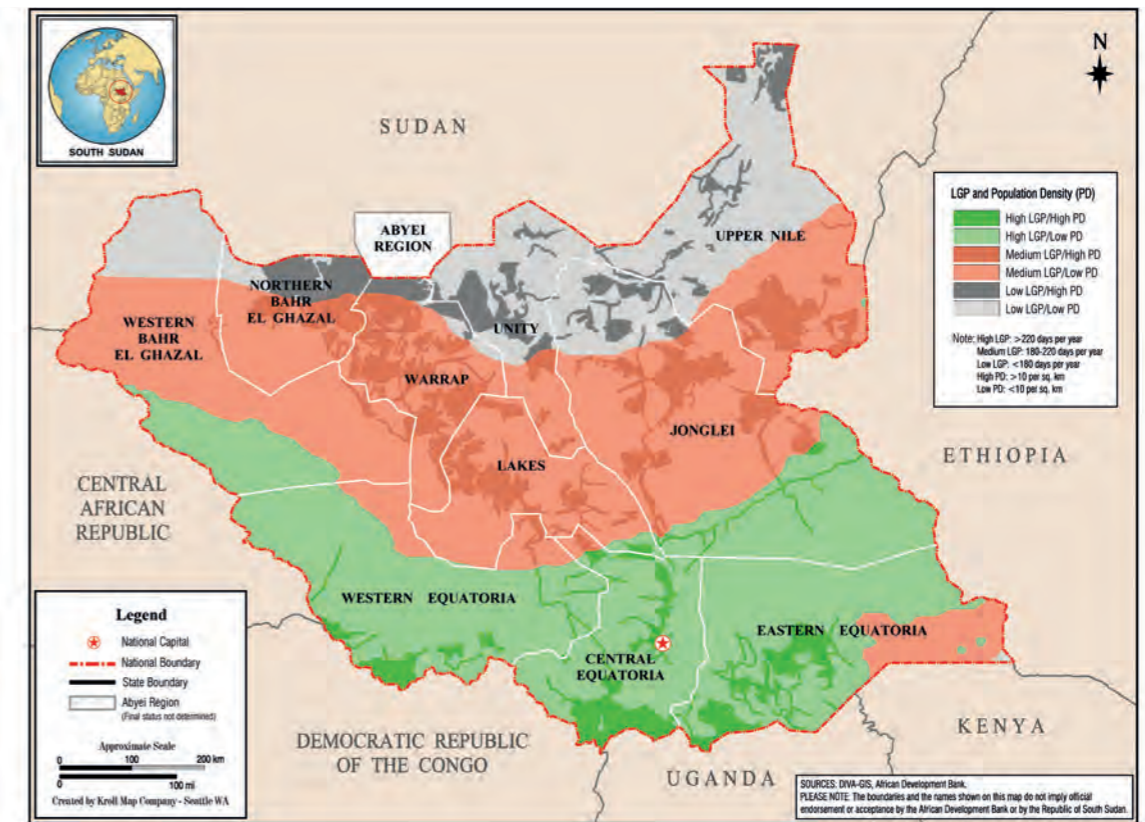
The wide range of challenges that face the sector today can be conveniently grouped around the following nine sets of concerns.

Weak entrepreneurship base and absence of commercial farming. Agriculture remains a subsistence activity by smallholder farmers using simple implements; the average farm size is in the range of 0.4-1.7 hectares. Intensive farming with little fertilizer application has progressively lowered yields and depleted soils. There are very few cooperatives and little commercial farming and/or the adoption of modern farming technologies. Farming remains primarily rain-fed; irrigation farming is still limited. In addition, livestock farming is dominated by culture and tradition that lack business orientation (cattle, for instance, are still

raised for prestige and for dowry payments rather than for meat, milk, hides and other by-products). The private sector is nascent and has weak business management skills.

Weak or non-existent capacity to provide farm and off-farm extension services to farmers. A recent joint GOSS/FAO baseline survey report on agriculture and animal resources found that weak extension service support to agricultural and livestock farmers is a major concern for farmers throughout South Sudan. The public sector extension and veterinary/animal care services are extremely limited. Inspection services are weak in enforcing standards and lack equipment and training. There is lack of critical mass in the number of Community Animal Health Workers.

MAP 6.2: Spatial Patterns of Agricultural Potential and Population Density



Lack of agricultural productivity-enhancing technologies. There is little use of improved varieties of seed or breeds of livestock. Crop farmers save their seed for planting in the next season, and there is little selection for improved varieties. There is a need for improved varieties that are resistant to common diseases and which are more productive. The traditional livestock breeds could increase productivity by upgrading the genetic base, but market incentives to improve quality are lacking.

Poor and inadequate infrastructure. Lack of developed trunk and feeder roads (and, other types of infrastructure – railway/rolling stock, electricity and transport systems as well as ICT) inhibit movement of goods and services into and out of rural areas, increases the cost of transportation and dampen producers’ incentives to generate surplus. The absence of rural and feeder roads and, therefore, access to domestic, regional and international markets is a key bottleneck to increased agricultural production. Similarly, the near complete absence of rural electrification limits the choice of farm implements and the adoption of modern farming techniques. These concerns are addressed at some length in the various sectoral chapters in Part B of this Report.

Weak markets and non-existent market information systems. As Chapter 10 indicates, South Sudan has yet to achieve the level of mobile voice and data telecommunication that is now commonly available in many rural communities in Africa. In addition, the absence of ICT in rural communities limits market information generation and dissemination. This also restricts market size, outreach and agricultural value chains development. Consequently the economic benefits of modern telecommunication still elude rural communities in South Sudan.

Paucity of microfinance facilities. Formal banking services are still extremely limited.⁹ The Southern Sudan Microfinance Facility is a government sponsored private micro-finance umbrella agency that is attempting to foster micro-finance market development. Presently, only a few microfinance institutions provide minimal financial services in some market towns, but there are no financial services for the agricultural sector – for producers or for agribusinesses.

Weak farmer/producer organizations. Years of war and displacement of population have weakened or destroyed whatever farm cooperatives existed before. Some donor

55 Some commercial from banks in Kenya (e.g. Kenya Commercial bank and Equity bank) have opened branches in Juba and a few other towns in Southern Sudan. The portfolio is still narrow with no lending to the agriculture sector at the moment.

projects have worked with smallholders to organize themselves into groups, cooperatives or associations.⁵⁶ However, many of the producer members do not farm as a business, and decisions are not made based on cost/benefit basis. There is little ability to calculate costs of production and to use market information to determine if products will be competitive and profitable in markets. Extremely weak literacy and numeracy skills, particularly among women, are constraints to smallholders becoming commercialized.

Shortage of farm labor. Even though 90% of the population of South Sudan lives in rural areas, close to 80% of farm labor is provided by women who combine this activity with their other domestic chores. Farming is not viewed favorably (as a befitting profession) by young men and women, who often migrate to cities. In addition, farm labor, when available, is expensive and often lacks appropriate skills and the incentive to work. The expectation that many of the South Sudanese returning from Sudan would swell the ranks of farm works may not materialize in the absence of incentives for the returnees to settle and farm in rural communities. Besides, it is instructive to note that most returnees were not farmers previously; most were city dwellers and may, in the absence of incentives, have little inclination to move to rural communities and engage in farming activities.

Unclear land tenure and demarcation. The concerns about land tenure are discussed at length in Chapter 5. Large-scale farming requires access to land with unambiguous rights to profitably develop the land.⁵⁷ Under the 2009 Land Act foreigners are not permitted to own land, but can lease land for a maximum of 99 years; community lands may be allocated for investment purposes, but that investment must reflect an important interest for the community and contribute to economic and social development of the local community; and land acquisition of 250 fedans or more (104 hectares) must be approved by state authorities. Having a uniform national land law and transparent ownership rights and obligations will facilitate the decision of foreign investment in agriculture in South Sudan. In addition, given the predominant role that women play in farming, the laws must be gender sensitive and accord women the right to land ownership.

6.4 Strategy for Development of the Agricultural Potential

Developing the country's agricultural and livestock potential has been identified in the SSDP as the most

feasible way to enable broad-based economic growth and food security in the short- to medium-term. South Sudan soils and ecological characteristics make the country suitable for the supply of wide range of agricultural products. Furthermore, the strategy envisages a South Sudan that would exploit opportunities to process food products and raw materials for value addition, job creation and increased earnings. The key drivers in the strategy for expansion of agricultural production are threefold: (i) expand substantially the area under cultivation; (ii) increase yields in areas that are already under cultivation along with ensuring high productivity on newly farmed lands; and (iii) expand opportunities substantially for production of marketable surpluses of livestock and fish products.

6.4.1 Strategy for Expansion of Cultivated Agriculture in South Sudan

There is, of course, a range of possible scenarios for the development of very large potential for expansion of cropland agriculture in South Sudan. For the purposes of this Report, one possible scenario for expansion of cropland has been considered. The total cultivated area would be increased from 2.7 million ha in 2010 to 4 million ha by 2020 and based on Table 6.2 above, perhaps 6-7 million hectares by say 2030 (Table 6.4). These increases in the cultivated area would come from bringing areas currently covered by forest, shrubs and grass under cultivation.

A two-pronged approach would be used in the decade ahead to develop this large potential for crop production:

- A larger share of the existing 2.7 million hectares of land that is cultivated periodically by smallholder farmers would be brought under continuous cultivation with improved access to markets, lower transport costs that reduce the cost of and access to inputs such as fertilizer and herbicides, use of out-grower models, and so on.
- A substantial investment would also be made in cultivation of new land by medium- and large-scale commercial farming operations, many of which would operate with out-grower models that would allow nearby existing or new smallholder farms to supply fresh foods and agricultural raw materials for processing by the commercial operation. (For example, sugar cane grown by smallholders, and processed by a central facility operated by a large-scale commercial operation.)

Table 6.4: Indicative Plan for Cropland Development (In hectares '000)

Indicator	Estimate	Indicative	
	2010	2020	2030
Harvested area			
Cereals	921	1 880	2 800
Other crops	79	620	1 900
Total	1 000	2 500	4 700
Cultivated land under rotation	1 681	1 500	1 570
Cultivated area	2 681	4 000	6 270
Memo items:			
Irrigated area (ha '000)	32	400	1 000
Cultivated as % total land area	4.2	6.2	9.7
Harvested as % of cultivated	37.3	62.5	75.0
Irrigated area as % total harvested	3.2	16.0	21.3

Source: Table 2.7.

As discussed below, much more work is needed on the details of a possible strategy for cropland development for the next one to two decades. Therefore, the scenario presented here is largely indicative at this stage. In this scenario the total area of cropland harvested annually would increase from about 1 million hectares at the present time to 2.5 million hectares by 2020. A large part of the increase would be accounted for by increased cultivation of cereals, initially for the domestic market to address the ongoing food security problem, but later in the decade for export of surpluses to regional markets as well. The remaining cultivated areas would be used to expand substantially the production of high value fruits and vegetables for local and export markets, and other cash crops such as sugar, groundnuts and tree crops such as oil palm, tea and coffee. In this indicative scenario, the cultivated area would increase from 4.2% of the total land area at present to about 6.3% by 2020; however, the cultivated area that is harvested annually would increase from about 37% at present to 63% by 2020. This expansion in cultivated cropland would be supported with a substantial investment in irrigation in the decade ahead. The irrigated area would increase from a negligible 32 thousand ha at present (3% of the harvested area) to 400 thousand ha by 2020 (equal to 16% of the harvested area). Successful development and implementation of this model in the decade ahead would then lay the foundations for further large expansion of the cultivated area to about 6.3 million hectares by 2030.

Successful development and implementation of this model in the decade ahead would then lay the foundations for further large expansion of the cultivated area perhaps to

about 6.3 million hectares by 2030 as in Table 6.4 above. In this scenario, the harvested area increases to 4.7 million ha, or 10% of the land area, with 75% of the total cultivated area being harvested annually. About 20% of the harvested area would be irrigated. This level of irrigation in the longer-term would almost certainly raise important issues for Nile Basin riparian countries regarding the use of water within the Basin.

More work is needed on the proposed strategy for the decade ahead (2011-2020) to determine: (i) the likely cost of bringing this additional land under cultivation in particular parts of the country; and (ii) the off-farm costs for roads, electric power and other infrastructure, and for off-farm storage and processing of products. The discussion below on infrastructure requirements for agriculture and the related discussions in other chapters of this Report provide insights into the off-farm development costs associated with these programs. In the case of on-farm costs, these may range from the equivalent of a few hundred US dollars per hectare for modest improvements to as much as \$3,000 per hectare for the water distribution costs of large-scale irrigation projects. At an average of \$500 per hectare, for example, the on-farm cost of bringing the additional 1.3 million ha of land under cultivation and improving capacities of the areas already cultivated could be in the range of \$1 billion. At an average of \$1,000 per hectare the on-farm development cost rises to \$2 billion. Most of these on-farm costs would have to be borne by the private sector, either by smallholders or large-scale commercial investment, much of which would have to come from offshore investors. The mobilization of these levels of investment for agriculture represents another major challenge for the decade ahead.

⁵⁶ FAO through its Sudan Productive Capacity Program and GIZ have been actively helping farmers to form groups and associations.

⁵⁷ In early 2009 USAID started up a new, 2-year land tenure program, which is helping to develop a new land policy for Southern Sudan.

6.4.2 Choice of Models for the Transformation of Agriculture

To achieve these objectives, given the small size of the South Sudan market, the strategy must be both domestic and export-oriented, contributing to food security, facilitating agriculture-supported domestic industrialization and maximizing exports. A high priority would be accorded to scaling up production of high value crops using adaptive technology and cost effective means of production. And, in order to achieve technical efficiency, resource allocation should be rationalized and output maximized. In addition, binding transport and other trade logistic constraints to market access must also be addressed.

Like Ethiopia, Ghana, Kenya, Uganda, Tanzania and Rwanda, South Sudan can enhance agricultural production and increase productivity by creating a conducive policy environment as well as making new and sustained investments in agricultural production and related supporting services including off-farm processing and infrastructure services. For a country such as South

Sudan, which is seeking to transform its rich but barely exploited agricultural endowments, knowing what model of agricultural development approaches has or has not worked in other countries is advantageous. Box 6.1 summarizes the approaches taken by Ethiopia and Ghana. While every country is unique, with different ecological characteristics and agricultural practices, a key lesson from the experience of these two countries is that the Government of South Sudan will need to play an important role in fostering agricultural development.

Under the AU/NEPAD CAADP framework, it is the role of government, with assistance from its development partners, to articulate the sector development strategy, create an enabling policy environment, demonstrate commitment to promote the attainment of key targets and increase public and private investment to levels that will result in sustained growth in agriculture of 6% a year.⁵⁸ An integral part of an enabling environment is the provision of basic infrastructure and extension services. These investments would take the form of budget allocations by the government, as well incentive-driven private domestic and foreign direct investment.

Box 6.1: Models for Promoting Agricultural Growth: Experience of Ethiopia and Ghana

Ethiopian Model. Ethiopia is considered a leader in the use of strategic international (foreign) partner to promote agricultural development. Agriculture is the backbone of the Ethiopian economy, accounting for 85% of employment and nearly 50% of GDP. Since 1991, the Agricultural Development Led Industrialization Program (ADLI) has served as the vehicle for promoting agricultural modernization, national growth and poverty reduction. Through ADLI, agricultural development has resulted in significant commercialization and entrenchment of value addition in the agricultural sector, expansion of capital base and accumulation of investment and technology. At the federal level, the Agricultural Investment Support Directive (AISD), under the Ministry of Agriculture and Rural Development serves as a central office to facilitate land leases of 5,000 hectares (ha) or larger for investment purposes. AISD is the central depository of these plots and expedites the issuance of licenses, permits, and approval of all land leases. At the state and local levels, the relevant authorities provide extension services and facilitate access to micro-finance and technical assistance services and training for smallholder farmers and farmer cooperatives. The aim of AISD is to lease three million hectares of land for large-scale commercial farming. Since 2004, the agency has allocated 607,760 ha to investors (of which 157 projects are over 1,000 ha), realizing total investment commitment of approximately US\$ 78.6 million. Foreign direct investors include a German bio fuel project; an investor in a livestock project (leasing 150,000 ha), and a Saudi Arabian government-backed company investing in rice and palm oil projects.

Ghana Model. In 2005 the Government of Ghana launched the Northern Ghana agricultural development program aimed at raising agricultural GDP, promoting national food sufficiency and raising smallholder income. The region was targeted because of its relative high poverty, large agricultural potential due to the existence of abundant uncultivated arable land, good water supply and yet low output yields. The region has agricultural high potential for import substitution in rice, maize and soy. The key targets of the program are: (i) double the per capita income of 250,000 farmer per year; (ii) increase cultivated land by 20% by end of program; (iii) achieve 70% food sufficiency in rice; and increase: agricultural GDP by \$500 million/year, earmark \$100 million public investment through the program and, attract \$600 million private (domestic and foreign). The Government, with support from AGRA, mobilized financial and technical support from the World Bank, the African Development Bank, bilateral donors and domestic and foreign private investors. The program aims to upgrade all segments of the agriculture sector value chain by mobilizing private sector contractors to organize and empower smallholder farmers, produce aggregators and marketing agents. The Ghana program is built on five key principles: (i) The AU/NEPAD Comprehensive African Agriculture Development

Program (CAADP) provides framework and the Northern Ghana Program the vehicle for national implementation of CAADP; (ii) agricultural transformation using pilot schemes in high potential areas and subsequently replicating and scaling up in other regions (Volta Region and Accra Plains); (iii) holistic and participatory, involving all stakeholders: government, local authorities, resourced smallholder farmers and farmer cooperatives; (iv) scaling up using private sector operatives, national and international; and (v) work with blueprints comprising detailed designs and execution modules, and delivery units.

Key components of the value chain for the Ghana model were as follows: (i) 200 warehouse entrepreneurs to operate as aggregators of smallholders; (ii) 25-35 private sector-led commercial farms using idle arable land- government facilitates land aggregation and allocation ensuring social equity; (iii) a nucleus farm/out-grower system for high-value crops; (iv) a transversal support system that included farm inputs, credit, infrastructure, and off-farm logistics; and (v) a credibly manned delivery unit under the Ministry of Agriculture to drive implementation.

As has been stated above, only 4% of South Sudan's estimated 320,000 km² or more of arable land is being cultivated mainly by smallholder subsistence farmers. The transformation of the agriculture sector will, of course, require that more cropland be brought under cultivation; it will also entail a holistic approach that encompasses recognition of the role of smallholder farmers and their associations as the nucleus that must be nurtured and strengthened. Above all, the strategy will be export-oriented and driven by foreign direct investors who will undertake the development of modern large scale farms with capacity to scale up farming as business units as well as train the small scale farmers; the establishment of holistic farm systems based on rain-fed cropping as well as irrigation systems that can prudently and profitably harness land and water resources to expand agricultural production, process and market value chain products in national, regional and global markets; enhanced market access by rural communities to urban centers, regional and global markets; and, transversal provision of extension and research services. Rising global demand for agricultural products and cereals, in particular, suggests that, if ever there was an opportune time for a strategic transition to a more efficient farming system in South Sudan, it is now.

6.4.3 Other Key Elements of the Strategy

Leadership and Alignment. To be successful, a lead agency must assume overall responsibility for the implementation of the strategy. As noted earlier, responsibility for promoting agricultural and rural development lies with four ministries. Effective implementation of the agricultural development strategy will require the establishment of a Joint Board or Steering Committee comprising the four ministries and the Ministry of Industry and Investment, with the later serving the Chair of the Steering Committee. Other relevant stakeholders must also be co-opted into the Committee.

Supportive policy environment. A conducive policy environment with incentive mechanism for domestic and foreign investment in agriculture value chain activities is a prerequisite for transforming the sector. Hence, the government should strive to enact policies and adopt regulations that promote and protect equitable private investment in arable land development, encourage market-driven seed production and distribution system, adopt a national investment codes and actively promote domestic and foreign trade in agricultural commodities.

Strategic International Partners in Agriculture. South Sudan's private sector is still nascent and domestic private investment in agriculture and livestock is hampered by traditional practices that lack market orientation. Successful implementation of the agriculture development strategy will, necessarily, require the stimulation of local investment in agriculture, which will take time to realize. At this point in time, South Sudan requires robust investment of capital in land and technology; this can only be realized through the attraction of strategic international partners, individual, institutions and even foreign governments willing to invest in agricultural land development, production of high value crops and the development of associated infrastructure.

Infrastructure. Years of war and benign neglect has left South Sudan with destroyed or neglected transport, power, water/sanitation, ICT and other infrastructure and support facilities. The need to rebuild the country's infrastructure is the subject of South Sudan Infrastructure Action Plan. The implementation of the recommendations of the Plan and agriculture transformation strategy will be key determinants of whether or not the country can transit from the present low production low productivity mode to a virile, diversified modern economic base that is driven by a transformed agricultural sector.

Delivery mechanisms. This will entail use of market driven organizations with policy and regulatory support from

⁵⁸ Other African countries that have managed similar high agricultural growth rates for a decade or more include Morocco and Togo in the 1980s, and Benin, Cameroon, Malawi and Chad in the 1990s. Burkina Faso and Nigeria also had similar high growth rates during 2000-2005. See World Bank country database at www.WorldBank.org.

government. To this end, the attraction of the right type of FDI will bring with it efficient delivery structures such capital investment in off farm infrastructure (collection, processing and storage systems) and out-grower farmer organizations that ensures that smallholder farmers are integrated into the production and delivery mechanisms.

6.4.4 Expansion of Crop Production

Current status of crop production. As noted earlier, a wide range of food and cash crops is grown in South Sudan depending on the agro-ecological zone. The Green Belt zone with the highest level of annual rainfall is the area with high potential for sustained crop production. The crops include casava, sorghum, groundnuts, sesame, maize, finger millet, cow peas, beans, pigeon peas, vegetables (onions, okra, tomatoes, cabbage, egg plant, cucumber and pumpkins). Rice production was expanded under the Awei Rice Scheme which collapsed during the war. At the present time some rice production is continuing by farmers who adopted rice production outside the scheme. Coffee is also grown commercially and, there are a handful of tobacco farmers. Fruit trees include banana, plantain, pineapple, mangoes and citrus. Other crops include sweet potatoes, yams, and papayas which are grown for home consumption and sale in local markets. The proposed strategy would aim to encourage expansion in most of these activities, subject to access to profitable marketing opportunities.

Strategy for cereals production. The sub-sector is critical to the prosperity of South Sudan, given its importance in the livelihood of a vast majority of the population. The need to revamp the sector and significantly increase production is compelling for the following reasons:

- At the domestic level, South Sudan has the potential to be both self-sufficient and to become a major exporter of cereals. The main constraints to realizing this potential are largely internal and therefore, within the control of the policy makers: marginal use of available arable land, low and declining productivity due to poor farming methods, high marketing margins caused by poor infrastructure, and, proliferation of taxes. The removal of these constraints is not only feasible and within reach but will be transformative and beneficial to the country;
- The opportunity cost of not developing the sector is huge. Cereals, encompassing wheat, maize, sorghum and rice, among other grains, is a US\$80 billion a year global industry and the average prices have risen steadily in recent years due to increasing demand from larger and more affluent societies, particularly China,

the ever increasing demand for bio-fuels and rising demand for animal feed. These demand-pull forces, aided by erratic weather patterns, have outstripped impressive global technological advances, resulting in ever increasing food prices for rich and poor countries alike. With its agricultural potential, the country should be able to beneficially fill some of the huge global cereal supply gap.

Net production of cereal (i.e. less post harvest loss of 20%) stood at approximately 695 thousand tons while consumption was about 885 thousand tons, resulting in the importation of about 200 thousand tons (see Table 6.5). Not only does the shortfall constitute a serious food security challenge, but it also raises the risk of eroding external and fiscal balances, increasing food aid dependency and impeding development of the sector. Against this backdrop, the Ministry of Commerce, Industry and Investment, in collaboration with the Ministry of Agriculture and Forestry, proposed the following targets for the development of the cereals sub-sector by 2016: (i) increase the volume of cereals produced to 1 million tons; (ii) increase yields for cereals from 0.97 tons per hectare to 1.1 tons per hectare; (iii) increase the volume of cereal exports from the current level of 148 thousand tons to 1.5 million tons; and (iv) mobilize \$350 million of FDI for commercial production of cereals for the domestic and international markets.

As noted earlier, production of cereals (and other crops) in South Sudan can be expanded by (i) increasing the area of cropped land; and (ii) raising productivity, that is, increasing the amount of production per unit area. The scenario outlined in Table 6.4 above is elaborated on in Table 6.5 below, which incorporates both of these strategies. This Report proposes a doubling of the harvested area of cereals in the decade ahead to about 1.88 million hectares and through improved farm productivity and reduction in the current high level of post harvest losses, raise yields from the current average of about 0.94 tons per hectare to 1.3 tons per hectare by 2020. These strategies, if successfully implemented, would increase cereal production (net of post harvest losses) from about 700,000 tons in 2010 to 2.4 million tons by 2020. Assuming a steady increase in cereal consumption per capita with improved supply conditions and livelihoods from about 100 kg per person at the present time to 130 kg per person by the latter part of the decade, South Sudan would meet domestic consumption requirements by 2016-2017 and then have an exportable surplus of cereals in the range of 600,000 tons a year by 2020. At recent international prices of about \$300 per ton for maize and wheat, the value of cereal production would increase from about \$200 million in 2010 to about \$700 million a year by 2020, with an exportable surplus of a little under \$200 million a year at that time.

Table 6.5: Projected Production and Consumption of Cereals in South Sudan

Indicator	Estimates		Projected					Growth (% p.a) 2011-20
	2010	2011	2012	2013	2014	2015	2020	
Production								
Total available cultivated area ('000 ha)	2 681	2 694	2 746	2 754	2 835	2 991	4 000	4.1
Cereal area harvested ('000 ha)	921	500	939	986	1 060	1 166	1 880	7.4
Cereal area as % total cultivated	34	19	34	36	37	39	47	
Production ('000 tons)								
Gross								
Net	695	475	916	971	1 060	1 225	2 444	13.4
Imports/Exports ('000 tons)	(190)	(480)	(250)	(307)	(330)	(277)	614	
Consumption								
Cereal consumption ('000 tons)	885	955	1 165	1 278	1 391	1 501	1 830	7.6
Memo items:								
Net yield (tons/ha)	0.75	0.95	0.98	0.99	1.00	1.05	1.30	3.2
Per capita cereal consumption (kg)	93	95	110	115	120	125	130	3.4
Population ('000)	9 494	10 048	10 594	11 116	11 589	12 012	14 079	4.0

Source: Estimates by authors.

Strategy for production of high value fruits and vegetables.

With its rich soil and favorable climate, several parts of South Sudan have enormous potential for competitive production of high value fruits and vegetable for the domestic and external markets. South Sudan smallholder farmers cultivate pineapples, mangoes, onions, tomatoes and yams. At the present time, the contribution of these fruits and vegetables to agricultural output is negligible; production has fallen dramatically and so has the export values of these products. Furthermore, the industry has only minimal commercial orientation. In general, due to infrastructure constraints producers have limited access to consumers beyond their local markets. As a result, decisions about area to be cultivated are often made on the basis of own household consumption needs, not market demand. Any surplus produced is usually sold or bartered for other goods in the local market. At the present time, the country is a net importer of these products, primarily from Kenya and Uganda, notwithstanding South Sudan's potential for producing high value fruits and vegetables, rising global prices for these items and an unmet regional demand.

Driven by globalization, technology and logistics, the market for high value fruits and vegetables has become global. Currently, trade in horticulture accounts for more than a fifth of global trade in agricultural commodities. The value of horticulture exports has risen from \$ 82.5 billion in 2005 to over \$ 122 billion in 2010.⁵⁹ Horticulture exports of Sub-Saharan Africa now exceed \$2.3 billion,

with Kenya, Uganda and Tanzania accounting for a sizeable share of this trade.

With its vast unexploited arable land and a favorable climate, South Sudan has high potential to prosper from participation in the global market for fruits and vegetables provided it is able to create the necessary transport logistics and associated cold chains and adopt a market-oriented system for commercial production. A successful transition from subsistence to a commercial model in these products would yield high returns for the country. However, having fertile soil and good climate are necessary, but not sufficient conditions for competitive entry into regional or global markets for fruits and vegetables. Fruits and vegetables are highly perishable and subject to high post-harvest losses if not preserved under ideal temperature conditions. As a result, competitiveness in the sector is determined by the availability of adequate logistics, including cold chains, to move products to markets. Furthermore, a sustainable entry into the terminal market, mostly in Europe, Asia and the Middle East, requires fast, dependable and adequate transport arrangements that can move the products to the markets consistently and on a timely basis. Ever more demanding customers in these terminal markets require products that arrive consistently on time and are of the highest quality. In order to meet these conditions, it has become necessary for many fruits and vegetable suppliers to own or control the entire value chain from production through marketing as this allows the supplier to control the logistics without having to rely on third

⁵⁹ UNCTAD Trade Statistics, 2010.

parties. Consequently, the industry is characterized by the dominance of large commercial firms with the capability and capacity to move products through the entire value chain, supplying high quality products to end markets consistently and on a timely basis.

In 2011, the Ministry of Commerce and Investment proposed the following key objectives for the industry: (i) increase exports from current levels of about \$800,000 a year to \$10 million a year by 2016; and (ii) attract FDI of \$100 million to spearhead the development of the industry.

A three-pronged strategy has therefore been formulated for expansion of production of high value fruits and vegetables in South Sudan:

- Identification and attraction of the right kind of strategic foreign direct investment;
- Establishment and support of farmer cooperatives that can be linked to larger commercial farms; and
- Linking these commercial farms to regional and international transport and logistics networks.

Box 6.2: Expanding Horticulture Production: a Kenyan Example Company Profile: Homegrown Company Ltd.

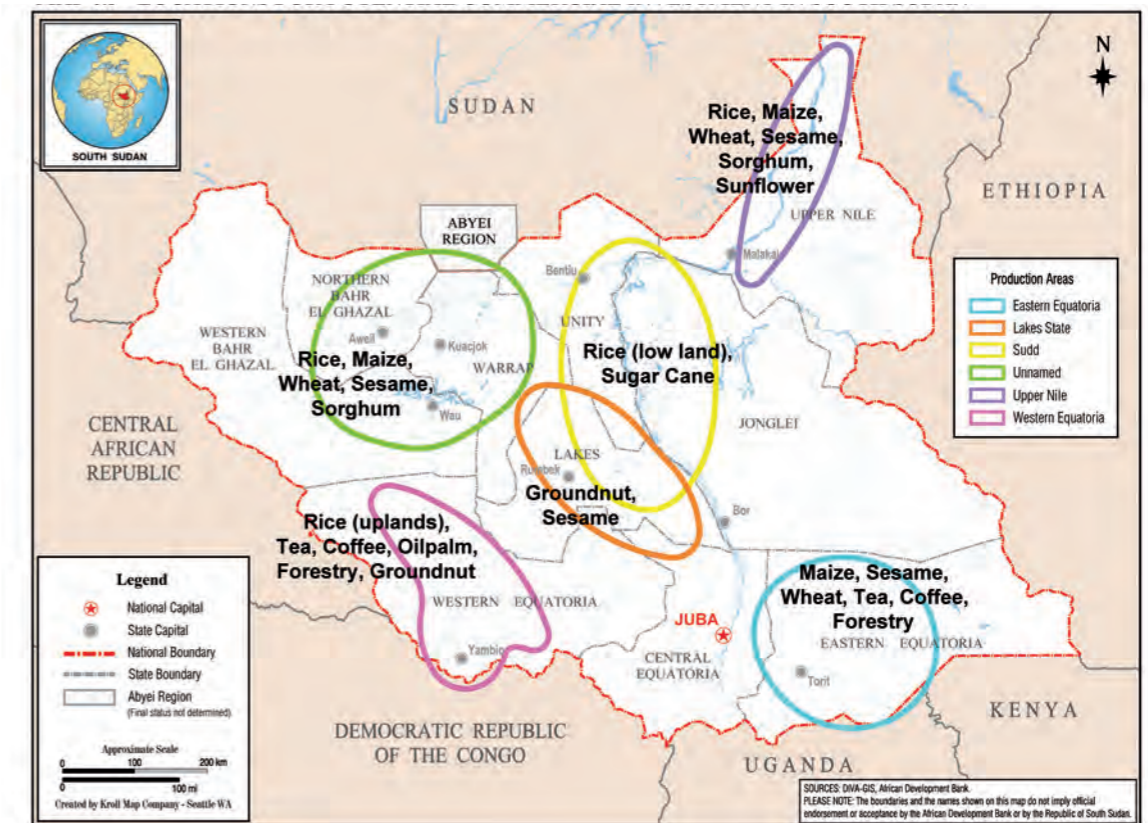
Homegrown is the largest vegetable exporter in Kenya. It is a success story of packaged horticulture produce. The company ventured into Kenya in 1982 and focused on processing and exporting vegetables to the United Kingdom. The firm's strategy has been the production and packaging of produce at the source for export directly to market without further packaging abroad. The firm operates its own nucleus of farm production units to meet a given level of demand, plus a network of farmers contracted to provide the balance. It is an out-grower model.

In order to ensure quality, and supply of fresh produce, Homegrown enters into partnership with local farmers to complement its own production. Through this partnership, the company is able to source about 25 % of total requirements and in some cases, such as French Beans, 100 % of the total requirement from independent farmers (as opposed to employees farming company land). Farmers are supplied with the latest farming technology, such as crop varieties and husbandry techniques. The provision of technical extension by the contractor has played a key role in ensuring that farmers are able to optimize production in both quality and quantity. Homegrown also supplies fertilizers, and agro-chemicals on credit to those farmers who need it, as many small farmers still find it difficult to obtain credit despite the importance of the sector. Kenya's financial market remains somewhat biased against agricultural production.

All farmers supplying to Homegrown must have a supply contract. The contract stipulates the specific commodity, the supply period, the desired quality and quantity, and the price. The system implies that farmers manage production schedules and the necessary inputs to meet the contracts. Farmers also agree to follow recommended crop husbandry practices to maintain required quality. Contracts allow Homegrown an assurance of production. The major constraint faced by the company is ensuring that farmers follow technical instructions so as to produce the required quality and quantity standards. This is especially important for those commodities in which the company is entirely supplied by contracted farmers. The EU market has exceptionally stringent standards for agricultural products; so there is very little room for error.

There are both benefits and constraints to Homegrown out-grower model. Farmers enjoy the benefits of an assured market for their produce, and an assured price for various grades of produce. Homegrown can assure farmers of a market for their produce because of its extensive knowledge of, and connection with, global buyers. Homegrown will also look after the logistics of the sale. The "just in time" nature of the business makes this a critical activity. However, Homegrown requires strict adherence to delivery schedules, agreed quantities and quality standards. The contract terms can be very demanding with little flexibility. Furthermore, farmers sometimes feel that the market price offered by the company is low compared to the prices for the final product, a tension that needs careful management to ensure all parties feel fairly treated.

MAP 6.3: Locations for Potential Commercial Investment in South Sudan



The MAF has recently outlined a more detailed program for private investment in high value fruits and vegetables (as well as for cereals and tree crops such as oil palm, tea and coffee). Map 6.3 highlights the locations where these investment opportunities may be pursued.⁶⁰

The foregoing strategy is informed by the characteristics of the market as well as lessons drawn from the experience of Kenya and other Sub-Saharan countries. Kenya is a successful exporter of fruits and vegetables, and is presently the leading all-season supplier of high quality horticultural products to brand name supermarket chains in the EU and several other countries in Europe. The sector has had phenomenal growth rates averaging over 15% a year with consistently rising annual sales, which reached \$330 million in 2010.⁶¹ As of June 2011, as many as 22,000 smallholder Kenyan farmers were engaged in export-oriented horticulture, with over 17,000 persons employed by firms across the horticulture value chain. The industry has made a transition from the dominance of an amalgam of smaller farmer/local exporter selling their produce to independent importers in Europe to a fully integrated sector controlled by a few large farms controlling the value chain and selling directly to large supermarkets in the importing countries. These firms are able to: (i)

provide the logistics at a level that ensures economies scale in operations; (ii) meet the demand preferences of supermarkets who prefer to deal with a small, but well organized and integrated suppliers; and (iii) adhere to the stringent quality assurance (phytosanitary standards) requirements of importing the countries.

The Kenyan model for development of a high value fruits and vegetables market is built on the following seven key elements.

- *Policy of openness to FDI:* The government has enacted laws and adopted legal frameworks such as the abolition of export and import taxes, allowing residents to open foreign currency denominated accounts and liberalizing borrowing regulations for domestic and foreign companies. In response to these incentives, new investments have been attracted from India, China, United Kingdom, Italy and Germany. Due to its openness, Kenya, as a member of the East African Community and COMESA, now serves as the business hub for investors in Eastern Africa.
- *Upgrade of human capital:* Kenya has moved from low cost labor force to one with critical mass in the

60 See Hon. Betty Achan Ogwaro, Minister of Agriculture, "South Sudan: The World's Newest Investment Destination." Presentation to the AgriBusiness Forum, Johannesburg, South Africa, 19th October 2011.
61 USAID DIA report, 2011

number of workers with skills and technical expertise, capable of meeting the human resource needs of the firms in the sector. Investors point to a competent and motivated and productive labor force,

- **Build key infrastructures:** Kenya has a good network of roads (trunk and feeder) that leads to ports (Mombasa) and Jomo Kenyatta International airport with modern cold storage and freight handling facilities. Kenya's export processing zones (EPZ) boast of good supply water, electricity and ICT.
- **Decrease investment risk:** Although Kenya is still experiencing high level of corruption, there have been improvements as reflected in Kenya's ranking in the World Bank Doing Business Index. Kenya laws recognize and protect property rights and the enforcement of contracts. Furthermore, the level of communal violence has decreased in the aftermath of the 2007 election crises.
- **Create business friendly institutions and support industry:** In order to diversify its economic base Kenya created the Industrial and Commercial Development Corporation (ICDC) and the Development Finance Company of Kenya (DFCK). Both organizations provide loan and equity financing. Furthermore, while providing facilitating leadership, the government has allowed firms to operate without undue government intervention or bureaucracy.
- **Improve on natural resources:** Although Kenyan horticulture firms engage in crop production, they have engaged in value adding production system and product transformation such as increase fertilizer use, all season cropping through irrigation farming, and

product upgrading through packaging and processing such as canning, drying and freezing.

- **Expand extension services and encourage private sector and civil society organizations:** Kenya farms enjoy a high level of extension services from the Ministry of Agriculture and Rural Development and Kenya Export Development Support (KEDS) and Kenya External Trade Authority, which is responsible for the overall policy direction. The government also provides support to the Kenya Agricultural Research Institute (KARI), the Fresh Produce Exporters Association of Kenya among others.

6.4.5 Development of the Livestock Industry

Current status of the industry. Livestock production represents a significant proportion of agricultural activity in South Sudan. The main populations of livestock are cattle, goats, sheep and poultry: the main products are meat, dairy products, hides and skin and eggs. Livestock production, especially cattle, is undertaken in the more arid and semi-arid zones such as East Equatoria. Livestock systems are either nomadic pastoralist or mixed crop-livestock systems and are a major source of livelihoods, especially in the floodplains and the semi-arid pastoral areas. Table 6.6 shows the estimated livestock population by state. According to these estimates there are almost 12 million cattle, 14 million goats and 13 million sheep in the country. This population is equivalent to about 2.6 animals per hectare of grassland in South Sudan as a whole and 1 animal per hectare of grassland and savannah. These population densities per hectare are relatively high.

Table 6.6: State Distribution of Livestock in South Sudan (In thousands)

State	Cattle	Goats	Sheep	Total	
				Number	Share (%)
Upper Nile	990	651	447	2 088	5.4
Unity	1 189	1 511	1 784	4 484	11.7
Jonglei	1 475	1 423	1 227	4 126	10.7
Northern Bahr el Ghazal	1 590	1 306	1 658	4 554	11.9
Western Bahr el Ghazal	1 256	1 184	1 139	3 579	9.3
Lakes	1 320	1 252	1 489	4 061	10.6
Warrap	1 539	3 131	1 392	6 061	15.8
Central Equatoria	883	1 286	1 173	3 342	8.7
Eastern Equatoria	895	1 042	1 152	3 088	8.0
Western Equatoria	680	1 189	1 152	3 020	7.9
Total	11 816	13 974	12 612	38 402	100.0

Source: FAO, South Sudan, 2010.

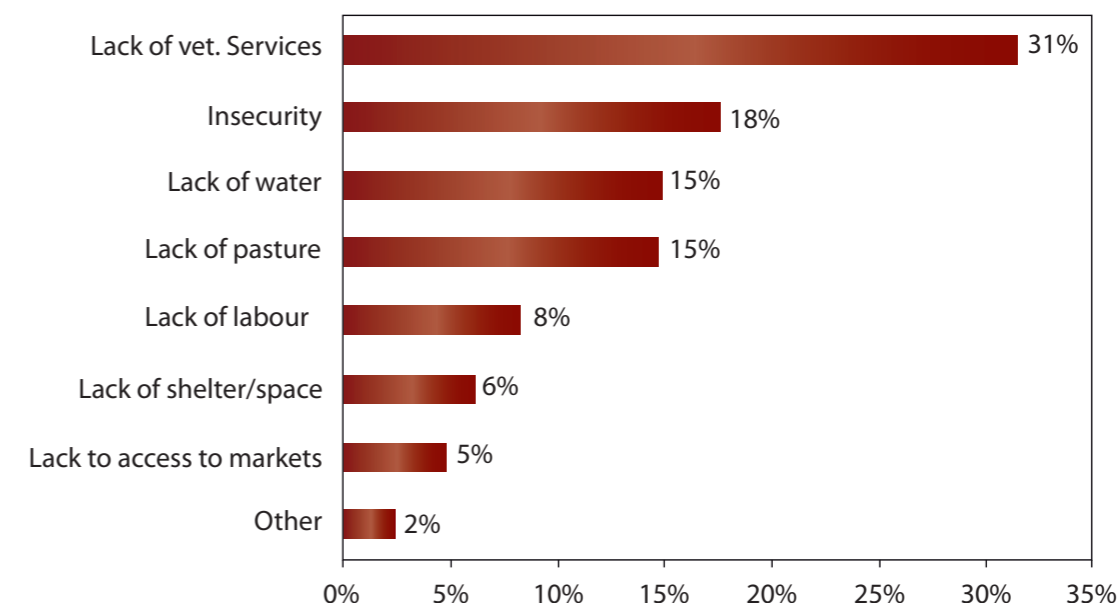
Livestock is an important economic asset, in addition to having a huge cultural value. Ownership of cattle is also a risk mitigation tool for pastoralists and farmers, the latter continually facing uncertainty caused by crop failure. Data from the Ministry of Animal Resources and Fisheries as well as the Food and Agricultural Organization (FAO) indicate that about 85% of South Sudanese households own one or more animal. This suggests that South Sudan has approximately 1.1 million livestock farmers.

Even though livestock is ubiquitous across South Sudan, from the southern equatorial forests to the arid and savannah north, the commercial value of livestock remains negligible. The estimated value of livestock production and products suggest that the income generated currently stands at about SDG 1.4 billion annually, equivalent to only 20% of the sector's potential. Market value is limited to the sale of red meat, mostly within the immediate local rural market and adjacent urban centers, particularly Juba, Yei and Malakal; some livestock is also sold to Sudan. Several years back South Sudan exported cattle to Uganda

and Kenya and through the Port Sudan to Saudi Arabia and other regional markets. Paradoxically, South Sudan currently imports meat from Uganda in spite of having the largest number of livestock per capita in Africa.

Major challenges facing the livestock industry. Perhaps, the single most important challenge to the transformation of the industry is social model, which circumscribes market orientation and limits value chain exploitation. Currently, livestock in South Sudan is not viewed as an industry as much as it is a deeply rooted cultural phenomenon that represents the very fabric of South Sudanese society. The livestock ownership is not measured by the market value of the animals; instead, it represents a status symbol that commands respect of the community and provides the owner with a source of nutrition and the ability to settle marriage dowry. Occasionally, cattle owners sell some stock, usually from his/her very old (oxen) stock to generate supplementary income. Consequently, only a small fraction of the commercial value is currently being realized.

Figure 6.2: Constraints to Livestock Production in South Sudan



Source: WFP-FAO-MAF 2006

The prevailing social model is not only a hindrance to growth and poverty reduction in the country, but represents a significant opportunity cost, in terms of lost growth and income. It is also a risk to food security and sustainable development of the country's natural resources. Projections of South Sudan population growth and

domestic and external demand for livestock and livestock products highlight the urgency to transform the current social model into one with a commercial orientation. Furthermore, as the livestock population increases, there will be more pressures on grazing land and water resources, heightening the prospects of more conflicts

among pastoralist and between pastoralists and farmers as they compete for limited fodder and water resources. Transforming and commercializing the sector is, therefore, an urgent necessity. Achieving this transformation will require, in addition to a mindset change, the alleviation of other constraints facing the sector.

The above-mentioned 2006 survey undertaken with the support of FAO and WFP identified a number of concerns among livestock producers, the most important of which was the lack of veterinary services. As Figure 6.2 indicates, 31% of producers cited lack of these services as their main concern.

Even though changing from the social model is the paramount obstacle to transforming South Sudan's livestock sector into a commercial orientation, several other constraints must be addressed if the sector objective is to be realized. Looming among these other constraints are the following:

- *Weak off-farm infrastructure.* In addition to generalized paucity of basic infrastructure such as roads (trunk and rural/feeder), South Sudan suffers from inadequacy of livestock markets where farmers trade their livestock. Given the size of the country and the dispersion of farmers over a wide area, there is need to create several more markets with the necessary facilities.
- *Insecurity and cattle rustling.* Even though the war with Sudan has formally ended, South Sudan is still faced with pockets of internal insecurity from ethnic conflicts and the existence of factional militia. In addition, cattle raids are still pervasive. Both factors combine to impede trade and limit investment, circumscribing the development of the livestock sector.
- *Lack of trust.* Inter-communal strife and low level of trust among South Sudanese constitute a hidden tax

on transactions. In the livestock sector, the absence of trusts can hinder the formation of farmer cooperatives and the establishment of partnership in value chain exploitation.

- *Poor breeds.* The prevalence of domestic genotype livestock breeds limits the productivity and yield of the sector. Almost all livestock in South Sudan comprises of the Toposa and Ingessana indigenous breeds, which have not been upgraded for many generations.
- *Poor animal health.* The prevalence of animal diseases limits the market value of livestock and represents a binding constraint on exports of South Sudan livestock. Rampant existence of tse-tse fly and recurrent outbreaks of Rift Valley Fever effectively quarantine livestock to local markets. Low availability and access to adequately qualified animal health service providers and poor animal husbandry practices among farmers lead to low births and high mortality rates for both young and mature herds, resulting in low yields
- *Inadequacy of animal feeds.* South Sudan livestock suffer productivity losses due to poor animal nutrition due to poor or inadequate grazing practices, poor pasture and water management and lack of supplement in animal diet.
- *Nascent private sector and low level of entrepreneurship.* The private sector in South Sudan is under developed and lack entrepreneurship, stifling the formation and management of agric-business in general and livestock operations, in particular.
- *Challenging economic policy environment.* Several policy factors inhibit growth of the livestock sector. These include: (i) inadequate and high cost of labor; (ii) high transportation costs; (iii) unclear land tenure; and (iv) high and multiple taxation.

Strategy for expansion of the livestock industry. The livestock industry in the country has a very substantial potential to emerge as a major food product industry in the decade ahead. The Government has identified the industry as a principal axis for making agriculture the engine of growth and poverty reduction in the country. Under the medium-term industrial strategy (2011-2016) outlined by the Ministry of Commerce, Industry and Investment in 2011 the key objectives for the livestock sector are: (i) increase domestic sales of red meat from the current level of about \$200 million to \$250 million a year by 2015; (ii) expand the number of primary markets for livestock from 117 at present to 380 by 2015; and (iii) develop an export market for red meat, with sales of \$50 million a year by 2015.

As with programs for cereals production, South Sudan can draw on the experience of Ethiopia for the design of its livestock program (see Box 6.3 above). However, the design of the program must also address the unique constraints facing the sector in South Sudan, particularly with respect to the imperative for a paradigm shift from the social to a market mindset model. A three-tier approach is proposed for attaining the objective: (i) changing mindset using a versatile and context relevant information communications campaign; (ii) the creation of a market-based platform; and (iii) with government support, creation of a private sector driven value chain system that focuses on production.

- *Launching a national campaign to change mindsets in local communities.* Changing to market and commercially oriented mindset is the single most important factor for the development of the country's livestock sector. Unlocking the enormous commercial potential of the industry will entail a transformational cultural change from the current social model of acquisition and conservation to a commercial market model that monetizes stock through market-based transactions. It will entail the use of a detailed focus group that does the following:
 - o Identifies the target audience which is all citizens, particularly livestock farmers.
 - o Conveys a clear message that development of a commercial livestock industry will enhance economic welfare.
 - o Identifies change agents. These will include commercially oriented farmers, key government advocates, committed community leaders, logistic providers, and niche markets that can benefit livestock producers.
 - o Highlights successful cross-border livestock examples, including Ethiopia, Kenya and Uganda.

- o Establishes and disseminates information on structures to help farmers, including for example, extension services and transport logistics.

- *Creating a market-driven commercial platform.* This will entail establishment of several primary markets for the sale of animals, the exchange of information between farmers, traders, agents and slaughterhouses. The objective here is to bring market players together in an integrated system to improve the value chain for meat production. The system should be built around the existing commercial trading market centers, including industry working groups in Greater Kapoeta region in Eastern Equatoria, Nyrol and Pibor Counties in Jonglei, Nasir, Baliet and Renk in Upper Nile; Panyinjar, Mayon and Leer in Unity; and Terekeka in Central Equatoria. With support from the Ministry of Animal Resources and Fisheries, the working groups should include all segments of the meat production value chain, including operators of slaughter houses, traders and market agents. The Chamber of Commerce could play a key role in facilitating the working group. Such a market-driven system will value and price animals according to their potential for high meat and hides quality, sending a tacit message to farmers about the value that the market places on the intrinsic quality animals.

- *Creating a sustainable value chain, emphasizing production of high quality livestock.* The low quality of breeds, poor animal health practices and low quality of animal product safeguards constitute the main technical challenge because of the impact they exert throughout the value chain. In addition, the government should rein in cattle rustling and improve infrastructure logistics. A key imperative for creating a strong value chain hinges on the production of high quality market-bound animals. Hence emphasis should be placed on:

- o The enactment of policies and regulatory initiatives to raise the quality of cattle and meat. This will entail the adoption of international SPS standards.
- o Improvement of animal husbandry, including technical assistance through the provision of a critical mass of experts who are paired with community animal health workers, and extension service officers that cover all aspects of animal husbandry – from training of farmers to ensure proper feeding and breeding of animals to the establishment of modern slaughter houses and cold storage.
- o An overt effort to produce high quality animals. Government could initiate a time-bound price

Box 6.3: Insights from the Development of the Livestock Industry in Ethiopia

In 2006 Ethiopia had close to 45 million head of cattle, which is continuing to expand rapidly in number. Ethiopia is currently the largest livestock exporter in the Eastern Africa representing about 10% of the country's export earnings, which amounted to US\$165 million in 2007 with strong showing in live animal sales, meat and hides and skin exports. Export destinations are diversified and include regional markets, Kenya, Somalia, Egypt and Sudan and global destination, primarily: Saudi Arabia, UAE for live animals and meat and, UK and China for hides and skin.

Ethiopia's exports are driven by small-scale pastoralists and livestock cooperatives that work closely with private sector value chain operators – all with a strong trading mindset; the country has very few large-scale livestock farmers. The government has played a support role in the industry, including: (i) enforcement of animal health and product quality standards, deregulation of domestic prices, liberalizing foreign trade; providing institutional support for the export sector; (ii) promoting a liberal investment climate; and (iii) with the support of state governments, providing access to grazing pastures. With support from the central and state government, support institutions have been created such as high quality SPS labs, an extensive research and development platform that includes several veterinary faculties, and colleges for the training of farmers, health workers and service providers.

subsidy program with a minimum price offer for animals that meet international quality standards. This may entail entering into sales contracts with guaranteed prices. The subsidy should be phased out as soon as market agents are entrenched and equipped to handle grade classification and pricing animals based on quality.

- o Create quality and reliable infrastructure to enhance timely market access of farmers. The access should include both backbone infrastructure and feeder roads that reduce transport costs and ensure timely arrival of products to the market as well as cold storage and other facilities.
- o Launch a robust survey of regional and international markets to determine demand requirements and develop an action plan to meet the needs of these markets. Given the limited size of the domestic market, a central thrust of the marketing strategy will entail the development of external niche demand markets mimicking relevant elements of the Ethiopian market diversification model.

For the purpose of estimating the water requirements of the livestock industry for the water demand analysis in Chapter 5, Annex Table 6.4 assumes that the livestock population will grow at 3% a year in the decade ahead, with the total population of cattle, sheep and goats exceeding 50 million by 2020. It is by no means certain that the livestock population will grow in this manner, but if it did, livestock densities in South Sudan would rise in the decade ahead, also driven in part by the proposed expansion in cultivated areas. These potential land pressures will require close attention to the manner in which the commercial livestock industry is developed. With a major expansion in commercial farming, it may be that an increasing large share of the livestock population

does not migrate but becomes more fully integrated into farming operations that combine cultivation and sale of animals for meat production and into the development of grazing reserves that combine forest reserve management with livestock farming, or integration of livestock farming with tree crop agriculture, including for example, oil palm, cashews, coffee, citrus and mango. In addition to forage found under these plantation crops, products from the tree crops can also be used to increase feed supply for livestock.⁶²

6.4.6 Fisheries and Forestry Development

Fishery development. According to a 2010 baseline survey report on agriculture and animal resources in South Sudan, about 14% of households in South Sudan, particularly those in the Sudd area along the River Nile and its tributaries, engage in fishery as a means of livelihood.⁶³ Detailed statistical data for the industry does not exist because no field assessments have been undertaken; however, the fisheries production potential is believed to be in the range of 100,000 to 300,000 metric tons per year. This is based on combined water surface area of 90,000 square kilometers of the River Nile. According to an FAO (2008) report, aquaculture development may have vast potential in the Central, Eastern and Western Equatoria states, in the Northern and Western Bahr El Gazal states, as well as in Warrap state. In addition to river and lake fishing, there is significant potential for fish farming in South Sudan that remains to be exploited.

The main constraints to fisheries development in South Sudan are the absence of policy incentives, lack of storage facilities due to weak or total absence of power supply and the absence of effective processing technologies. In addition, inadequate transport infrastructure which limits producers access to markets, is a deterrent to fisheries development in South Sudan.

Forestry. South Sudan has diverse natural forests and woodlands, making it one of the richest areas of concentrations of biodiversity in Africa. It is estimated that natural forests and woodlands of South Sudan cover a total area of about 207,422 km² or about 33% of the total land area. These moist forests contain valuable commercial products, including cabinet grade timber trees such as mahogany, ebony and teak, among others. In addition to the direct benefits in the form of income, food and fodder for wildlife and domesticated animals, the forests provide many vital indirect benefits in forms of environmental protection (shade, wind belts), improved agricultural production (from increased soil fertility through mulching and nitrogen fixation) and food (Shea butter and wild fruits and fodder for wildlife). As Table 6.7 indicates, forest reserves account for only 3% of the total forested area of the country and commercial plantations are negligible accounting for about 0.1% of the total forested area.

The main challenges to the existing natural forests and woodlands in Southern Sudan include: forest base degradation from wild fires; overgrazing and over cutting of trees during successive wars. According to a MAF-GOSS 2006 report, the productivity of South Sudan natural forests and woodlands is low and declining due to shallow soils found in many areas and intermittent droughts, which limit tree growth. The absence of a strong forestry management, policy and regulations, has also contributed to degradation and inefficiency in forestry development and exploitation.

6.4.7 Infrastructure Requirements for Agriculture

The availability of arable land and favorable climate is a necessary, but not sufficient condition for successful development of the sector. A critical requirement is the availability of logistics, including key off-farm infrastructure, to facilitate timely and cost-effective movement of products to domestic and international markets. The required infrastructure includes, for example, trunk and feeder roads, airports with regular flights to market destinations, cold chain facilities that include cold storage at airports and other destinations, reliable road transport services at competitive freight rates, prompt customs clearance for exports and key agricultural inputs that must be imported. To compete effectively in regional and international markets and against imports of agricultural products from neighboring countries, and attract the large amounts of FDI that will be required, South Sudan must have the ability to facilitate the provision of essential off-farm infrastructure. The key requirements include the following:

- A network of market access roads: trunk roads as well as rural/feeder roads.
- Off-farm storage and processing facilities.
- Cold chain facilities, including cold storage at airports and other locations throughout the country.
- Reliable supplies of electricity and water
- Airfreight processing stations key airports that can operate 24 hours a day.
- Reliable and economically affordable road and air freight to the main consumer centers in the region and overseas.
- Access to low cost communications networks.
- Adequate supplies of skilled labor.

Some of these facilities would be provided by the national or state governments and some by the private sector. As the discussion in the next Section indicates, where appropriate the latter should be integral parts of the proposed SIAP agreements with potential investors.

Transport requirements for agricultural development. The transport requirements of the country and proposed action plan for addressing these requirements is discussed at some length in Chapter 7. In sum, the current road network is fragmented with many roads unusable during the rainy season. Transport typically entails long travel time and high prices. These shortcomings impede access to rural and agricultural production areas, leaving them isolated from markets for more than half of the year. There is substantial evidence that investments in roads and improved road connectivity positively affect agricultural productivity and output. Experience from other countries in Sub-Saharan countries indicates that a relatively low level of road infrastructure and long average travel times result in high transaction costs for sales of agricultural inputs and output that, in turn, limits agricultural productivity and growth.⁶⁴ However, remoteness and demand constraints may not be the only factor limiting production. Improved roads will not reduce transport and marketing costs significantly in the short-term if transport and trade services are not competitive or volumes of marketed products are small. Similarly, production increases may not be forthcoming in the absence of availability of credit, land tenure arrangements that encourage investment and government policies that increase risk.

The Government is keenly aware of the poor state of the road network and of the fact that lack of rural connectivity

Table 6.7: Forest Land in South Sudan (Hectares '000)

Land use category	Area	Share (% of total)
Forest reserves	640	3.1
Forest plantations	23	0.1
Other forested areas	20 079	96.8
Total	20 742	100.0

Source: Table 6.1 and government sources.

⁶² The integration of livestock into tree crop farming has been studied in some detail in Asia and the Americas, for example, but there has been very little done on these possibilities in Africa. See, for example, FAO, "Integrating Crops and Livestock in West Africa." Chapter IV. FAO Corporate document Repository. www.fao.org/DOCREP/004/X6543E/X6543E04.htm.

⁶³ The Joint Baseline Survey Report of the Agriculture and Animal Resources in South Sudan by GOSS/FAO with financial assistance for the European Union. A table summarizing the key agriculture baseline survey indicators as attached as Annex 1.

⁶⁴ See Dorosh, Paul et al. (2009), Crop Production and Road Connectivity in Sub-Saharan Africa: A Spatial Analysis. Africa Infrastructure Country Diagnostic, World Bank, Washington DC, Working Paper 19, February 2009; and Doroash, Paul et al. (2012), "Road Connectivity, Population, and Crop Production in Sub-Saharan Africa." Agricultural Economics 43 (2012), pp.89-103.

(trunk and feeder roads) is the binding constraint to agricultural transformation and growth in South Sudan. It is the inability to connect rural communities to urban, regional and global markets that severely constrains economic growth and poverty reduction, particularly in the rural areas.

Rural connectivity measures the access to means of transport, particularly roads by rural communities. Rural connectivity is measured in the following conceptual ways:

- *Rural Accessibility Index (RAI)*: A social-oriented measure that is computed as the share of the rural

population living within two km of an all-season passable road.

- *Market Accessibility*: An approach used by the African Infrastructure Country Diagnostic studies (2009) focuses on market accessibility of agricultural production zones.
- *High Population-High Agriculture Potential Measure*: Advocated by the World Bank in its recent report on the agricultural sector of South Sudan, this is a composite measure of accessibility to the road network by areas with both high population density and high agricultural potential.

Table 6.8: Distribution of Road Network by Zones of Agricultural Potential (kilometers)

Agricultural potential zone	Interstate roads	Other primary	Secondary roads	Tertiary roads	Total roads
HH	389	1 249	1 004	887	3 529
HL	485	641	1 570	1 416	4 112
MH	582	874	1 121		2 577
ML	276	939	1 193		2 408
LH	443	373	535		1 351
LL	522	400	862		1 784
Total	2 697	4 476	6 285	2 303	15 761

Source: World Bank (2011).

The development and rehabilitation of roads in areas with the highest agricultural potential and population density would have a high development impact, allowing small scale farmers to expand production and compete with food imports in the short-run and commercial firms to penetrate and conquer cross-border market and compete effectively in global markets in the medium- to long-run. To facilitate an assessment of the actions needed to improve rural connectivity, the portion of the national road network that is located in each of the six zones of agricultural potential has been estimated. As Table 6.8 indicates, about 10,220 km of roads are located in the three zones with a high agricultural potential (HH, HL and MH) – equivalent to about 65% of the national network, using the World Bank estimates for the size of the national network, which are somewhat larger than the estimates used for this Report in Chapter 7.⁶⁵

For the purposes of this Report, the High Population-High Agriculture Potential Measure has been used to formulate a strategy and action plan to improve rural connectivity in the decade ahead. The approach emphasizes the need to invest in roads in areas with high population density

and high potential for agricultural production. Under this approach, priority access is given to regions or area with “high production potential and high population density” (HH), “high production potential and low population density” (HL), and “medium production potential and high population density” (MH). The objective is to achieve a high Cropland Connectivity (CLC).

Application of the RAI Index with a 2 km requirement for access to the interstate primary road network of South Sudan results in a CLC Index measure of 39%. About 18% of the rural population and 7% of the currently cultivated areas of high agricultural potential are within 2 km of the all season primary road network. This level of rural connectivity was judged to be too low. However, if the rural population and high potential agricultural land that is within 5 km of an all-season road is used, the CLC Index measures 64% for that part of the country that is classified as having high agricultural potential. About 51% of the total cropland and 71% of the rural population in these high potential areas would be within 5 km of all-season roads. This level of road access is judged to provide the basis for a strong agricultural supply response.

Table 6.9: Length of Road Required for Rural Connectivity Target (In kilometers)

Road category	Required all-season roads	Total roads	Required as % of total
Interstate primary roads	2 697	2 697	100.0
Other primary roads	2 764	4 476	61.8
Secondary roads	3 695	6 285	58.8
Tertiary roads	2 303	2 303	100.0
Total	11 459	15 761	72.7

Source: World Bank (2011)

To provide this level of access to an all-season network of roads, about 11,460 km of existing roads would need to be converted to all-weather status, either as paved roads or all-weather gravel roads. This includes the above-mentioned 10,220 km of roads in the zones with high potential and the balance of 1,240 km of the interstate road network. Such a program would convert about 73% of the existing road network in South Sudan to all-weather status. Analysis of the location of these roads relative to the land areas that are classified as having high potential for agriculture indicates that the bulk of the roads are in the three Equatoria states and Jonglei. These four states account for almost 80% of the all-weather road network required to meet the rural connectivity target. Most of this proposed all-weather network is located in the Greenbelt (34% of the proposed network), the Hills and Mountains agro-ecological zone (22%) and the Pastoral zone (21%). As Table 7.7 in Chapter 7 indicates, the proposed program

put forward in this Report to improve road connectivity in the decade ahead calls for the upgrade of 14,560 km of road to paved and all-weather status, including a notional allocation for 2,180 km of tertiary roads pending the results of the ongoing inventory of the road network that will determine the actual length of the tertiary network in place today.

Additional road development targeting areas with high potential for irrigation-based commercial agriculture should also be prioritized and rehabilitated on the merit of the expected high pay-off in terms of agricultural expansion, employment creation and technology transfer. As Map 6.4 indicates, areas with high irrigation potential for possible development in the decade ahead include areas of Western Equatoria, Eastern Equatoria, and parts of the Western Flood Plain Zone, including Northern Bahr el Ghazel and Warrap

Table 6.10: Proposed Distribution of All-Season Roads for Enhanced Rural Connectivity (In kilometers)

State	Interstate roads	Other primary	Secondary roads	Tertiary roads	Total roads	Share of total
Upper Nile	-	9	17	-	26	0.2
Unity	-	72	15	-	87	0.8
Jonglei	84	553	660	590	1 886	16.8
Northern Bahr el Ghazal	200	72	126	-	397	3.5
Western Bahr el Ghazal	286	75	140	-	501	4.5
Lakes	575	69	232	2	878	7.8
Warrap	129	130	282	-	542	4.8
Western Equatoria	589	512	686	539	2 326	20.7
Central Equatoria	578	891	188	562	2 220	19.8
Eastern Equatoria	256	305	1 192	610	2 363	21.1
Total	2 697	2 687	3 539	2 303	11 226	100.0

Source: Ministry of Roads and Bridges.

⁶⁵ The road network data used in the recent World Bank study differ from that used in Chapter 7 of this Report. See Annex 8 for a discussion of these differences.

Water resources and irrigation. Before the second war broke out in 1983, the overall plan for irrigation development in Southern Sudan was to irrigate about 270,000 ha of land.⁶⁶ Because of the ensuing conflict these plans were not realized and there has been no significant development of the country's irrigation potential. The current area of irrigated crop area is negligible occupying only 321 sq km (32,100 hectares) – less than a tenth of one percent of national land space. About 12,700 ha sq km of the irrigated cropland in South Sudan is in Upper Nile state; irrigated areas in Jonglei and Western Equatoria states are 300 and 500 ha respectively, with the remaining 18,600 ha in small parcels of land across the country. In addition, about 6,000 ha of flood land, confined primarily to Northern Bahr el Ghazal, is used for rice production. By livelihood zones, Eastern Flood Plains has most of the national irrigated cropland, followed by the Green Belt and Nile Sobot River Basin.

Given the country's rich land and water endowment, the potential for irrigated agriculture is large. With its substantial water resources, South Sudan can, through irrigation, increase agricultural production by converting into cropland, some parts of its land cover that is currently not under cultivation or is cultivated only periodically. The MWRI has identified irrigation as means for attaining food security and improvement of water management for agriculture and as a remedy to the dual problems of recurrent droughts and periodic floods. The locations for potential development include the following: (i) the lowlands, where farmers make use of flooding to supplement water for growing rice; (ii) areas adjacent to river floodplains, where farmers cultivate short-maturing varieties of sorghum; (iii) areas around swamps/marshes where extension of the growing season is possible by planting in moist soils left by receding floods; (iv) drought-prone eastern mountainous semiarid areas with low water storage and infiltration capacity; and (v) southwest and western (Green Belt zone) whose agricultural output usually exceeds subsistence level and where modern irrigation techniques can further increase agricultural production, enhance food security and supply agro-industries.

The choice of locations for irrigation development should be guided by the prospects and potential to increase cropland and cropping season (i.e. LPG) in areas where, due to low rainfall, unutilized arable can be converted to cropland using irrigation schemes to harness water resources for agricultural production. The analysis of the classification of aggregated land use in South Sudan shows that 27% of existing cropland is located in areas where agricultural potential is high (LPG > 220 days) while as much as 42% is located in areas with medium to low potential because of low LPG. Furthermore, as underscored earlier, the areas with medium to low LPG

have high population densities. On this basis, the best opportunities for expanded smallholder and commercial irrigated-based agriculture appear to be in parts of the Eastern and Western Flood Plains, the Nile-Sobot Rivers area, and the Green Belt zone.

Nile-Sobot River Basin Irrigation Schemes. The potential area that can be irrigated in the Nile-Sobot River Basin is estimated to be about 654,700 ha. On average, the annual rainfall in the Basin area is between 200 to 400 mm. However, with the introduction of irrigation, the area acquires huge potential for increased agricultural production. Development of this potential would make a significant contribution to agricultural output, enhance food security and boost export earnings. It is anticipated that cereals (sorghum, rice, maize), oil seeds (groundnuts sesame, sunflower) and gum acacia would feature prominently in these programs because of the suitability of the soil as well as the large unmet domestic, regional and global demand for these commodities. Along with the introduction of large-scale commercial irrigation, there are opportunities for development of small- to medium-scale irrigation schemes (primarily for production of rice and possibly sugar cane) in the following areas of the Nile-Sobot Basin:

- Between Geigar and Gelhak the development of pump schemes for smallholder farmers is feasible. As much as 11,840 ha could be irrigated in this manner.
- Between Gelhak and Melut there is an estimated irrigable area of 27,890 ha.
- Between Melut and Malakal an area estimated at 17,000 ha could be irrigated.

Western and Eastern Flood Plains Irrigation Scheme. As with the Nile-Sobot River Basin, the Western and Eastern Flood Plains have a significant proportion of its land area is prone to floods. It is estimated that as much as 600,000 hectares of land could be converted into cropland in Warrap, Unity and Jonglei states. However, in these two zones a large amount of the total landmass is covered by trees, flood land and water with rocks. Before this potential can be developed, extensive due diligence and environmental assessments must be first undertaken to ensure that such development is sustainable and based on sound environmental and ecological principles. Moreover, construction of such schemes must also be in compliance with the evolving provisions of the Nile Basin Initiative on water resource management/utilization. Within these two zones, flood rice and sugar cane can be grown on a commercial scale to meet local demands and generate export earnings. Furthermore, alongside irrigation for crop farming, there are opportunities to construct water catchments for better management of floods and droughts and for provision of a year-round supply of water for

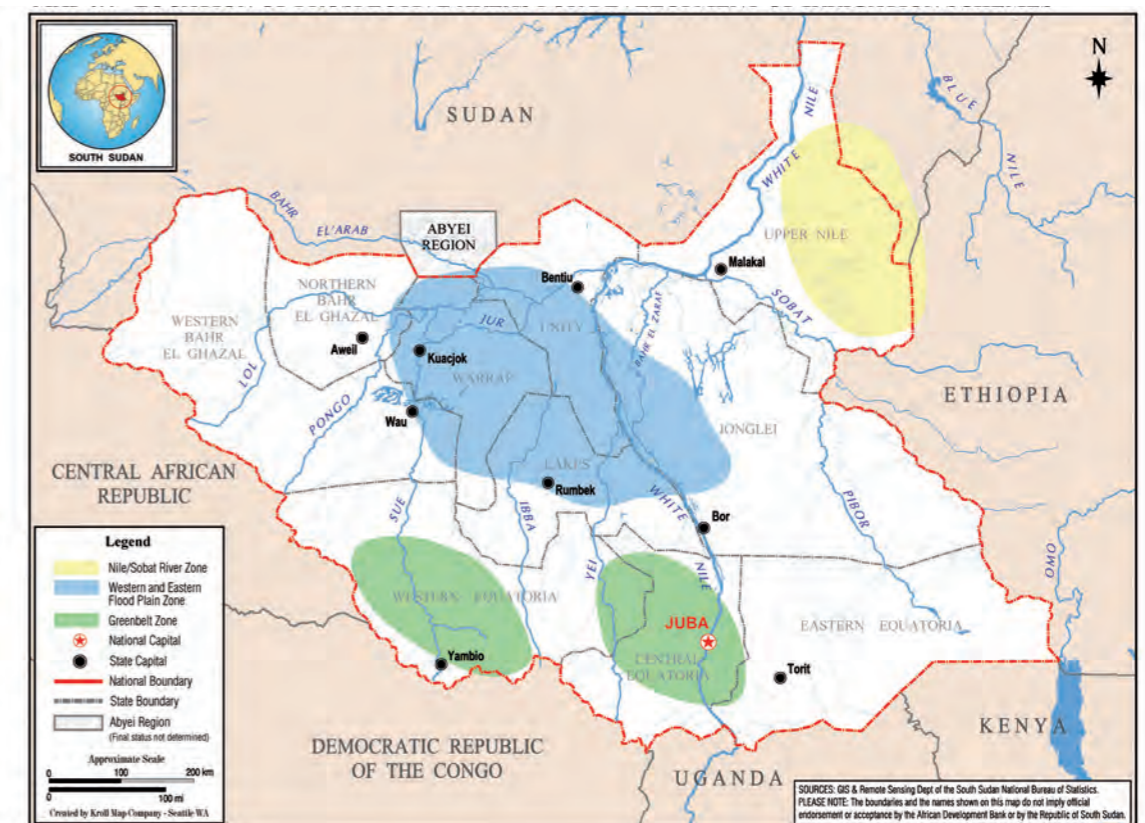
livestock farmers. There are good prospects for commercial livestock farming in the medium term.⁶⁷ In addition to facilitating crop and livestock farming, the construction of catchments will contribute to a reduction of the incidence of cattle raiding and the attendant ethnic conflicts over control of water resources, which is prevalent in the zones.

Mangalla Irrigation Scheme. Mangalla is located at the confluence of the White Nile and one of its tributaries in Central Equatoria state. The area has considerable potential for large commercial farming using irrigation to produce sugar cane. The region has rich alluvial soil within a vast marshy plain from the overflow of rivers during the rainy season. It is estimated that approximately 250,000 hectares can be irrigated. Mangalla is only 45 km from Juba. It has good market access and power supply from bagasse and presents opportunities for operating a cane processing plant that could supply domestic and regional markets.

Irrigation schemes in the Green Belt Zone. As noted earlier,

the Green Belt has a high LPG in addition to being densely populated. It is among the livelihood zones with the highest agricultural potential, having both a long growing period and relative high population density. The zone has approximately 500,000 ha of virgin land under tree cover, some of which can be converted into agricultural land. The introduction of irrigation schemes would provide significant opportunities for year-round cropping activities. The development of small- to medium-scale irrigation schemes in the Green Belt would increase agricultural production and income of smallholder farmers engaged in fruits and vegetables farming. The region's proximity to EAC and COMESA regional markets with sizable unmet demand for cereals and oilseeds provides good market opportunities for producers. In addition, the region has easy and fast access to international markets through the seaport of Mombasa and Juba and Nairobi international airports. Nairobi airport is known to have world-class produce handling logistics for exporters of fresh fruits and horticulture.

MAP 6.4: Location of Prospective Areas for Development of Irrigation Schemes



66 Among the schemes considered then were the Mangalla Sugarcane Scheme in Central Equatoria, Panko (Penykou) scheme for different varieties of crops in Jonglei and, with support from UNDP and FAO, the Aweil Rice Scheme in Northern Bahr el-Ghazal. The Aweil scheme was expected to irrigate an area approximately 2,440 ha.

67 The livestock population of Jonglei, Unity and Warrap accounts for 35% of total livestock in South Sudan.

Development of a national strategy for irrigation and related water management. The foregoing discussion about the potential for irrigation suggests that there may be as much as 1.5 million ha of land that could be brought under irrigation by smallholders and commercial farming. The World Bank has noted that experience in Sub-Saharan countries indicates that economic returns on small-scale schemes have averaged about 26% compared to 17% for large-scale schemes.⁶⁸ These results depend on keeping investment costs down to best-practice levels of \$3,000 per hectare for the water distribution component of large-scale irrigation and \$2,000 per hectare for small-scale irrigation. For each 100,000 hectares of smallholder and medium- and large-scale irrigation brought into production at these best practice costs, the investment costs would be \$200 million and \$300 million respectively. However, these World Bank studies of African experience indicate that the cost of public irrigation has been excessively high. Many schemes failed to capture higher yield levels and failed to transition to higher value crops. Another important consideration drawn from experience in Sub-Saharan Africa is that in most cases, irrigation is only viable for cash crops or high value food crops (such as horticulture). Experience has shown that the economic viability of irrigation for staple food crops is often doubtful. These concerns about economic viability, farm-level profitability and sustainability should guide investment decisions in the decade ahead.

The country's development and growth will also benefit from enhanced use of the Nile and its tributaries as sources of water for irrigation and as a means of transport. However, development of the country's large irrigation potential will need to be undertaken within the framework of a national strategy for agricultural water development. At this stage, it is not clear how much water may be available for irrigation programs from multipurpose dams that are under consideration for the decade ahead, how much water would come from run-of-the-river type schemes, and how much would come from tapping aquifers. More work is needed on the implications of the program for downstream riparian states.

A possible program for irrigation development. As a first step in the development of this potential, this Report proposes that as a matter of priority, a master plan for irrigation development be prepared for the decade ahead. The master plan will need to give particular attention to the amounts of existing or potential cropland to be brought under smallholder irrigation schemes and the amount to be developed under medium- and large-scale commercial farming and the likely investment cost per hectare. Construction costs in South Sudan are known to be high. In the event that water-related investment costs per hectare for large-scale commercial operations were say \$6,000 per hectare, it is entirely possible that the viable area of irrigation land would decline substantially. Furthermore, the proposed program for irrigation development needs to be drawn up within the framework of a national water resources strategy that includes close attention to the domestic and regional institutional arrangements for development of these water resources, along the lines outlined in Chapter 5.

Subject to the completion of a master plan for irrigation that addresses these foregoing concerns, an indicative program for the development of 400,000 hectares of irrigated agriculture has been included in the program for agriculture. The underlying assumption is that 50% would be smallholder farm development and 50% would be large-scale commercial farming with links to the smallholder outgrowers. Assuming application of best practice investment costs, the water related component of the program would cost \$1.0 billion (Table 6.11). The \$600 million for commercial farm operations would have to be mobilized from private investment. The \$400 million required for smallholder development would have to be funded from public sources using Government and donor resources. Assuming the program was successful in concentrating on the production of high value crops that yielded revenue of say \$2,000 a hectare, gross revenues from the program would amount to about \$1 billion a year. This would be a substantial contribution to the GDP of the country, to employment opportunities and to import replacement and or export revenues.

Table 6.11: Proposed Investment Program for Irrigation Development

Indicator	2010	2011	2012	2013	2014	2015	2020
Land under irrigation (hectares '000)							
Smallholder program	32.1	35.0	40.0	50.0	60.0	80.0	200.0
Large scale commercial	-	(15.7)	(2.9)	3.5	25.9	52.0	200.0
Total	32.1	19.3	37.1	53.5	85.9	132.0	400.0
Capital cost per hectare (US\$)							

68 See Foster and Briceño-Garmendia (2010), op cit., and Svendsen, Mark, Mandy Ewing and Siwa Msangi (2008), "Watermarks: Indicators of Irrigation Sector Performance in Sub-Saharan Africa." Africa Infrastructure Country Diagnostic, Summary of Background Paper 4, World Bank, Washington DC, April 2008.

Indicator	2010	2011	2012	2013	2014	2015	2020
Smallholder program	2 000	2 000	2 000	2 000	2 000	2 000	2 000
Large scale commercial	3 000	3 000	3 000	3 000	3 000	3 000	3 000
Cumulative capital cost (US\$ mill)							
Smallholder program	64	70	80	100	120	160	400
Large scale commercial	-	(47)	(9)	10	78	156	600
Total	64	23	71	110	198	316	1 000
Annual capital expenditure (US\$ mill)							
Smallholder program	-	5.8	10.0	20.0	20.0	40.0	50.0
Large scale commercial	-	(47.0)	38.3	19.2	67.4	78.2	106.9
Total	-	(41.2)	48.3	39.2	87.4	118.2	156.9

Source: Estimates by authors.

Such a program would require mobilization of FDI from strategic international agriculture partners (SIAP) and expansion of cropland. The attraction of investors of the Hybrid model should aim to stimulate the development of a local outgrower schemes, farmer cooperatives and other farmer-based organization. The SIAP investor would also be expected to contribute to the provision of modern technology and agric-business management systems and facilitate the creation of the necessary logistics, including river and rural transport infrastructure. One of the side benefits of such a program may be its impact on complementary farming systems, including in particular livestock. These new investments in irrigated cropland farming may also bring investment opportunities in the livestock value chain activities and processes, focusing on market development and consolidation, processing of hides and skin (leather and leather goods) and the establishment of modern slaughterhouses and cold storage facilities.

An important concern related to this proposed program for irrigation is its implications for water demand. Section 5.6.3 in Chapter 5 includes a detailed discussion of the possible growth in demand for water by the agricultural sector. Driven by the proposed expansion in irrigation, water demand for cropland agriculture is projected to increase from an estimated 0.42 billion m³ at present to 4.8 billion m³ by 2020 (see Table 5.5).

6.4.8 Promoting Commercial Investment in Agriculture

Attracting high impact foreign direct investment. As a direct consequence of decades of war and abject neglect, there has been near complete depletion of the country's technical, institutional, financial, man-made and social capital, which has, in effect, circumscribed the country's ability to engineer and sustain development and

growth without direct foreign assistance, particularly, foreign direct investment. The lack of financial and technical resources required for the country to achieve its development objectives is clearly evident in the agriculture sector. As discussed in the preceding sections of the Chapter, notwithstanding its natural land and water resource endowments, the agriculture sector is producing at substantially below capacity with yields that are far below those of less endowed neighboring countries. If the country is to achieve an export-led agricultural transformation and growth, it must attract high impact foreign direct investment and link it to the country's smallholder farmers and farmer cooperatives. Further, given the importance of cereals in the food basket of the population, the cereals industry should be at the center of efforts to strengthen the traditional sector and lay the foundations for a competitive performance in export markets.

The challenge is to identify and attract the right type of foreign direct investment in South Sudan: those with high impact on development and that contribute to building the capital base of the country. South Sudan can benefit from the experience of many other African countries in this regard. The recent experience of South Sudan's neighbors provides a valuable lesson on the type of Strategic International Agriculture Partners (SIAP) that South Sudan should seek to attract. Summarized below are a set of best practices and insights from Ethiopia, Ghana, Kenya, Uganda and other East African countries. Experience elsewhere in the region suggests that there are three widely used operating models for large-scale commercial agriculture:

- *Investor Controlled Model*, under which the investor manages the farm and is the sole entity that grows, harvests and markets crops.
- *The Out-grower Model*: Under this model, the investor does not directly engage in large-scale farming; instead the investor relies on local farms and a farmer groups and independent suppliers to produce crop, which the investor then purchases. A prerequisite for operational

effectiveness of this model is the existence of a well-organized and coordinated structure of local out-grower farmers, with sound agricultural knowledge and capacity to maintain standard and produce high quality crops with minimum supervision from the investor. Investors in bio-fuel schemes often use this model.

- **Hybrid Model:** This model combines elements of the investor controlled and out-grower models. Under the hybrid model, the investor maintains a large-scale farm and also buys crops from local out-grower farmer groups or cooperatives. A key advantage of this model, at least from South Sudan's standpoint, is that the investor plays a role in organizing and training local farms, thus the community benefits from employment, and knowledge and technology transfer. It is common for the investor to initiate this model. However, many African countries, including Ghana, Morocco, Kenya and Ethiopia have developed investment criteria that mandate the foreign investor to integrate traditional farmers and local out-grower producers in the firm's production and supply chain structure.

The position taken in this Report is that South Sudan should identify and attract a SAIP that falls with the Hybrid Model because the relevant local community will benefit from employment opportunities arising from scale operations of the investors as well as the technical transfer and managerial knowledge. The Government should aggressively seek out this type of investors using the resources of the country's investment promotion agency. The Government should also develop structured investment standards and codes that would ensure the inclusion of South Sudan's smallholder farmers and farmer cooperatives in the supply chain of the commercial investor. Prior to entering into SIAP agreements, the Government of South Sudan may want to draw on international experience with best practice SIAP models.

Design and implementation of SIAP agreements: The principal actors are usually the national host government and the international agricultural partner. The foreign partner can be a foreign government, a sovereign wealth fund, a private enterprise endorsed by its home country government. Depending on structure of the deal, other actors, such as multilateral financial institution such as the World Bank or the African Development Bank, or MIGA may be included. The need to involve the host country's government is pivotal because it is the authority best suited to: coordinate internally with state and local governments as well as civil society; structure a legally binding agreement; and, place the investment within the framework of the national development plan. The involvement of the national government also ensures a uniform approach and avoids the prospects of different localities offering competing concessions.

In order to maximize the mutual benefits of the investor and the host country its citizens, the following factors should be central to the agreement:

- **Duration of the agreement.** Land leases (not outright sale) range from 10-99 years. The actual duration will depend on the crop. For example, for annual crops, the duration typically does not exceed 30 years.
- **Labor force and technology transfer.** Most SIAPs agree to recruit and train the local labor force. Labor force is a subject of mutual interest of the country and the investor. SIAPs are concerned about the availability of dependable labor force from which they can draw from; the host country and involved communities are interest in employment creation and skill development. Some agreements do include provisions for temporary and time-bound importation of some labor force when the required skills are not yet available. Many SIAP agreements specifically require that the investor brings modern agricultural practices and technology to the host country, very often transforming the sector from dependence on traditional agricultural methods using simple instrument to the use of mechanized equipment (tractors) and other productivity-enhancing tools and equipment.
- **Compensation.** In addition to taxes, it is common for compensation to include the construction of community facilities such as rural roads, irrigation schemes, water treatment and supply systems, schools, clinics and as well as the training of local farmers or farmer groups on agricultural methods, raising their knowledge and productivity.
- **Land.** Property rights and enforceable land lease contracts are central in land deals as is the protection of the land rights of the community. The involvement of the host government and civil society is central to ensuring the safety of the SIAP investment as well as securing equitable compensation to the community. The central government is best suited to arbitrate and protect the rights of the investor as well as the communities involved in the host country. A good and transparent land deal will entail early involvement of civil society, creating a process where the voices of community members can be heard and their concerns addressed. The deal must be seen to be fair and seen to be equitable in terms of quantity, quality and price of the land involved. Some land deals also address water access issues, including annual water rents.
- **Yield.** One of the many advantages of large-scale farming is that it can contribute to national food security by increasing yields and supply of crops in the domestic market. Agreements usually specify the percentage of output of the investor that must be sold

in the domestic market. The yield percentage must be clearly specified in the agreement.

- **Taxation.** When structuring agreements care must be taken to balance the tax revenue interests of the state and the profitability of the investment of the investor. Depending on the crop and complexity of the farming operation, investors would like to monetize their investments as soon as possible and often seek the granting on tax holidays in order to generate quick cash flows. Other provisions in the agreement deal with land transfer rights, land duties and transfer of profits to the investor's parent company in foreign countries.
- **Security.** Having a stable and political and economic environment that is devoid of conflict is the responsibility of the host government, but is crucial to the investor. If an investor perceives high political risk such as arms conflict, unstable policy environment with the prospects theft or government expatriation, then they will not enter into agreement. It is not unusual for investors to demand a stabilization clause to ensure that the regulatory framework governing investment is not threatened. Both the government and the investor are interested in and will ensure the inclusion of a fair arbitration process that will address disputes that may arise.

6.4.9 Linking Strategic Investors to Smallholder Farms and Cooperatives

In order to maximize the benefits from foreign direct investment local stakeholders must be mobilized and actively linked to the larger commercial farmers. Furthermore, in order to create effective farmer cooperatives that will supply the larger commercial farmers, the members of the cooperatives must be trained by the commercial farmer on modern farming approaches, including the application of fertilizer and pesticides and on methods of ensuring high standard of products.

In recognition of the importance of logistics and access to good arable land and favorable climate (mainly in the Green belt zone) and airfreight services and communities within a radius of one hundred miles to the Juba airport should be targeted. Farmer-based organizations and cooperatives, under the guidance of the Ministries of Agriculture and Forestry and Rural Development and Cooperatives, would enter into supply agreements with the commercial farmers. A technical assistance package for farmer-based organizations and out-growers would be designed and supported by the commercial farmers and the government. Key issues to be addressed in the technical assistance packages would include fertilizer

availability and use, seed cultivation and multiplication, integrated pest control and management, and post-harvest management.

Government should facilitate the leveraging of the strategic partner basket of resources to support the traditional sector. It is well known and empirically documented that most international agricultural investors provide financing resources, technology, off-farm and some basic infrastructure. To galvanize the impact of these benefits, the government should support the creation of agro-business hubs and formation of community-based grower cooperatives and other farmer-based organizations that would be linked with the foreign commercial scale operations in their area. These integrated clusters of the traditional sector are the channeled through which the government, in partnership with commercial farm, could provide technical assistance packages, design some basic infrastructure as well as provide technical and managerial training in very cost ways.

The strategic partner can deliver technical assistance. Raising the productivity of the country's cereal subsector is imperative. The country cereal producers have the lowest yields in Africa. The presence and support of the strategic commercial farmer can reverse this phenomenon. GoSS, through the Ministry of Agriculture, the state level ministries and county departments of agriculture, in partnership with the scale farmer can provide technical training to extension officers and the establishing of farmer field schools.

Strategic farmers can assist seed production programs. With support from government, the strategic international farmer could facilitate the establishment of viable county seed production units. Within the framework of a supply chain that links the international scale farmer to traditional farmers organization, the international farmer will benefit from the establishment high yield seed production units. The government should provide a time-based subsidy to the seed units pending when farmers' operations become financially self-supporting.

Fertilizer production and distribution. At the present time, the vast majority of traditional farmers do not use any synthetic fertilizer, herbicide or pesticide, which, in part, accounts for the low yields relative to farmers in the broader region. GoSS, through the Ministry of Agriculture and Forestry, in close collaboration with the scale farmer, should earmark funds for financing the establishment of a fertilizer plant and a distribution system that enables farmers and farmer based organization to acquire fertilizer in a timely and cost effective manner.

Higher quality and more widely available extension services. Continuous training and development is an absolute necessity in order to upgrade the competitiveness

of the cereal industry. Specific and dovetailed training targeting agronomists should be institutionalized and administered through State and County government structures. Training/skills development is needed in:

- Production practices of the different grains
- Food science and practical skills in grain processing as business units
- General business skill (including farm management and financial, marketing and risk management)
- Pesticide use and handling, market quality assurance and SPS requirements
- Collection, handling and interpretation of market and business information

Adaptive research. Sustainable competitiveness of the South Sudan cereal sub-sector will depend on its ability to adopt and adapt latest and relevant production and processing technologies. A research laboratory that aims at commercial application of such technologies will ensure that extension services provide and dovetailed to South Sudan circumstances.

Mechanized farming equipment. Currently approximately 80% of local production comes from small and traditional farmers. Only a tiny proportion is mechanized agriculture and limited to the Upper Nile region. The absence of mechanized tractors (or at the least, animal draught ploughs) has resulted in the absence of scale and yields on all of the main cereals in South Sudan. The Government has purchased various models of tractors and distributed to each of the ten states with the objective of encouraging the mechanization of land preparation and other field operations. The tractors are, in principle, available for hire by farmers, farmer groups and cooperatives, at a cost ranging from 50 to 240 SDG/feddan for land preparation. Over 400 tractors have been distributed to the states since 2005. Given the limited infrastructure on the ground, there are concerns regarding the capacity to maintain these tractors locally. The Ministry of Agriculture and Forestry should scale up the acquisition and distribution of tractors and ploughs along with the requisite comprehensive training program for operators. In this regard, selected farmers should be trained in basic tractor operations, including the mounting and setting of implements. Fully equipped workshops should also be established in the state centers along with trained mechanics to maintain, service and repair both government and privately owned tractors. The Government should also ensure that access to these tractors is equitable and that they are available to female farmers.

6.4.10 Capacity Building and Technical Support

A key component of the proposed strategy outlined in This Report for agricultural development in the decade ahead is to build capacities with the national government and the state governments for provision of basic services to smallholder farming communities. As noted earlier in this Chapter, farmers, pastoralists, and people that depend on fisheries for a livelihood, have cited lack of technical support services for a wide range of activities in the sector as a major obstacle to increased production. These include, for example, inadequate supplies of improved seeds and planting materials, inadequate support for the management of animal diseases and pests and diseases in crops, and issues related to land use.

A comprehensive list of ongoing donor-funded capacity building and technical support is not available for the Ministry of Agriculture and Forestry, the Ministry of Animal Resources and Fisheries, and the state government ministries responsible for the agriculture sector. Information from the AIMS database of the MoFEP identifies \$11.5 million of technical support and capacity building in 2010, with actual disbursements of \$6.8 million during the year – equivalent to 11.4% and 9.4% of planned and actual total disbursements in 2010. There is significant provision of technical support and capacity building in other ongoing programs supported of donors. For the purposes of this Report, it is assumed that the total amount of technical support and capacity building funded by donors in 2010 was 30% of their total disbursements. This puts the total amount of such support at about \$27 million a year at the present time. The total operating budget (salaries plus operating expenses) of the MoAF and MoARF taken together for 2010 and 2011 was \$19 million equivalent (Table 6.11). Donors and government are therefore spending about \$50 million a year on agricultural services of various kinds (other than capital expenditures) – equivalent to about \$35 a year for each rural household. It is not clear how much of these services provide reasonably direct benefits to the rural population of the country. The position taken in this Report is that for successful implementation of the proposed strategy for agriculture, there will have to be a major expansion in basic extension and other services to smallholder farmers, pastoral and fishing families. Some of the increase in services will come from commercial investors under the proposed out grower models; but there will also have to be a significant increase in public support services as well.

In the early stages of the program, build-up in these

public service capacities would be undertaken by the government with strong support from the international donor community. In the latter part of the decade, large scale commercial investors would become important suppliers of services to smallholder farms that contract to supply agricultural, livestock and fisheries products on a regular basis. As Table 6.11 indicates, operating services funded by the government and donor community would need to increase to close to \$100 million a year by 2020, with much of the \$50 million increase going into extension, veterinary and other direct services to farm families.

6.5 Development Expenditure Requirements and Financing

The proposed program for agriculture, forestry and fisheries will require a significant build-up in recurrent and capital spending in the sector. The program for the decade ahead is built around three broad thrusts: (i) a major expansion in private investment in medium- and large-scale commercial farming to supply the domestic and international markets with a range of food products and agricultural raw materials; (ii) a substantial build-up in public spending on services provision, especially for smallholder farms, combined with efforts to improve access to working capital loans and agricultural inputs; and (iii) a substantial improvement in the quality of infrastructure in these areas, in the degree of access to markets and in the cost of the infrastructure services.

6.5.1 Private Investment in Agriculture

As discussed earlier, a key objective for the sector is to raise the growth in production and value added to about 6% a year in real terms by the latter part of the decade ahead. Achieving sustained strong growth of this kind will require a substantial increase in private investment in the sector in the decade ahead.

There is no up-to-date and complete information about current levels of private investment in the sector. There are two distinctly different components for the estimates of private investment. One is capital improvements on smallholder farms that are undertaken primarily with the use of farm labor with little or no use of outside capital. The other is investment undertaken on medium- and large-scale farms that are funded primarily with debt or equity financing by the private investors concerned. In kind capital expenditures by smallholders is assumed to be about \$10 million a year during 2010-11, with a steady increase to about \$65 million a year by 2010.⁶⁹ Investment outlays by commercial farmers are assumed to be in the range of \$20 million a year at the present time. Commercial investment in agriculture is projected to increase sharply in the decade ahead to about \$600 million a year by 2020 (at 2010 constant prices and exchange rate). A substantial part of this investment would come from offshore private investors, some of which would involve joint ventures with domestic partners. For the decade as a whole, the amount of private investment required to achieve a 6% growth rate is projected to be about \$2.6 billion (at 2010 constant prices and exchange rate).

Table 6.12: Indicative Cost for Development of the Agriculture, Forestry and Fisheries Sector
(\$ millions at 2010 constant prices and exchange rate)

Category	Estimate		Projection					Total 2011-2020
	2010	2011	2012	2013	2014	2015	2020	
Management and service provision								
National government	18.3	19.9	21.9	24.5	27.4	30.7	54.1	342.8
Capacity building & technical support								
Donor programs	21.9	27.1	28.5	30.0	31.5	33.0	36.8	326.3
Capital expenditures								
Donor programs	51.0	63.2	66.5	70.0	73.5	77.0	85.8	761.4
National government	4.1	16.1	32.3	48.1	65.6	84.6	172.9	964.0
Private sector	25.0	30.0	60.0	100.0	150.0	206.0	675.9	3 109.9
Sub-total	80.1	109.3	158.8	218.1	289.1	367.6	934.5	4 835.4
Total								
Government	22.4	36.0	54.2	72.6	93.0	115.3	227.0	1 306.8
Donor funding	72.9	90.3	95.0	100.0	105.0	110.0	122.5	1 087.8

⁶⁹ See Annex 7 for a discussion of the basis for these estimates.

Category	Estimate		Projection					Total 2011-2020
	2010	2011	2012	2013	2014	2015	2020	
Private sector								
Smallhold farmers	10.0	11.4	17.5	23.9	36.7	49.7	65.6	460.7
Commercial investment	15.0	18.6	42.5	76.1	113.3	156.3	610.3	2 649.2
Sub-total	25.0	30.0	60.0	100.0	150.0	206.0	675.9	3 109.9
Grand total	120.3	156.3	209.2	272.6	348.0	431.3	1 025.4	5 504.5
Memo items:								
Growth in basic services (% p.a)		8.5	10.0	12.0	12.0	12.0	12.0	
National budget allocation for sector (%)	1.0	1.5	2.0	2.5	3.0	3.5	5.0	
Total budget expenditures (US\$ mill)	2 342.9	2 423.2	2 710.0	2 905.0	3 100.0	3 295.0	4 540.0	
Public investment in irrigation (US\$ mill)	-	5.8	10.0	20.0	20.0	40.0	50.0	
Exchange rate	2.38	2.38	2.38	2.38	2.38	2.38	2.38	

Source: Estimates for 2010 and 2011 from 2011 National Budget and MoFEP AIMS database. Projections for 2012-2020 prepared by authors.

6.5.2 Public Expenditures on Agriculture, Forestry and Fisheries

In 2010, public spending on programs for agriculture, forestry and fisheries amounted to about \$95 million, including donor support in the amount of \$73 million and national budget expenditures of \$22 million equivalent. Public expenditures on programs for which the Ministry of Animal Resources and Fisheries is responsible amounted to about \$30 million equivalent in 2010; for Ministry of Agriculture and Forestry programs, total public spending was about \$65 million. At the time this Report was prepared, total outlays in 2011 were estimated to be about \$125 million.

Government support for the program. During 2006-2010, national government spending on programs for agriculture, forestry and fisheries accounted for about 1% of total expenditures in the national budget (Table 6.12). The 2011 budget allocation amounts to 1.8% of proposed total expenditures.

As Table 6.13 indicates, recurrent spending by the government on service provision to the farming community, pastoralists and those depending on fisheries for a livelihood is currently about \$20 million a year. Under the proposed program this would increase to about \$54 a year by 2020. As noted in the above discussion, this growth in capacities for service provision would be supported by the donor community with capacity building and technical support increasing to about \$35 million a year by 2020. (Both expenditure programs are at 2010 constant prices and exchange rate.)

Table 6.13: National Government Expenditures on Agriculture, Forestry and Fisheries (In SDG millions)

Indicator	Realized expenditures					Budget 2011
	2006	2007	2008	2009	2010	
Ministry of Agriculture & Forestry						
Recurrent expenditure					28.044	36.950
Capital expenditures					4.797	25.345
Sub-total	33.363	18.507	32.356	44.443	32.841	62.295
Ministry of Animal Resources & Fisheries						
Recurrent expenditure					15.527	21.656
Capital expenditures					4.899	22.176
Sub-total	13.484	12.129	26.354	14.080	20.426	43.832
Total for two ministries						
Recurrent expenditure	-	-	-	-	43.571	58.606
Capital expenditures	-	-	-	-	9.696	47.521
Total	46.847	30.636	58.710	58.523	53.267	106.127

Indicator	Realized expenditures					Budget 2011
	2006	2007	2008	2009	2010	
Memo items:						
Total expenditures (US\$ mill)						
Total	21.6	15.2	28.1	25.3	22.4	36.0
Capital	-	-	-	-	4.1	16.1
Total expenditures as % national budget	1.3	1.0	1.0	1.4	1.0	1.8

Source: Ministry of Finance & Economic Planning (2011), Approved Budget, 2011. March 14, 2011.

Capital outlays by the national government have averaged less than \$10 million a year in the past two years. However, the strategy set forth in this Report calls for a substantial build-up in government capital spending on field service facilities, and extension and research services. As Table 6.12 indicates capital outlays by the government would build up to about \$170 million a year by 2020, a level that would be substantially larger than the proposed donor program. These capital expenditures would, for example, include the \$50 million a year being spent on expansion of public irrigation schemes for smallholder farms in 2020. In this scenario, donors would increasingly become cofinanciers with the government in these capital works programs, in contrast to the current situation where donors fund a substantial part of the capital works program independent of the government.

Role of the donor community. The agricultural sector (including crops, livestock, fisheries and forestry) currently receives support from 16 multilateral and bilateral donors. As of October 2011, total donor commitments for ongoing projects in 2010-2013 amounted to \$192 million (Table 6.12). The commitment of \$101 million in 2010 was equivalent to about 10% of the donor-funded development assistance program (excluding humanitarian assistance) for that year. Disbursements against these ongoing programs amounted to \$73 million in 2010 (implying a disbursement ratio of 72% in 2010). The livestock, fisheries and forestry sub-sectors account for about 17% of the ongoing program, with support for cropping activities, capacity building and institutional development such as land tenure issues accounting for about 83% of the program.

Table 6.14: Ongoing Donor Funded Agriculture, Forestry and Fisheries Projects (\$ thousands)

	Budget allocation					Disbursement				
	2010	2011	2012	2013	Total	2010	2011	2012	2013	Total
Livestock	8 294	2 809	1 647	420	13 170	6 423	3 509	2 113	1 124	13 169
Fisheries	9 628	1 277	1 753	400	13 057	9 390	1 438	1 737	491	13 057
Forestry	5 984	400	800		7 184	4 197	2 187	800		7 184
Crops and other	77 056	61 738	13 708	6 334	158 836	52 872	58 427	41 203	6 334	158 836
Total	100 962	66 223	17 908	7 154	192 247	72 882	65 562	45 853	7 949	192 246

Source: Ministry of Finance and Economic Planning. AIMS database.

The United States of America and European Union have the largest ongoing programs with commitments of almost \$70 million and \$50 million respectively (Table 6.15). The MDTF, Canada, Common Humanitarian Fund and World Bank account for another \$60 million of the ongoing commitments. The other 10 donors account for the balance of \$19 million of ongoing commitments, six of whom have programs of less than \$2 million. The fragmentation of

the donor program is a matter of concern for the National Government. The proposed action plan for agriculture set forth in this Report calls for a carefully focused set of public and private interventions in selected geographic areas of the country, backed by programs of technical support and capacity building at the national and state levels. Successful implementation of this strategy will require a close attention to issues of donor coordination in the sector.

Table 6.15: Ongoing Donor Commitments (In \$ millions)

Donor	Amount	Share (%)
USA	68.5	35.6
European Union	49.3	25.6
Multi-Donor Trust Fund	18.1	9.4
Canada	15.8	8.2
Common Humanitarian Fund	13.4	7.0
World Bank	8.5	4.4
Other donors (10)	18.6	9.7
Total	192.2	100.0

Source: MoFEP, AIMS database.

6.6 Managing Risks and Uncertainties

The main risks and uncertainties facing the strategy outlined in this strategy for attaining agricultural transformation and a sustainable agriculture – led growth of South Sudan include: (i) doubts about South Sudan's ability to effectively implement the strategy; (ii) continued insecurity in parts of the country; (iii) unclear land laws; (iv) acute infrastructure shortage, including the cost financing rural connectivity; and, (v) weak entrepreneurship and the high cost of labor in South Sudan. These risks must be managed if the strategy is to succeed. The following paragraphs highlight the risks as well as propose some remedial measures to attenuate the risks.

6.6.1 Ensuring Effective Implementation of the Strategy

Key implementation risks include organizational inertia and the lack of implementation and coordination capacity at the national and state levels. The social model, which has impeded development of the livestock sector, illustrates one of the core implementation risks that must be addressed.

To this end, there is a need to rebuild South Sudan's institutional and human/technical capacities, which were depleted as a result of decades of civil conflicts and wars. Agricultural institutions need to be rehabilitated or rebuilt from scratch. In addition, individuals and organizations must be trained and empowered with skills and knowledge needed to fulfill their roles. Farmers must be trained on modern farming methods, including the acquisition of

productivity-enhancing knowledge and skills. Livestock farmers are in need of a transformational mindset change and must, therefore, be trained to see the advantages of and embrace the commercial model. It is also well recognized that South Sudan suffers from a deficit of trust among South Sudanese ethnic/tribal groups, which has been the source of ethnic/tribal tensions, which can very well obstruct the implementation of the strategy. To this end, the government must develop and implement an awareness campaign aimed at promoting peace and good neighborliness among the ethnic groups, particularly at the state and local levels where tolerance and amicable social interaction are desirable for the formation of cohesive cooperatives and other farmer groups.

There is also a need to harness and streamline the wide array of donor and NGO systems in South Sudan, transforming them into a nucleus for strategy implementation. The government should establish a national coordination task force. The task force, to be co-chaired by the Ministers for Commerce and Industry and Investment and the Minister for Agriculture and Forestry, should include representative of states, private sector, donors and NGOs. In addition, the government should convene sector-working groups to drive the implementation of the subsector strategies. Already, there exist working groups for Livestock, Cereals and High Value Fruits and Vegetable. Their knowledge and commitment should be harnessed to drive the implementation of the sector strategies.

Furthermore the government should strengthen the South Sudan Investment Authority (SSIA), enabling it play its role of identifying, attracting and supporting the type of foreign direct investors whose commercial interests are aligned with the strategies outlined in this Report. Such investors can enhance capacity building, bring managerial expertise and support infrastructure development in South Sudan.

6.6.2 Insecurity in South Sudan

Even though the war between Sudan and South Sudan was formally declared over by the signature of the CPA-Protocol on Security Arrangements, persistent episodes of violence and insecurity have continued to afflict various parts of the country and continues even after independence. The proliferation of opportunistic militia groups and violent activities by the Lords Resistance Army have made many communities throughout South Sudan vulnerable to effects of violent conflicts- deaths/injury, displacement and destruction of social and economic assets. As a result of the proliferation of small arms, too few productive opportunities for unemployed youth, distrust among many tribes and ethnic groups, and poor and inadequate physical infrastructure, especially in the rural areas, violence and insecurity remain and constitute a source of concern across South Sudan. Criminal cattle raids have become a frequent phenomenon, leading to loss of life and destruction of economic assets.

Insecurity is both a threat to personal safety as well as an impediment to economic transformation and development. The security of and confidence in large-scale and long-term projects are crucial decision variables for foreign investors, which can have far reaching consequences for investment and medium-term development and economic growth. If farms are threatened by violence, theft, or government expropriation then investors will pull their projects and funding from the country and new investors will be reticent to enter. Investors seek projects with low political risk and strong government support.

Security, peace and good governance are cornerstone pillars of the SSDP. In this regard, the Government is working towards providing a peaceful and stable political and economic environment. To assuage potential investors concern about security of investment, the government should be willing to provide stabilization clauses, ensuring that the regulatory framework governing investment in land are not threatened (i.e., investors do not want the project's original economic equilibrium to be in jeopardy). The Government should also establish dispute settlement mechanisms and arbitration processes that are transparent and viewed as fair and equitable by all potential parties in any dispute.

6.6.3 Unclear Land Tenure and Demarcation⁷⁰

There is a risk that current land acquisition laws may hinder or complicate access to land by a SIAP. This is due

to several provisions in the current South Sudan land law⁷¹, which prohibits foreigners from owning land in South Sudan. Although a recent IDS Academie publication claims that, between 2007 and 2010, at least 10 large-scale investment in agricultural land and 4 in forestry/carbon credit have been concluded, it also states that some of the land acquisitions have been conducted under questionable conditions and are being reviewed, risking abrogation.⁷²

Arguably, commercial/large scale farming, which is essential for FDI in agricultural development, requires access to land with unambiguous right to develop the land. Under the 2009 Land Act (i) foreigner are not permitted to own land in South Sudan; they can, however, conditionally, lease land (for a maximum of 99 years); (ii) community lands may be allocated for investment purposes but that investment must reflect an "important interest of the community" and contribute to economic and social development of the local community; and (iii) land acquisition of 250 fedans (104 hectares must be approved by state authorities). If South Sudan is to transit from traditional farming to FDI-led commercial farming, then access to land must be equitably liberalized. Having a uniform national land law and a clearly defined and transparent ownership right and obligations will facilitate the decision of potential foreign investors in agricultural land in South Sudan. In addition, given the predominant role that women play in farming in South Sudan, the laws must be gender sensitive and accord women unfettered right to own and develop land. There is, therefore, a need for the government to adopt land development policies that allow potential investors to acquire, develop land and reap the benefits of their investment in commercial agricultural land.

6.6.4 Acute Shortage of Infrastructure

Poor and inadequate physical and soft infrastructure is a binding constraint to economic development in South Sudan. A central assumption of the agricultural transformation strategy outlined in this Report is that alongside investment in agriculture there will be a parallel development of rural infrastructure that will serve as an incentive for smallholder and commercial farmers to increase production knowing that markets are accessible. If rural connectivity is not improved, then the strategy will be in jeopardy. From the analysis undertaken in this Report it is obvious that government must increase its budgetary allocation for rural infrastructure in order to improve rural connectivity. One of the ways of through which allocation to rural roads can be increased is by adopting cost-saving material and technology measures that will reduce the cost and budget allocation to interstate

⁷⁰ In early 2009 USAID funded 2-year land tenure program which is helping the government efforts to develop a new land policy for South Sudan.

⁷¹ See "Laws of Southern Sudan: "The Land Act, 2009"

⁷² See IDS Academie, "South Sudan –Food Security and Land Governance Fact Sheet", 2011 and D. Deng: "Land belongs to the community, Demystifying the 'global land grab' in Southern Sudan, a paper presented at IDS conference in April 2011

roads, thus channeling the savings towards the financing of more rural/feeder roads. Another plausible measure will entail shifting part of the cost of enhancing rural connectivity to the SIAP as an integral part of any SIAP agreement. As a general guiding principle, for all public investment in infrastructure, it is important to ensure that government expenditure is used to “crowd in” private investments rather than discourage them.

6.6.5 Weak Entrepreneurship and High Cost of Labor

Weak entrepreneurship. The agricultural sector in South Sudan is constrained by weak entrepreneurship base and the absence of commercial orientation: to date agriculture remains a subsistence activity by smallholder farmers using simple implements; the average farm size is small and in the range of 0.4-1.7 hectares. Intensive farming undertaken with little fertilizer application has progressively lowered yields and depleted soils. There are very few cooperatives and little commercial farming and/or the adoption of modern farming technologies. Farming remains primarily rain-fed; irrigation farming is still limited. In addition, livestock farming is dominated by culture and tradition that lack business orientation (cattle, for instance, is still raised for prestige and for dowry payments rather than for meat, milk, hides and other by-products). The private sector is nascent and has weak business management skills. These characteristics must begin to change and change at a fast pace if the transformation of the sector is to gain traction and drive change and foster economic growth. To maximize growth in the agriculture sector, the government should encourage the transition to a culture that values innovation, competition and commercial success and create a business environment that welcomes ideas, talent, and capital, regardless of its origin.

High cost of labor. The country suffers from an aberration of two twin risks: high labor cost and low labor productivity. Furthermore, given the high cost of living in South Sudan and the experience of other natural resource-dependent countries, it is unlikely that labor wages - the most significant component of total farm production cost - will decline in the short to medium term. Thus, reductions in farm production costs in South Sudan would have to accrue from a combination of increased cropland ushering in economies of scale and labor productivity gains through mechanization of some of the production processes. Sebit (2011) shows that when tractors are used, 16% less labor is used and higher output realized. Further expansion of such practices will have greater productivity impact and lower the unit cost of labor. Furthermore:

- South Sudan should accelerate the pace of formulating an agricultural mechanization policy that will help improve the use and efficiency tools, implements, and machinery in agricultural production and associated value chain operations. In this connection, the government has to recognize that the private sector is better placed to provide mechanization services and should strive to create conditions for self-sustaining development of mechanization with minimal direct government intervention. There is need to build on some of the already existing and successful private sector-driven models in Upper Nile, Unity, and Central Equatoria;
- In tandem with mechanization, South Sudan should pursue other productivity enhancing measures if it is to reduce farm production costs. Key to this will be the use of tradable inputs and the provision of advisory services on technology and other production related activities; and,
- The government should also realize that to achieve yield potentials for improved varieties will necessarily require significant increase in the level of fertilizer use in South Sudan.

7 Transport Infrastructure and Services

7.1 Current Status of Transport Services and Infrastructure

7.1.1 Overview of the Transport Sector

The transport system in South Sudan consists of four modes – road, rail, river and air transport – the largest being road transport. South Sudan’s main access to the sea is through Mombasa in Kenya, which accounts for most of the traffic, Port Sudan and Djibouti ports (see Map 7.1). The Juba-Mombasa link is mainly accessed by road through Uganda or directly to Kenya. The distance from Juba to Mombasa by road is around 1,900 km via Nimule and Gulu in Uganda and 1,800 km through Torit, Nadapal and Lokichogio in Kenya.

Multimodal transport is also possible, and it involves combining road transport from Juba to Kampala or Eldoret and rail transport to Mombasa. South Sudan is connected to Port Sudan by road, rail and multimodal link. Port Sudan connects by road to Malakal (Upper Nile State), Bentiu (Unity State), Aweil (Northern Bahr El Ghazal State) and Wau (Western Bahr El Ghazal State). A railway line links Wau and Aweil to Port Sudan. Between Juba and Port Sudan, the existing infrastructure allows bi-modal transport by river from Juba to Kosti and then by rail or by road from Kosti to Port Sudan. However, multimodal transport is hampered by the poor condition of the existing infrastructure and inadequate connectivity between modes. Malakal is linked to Djibouti by road through Jikou and Addis Ababa. The other possible link is from Juba to Kapoeta - Boma in the South East and then to Djibouti via Ethiopia.

Transport Infrastructure and Services

Table 7.1: Paved Road and Railway Indicators in Sub-Saharan Africa

Country category	Urban population (%)	Paved road density		Rail density	
		By area (km/1 000 km ²)	By population (km/million)	By area (km/1 000 km ²)	By population (km/million)
Sub-Saharan Africa	34.9	16.8	533.0	2.8	83.1
Low income fragile states	34.5	9.9	275.0	1.6	45.9
South Sudan	19.7	0.2	15.0	0.4	25.0

Source: Carruther et. al. (2009), Annex Table 1.4, and estimates by authors.

Access to transport infrastructure in the country is poor. Table 7.1 shows that the road density in terms of land area or population in the country is extremely low with 19 km per 1,000 km² or 1.3 km/1,000 persons. The density for paved roads is 0.2 km per 1,000 km², which is much lower than the averages of 16.8 and 9.9 km per 1,000 km² for Sub-Saharan Africa and Low income fragile states respectively.

Institutional arrangements. Prior to independence, the Ministry of Transport and Roads (MTR) was responsible for transport services and infrastructure in the country. At the time, the MTR was divided into the following directorates:

Directorate of Roads and Bridges (DRB); Directorate of Road Transport and Safety; Directorate of Railway Transport; Directorate of River Transport; Directorate of Air Transport; and Directorate of Administration and Finance.

Post independence, the MTR was split into two ministries to form the Ministry of Transport (MoT) and the Ministry of Roads and Bridges (MoRB). Additionally, the Ministry of Physical Infrastructure (MoPI) was created and it is in charge of the intrastate transport infrastructure in each of the ten states of South Sudan.

MAP 7.1: Regional Routes from South Sudan to Seaports



These ministries face considerable difficulties recruiting well qualified technical staff. To address this challenge, training programs have been undertaken, but starting from a low base a large skills gap still persists.

Transport policy. A Transport Sector Policy was developed and passed by South Sudan Legislative Assembly on 3rd October, 2007. The policy framework covers a five year period with a two phase implementation strategy, which

included the recovery and development phases between 2007-2008 and 2009-2011 respectively.

The policy paper has twelve objectives, namely to: (i) strengthen the MTR to play an effective coordination and regulation role; (ii) create capacity to meet the transport requirements of the economy; (iii) optimize the allocation of available resources among the various transport modes; (iv) improve mobility in rural areas through the promotion

of the use of appropriate means and modes of transport; (v) facilitate the return and settlement of the Internally Displaced People (IDP) and refugees; (vi) encourage and promote increased private sector participation in the provision, management and maintenance of transport infrastructure and services; (vii) contribute to job creation and income generation, and provide equal opportunities for men and women in transport sector; (viii) ensure safety standards in all modes of transport; (ix) ensure coordinated disaster management in all modes of transport by enforcing appropriate protective and control measures; (x) introduce sound management through appropriate policies and institutions in the transport sector that will lead to rapid sustainable development and poverty eradication; (xi) provide links with the states and neighbouring countries; and (xii) recognize and account for environmental concerns in line with the national environmental plan.

Recognizing the negative impact of a poor transport system on the performance of the economy, the new Government of the Republic of South Sudan has reaffirmed its commitment to reform the sector to catalyze the social and economic development process of the country.

The establishment and operation of a new institutional framework is a priority for each transport sub-sector. This framework will guide the functions of a regulator and service providers. Additionally, the country needs to urgently develop a regulatory framework to promote

Public Private Partnership (PPP) opportunities. It will therefore be necessary to have a timely decision on whether a single authority will regulate the entire transport sector or various regulatory authorities' will be accorded different regulatory responsibilities for each sub-sector. In the latter case for example, the Civil Aviation Authority (CAA) will regulate the air transport sub-sector as well as own and operate the country's major airports.

7.2 Road Transport Infrastructure and Services

There is very limited data on the transport sector. Despite its importance for proper development and maintenance planning, the inventory and classification of the road network is incomplete.

7.2.1 Road Network and Condition

According to the Transport Policy document, the country has an estimated road network of 12,642 km; consisting of 7,369 km of Interstate roads, 1,451 km of State primary roads and 3,822 km of State secondary roads (see Map 7.2). The recent World Bank report estimates tertiary road network to be 2,301 km.⁷³ The Road Authority Provisional Order states that all public roads shall be categorized into classes as shown in Table 7.2.

Table 7.2: Road Classes

Class	Description
Part A - Trunk Roads	
International Roads	International trunk Roads linking centres of international importance and crossing international boundaries or terminating at international ports
Interstate Roads	National trunk Roads linking nationally important centres
Part B - State Roads	
Primary Roads	Primary Roads linking State important centres to each other
Secondary Roads	Secondary Roads linking County important centre to each other, to more important centres or to higher class Roads
Feeder Roads	Tertiary Roads linking minor centres (Roads other than Inter-State and International Roads other than those inside cities and municipalities)
Part C - Urban Roads	
UA	Urban Arterials
UC	Urban Collectors
UL	Urban local roads

Source: The Southern Sudan Roads Authority Provisional Order, 2011

⁷³ A recent report by the World Bank provides somewhat different estimates for the road network: 2,696 km of interstate primary roads which are those connecting all state capitals and major cross-border corridors; 4,475 km of "other primary roads"; 6,292 km of secondary roads; and 2,301 km of tertiary roads. Excluding the estimate for tertiary roads in the World Bank total, the adjusted length of the national network is 13,463 km compared with the 2006 official estimate of 12,642 km. (See World Bank (2011a).

MAP 7.2: South Sudan Road Network



South Sudan's road infrastructure was largely destroyed or left in disrepair during the protracted civil wars. After the signing of the Comprehensive Peace Agreement (CPA) in 2005, significant construction and rehabilitation projects were initiated and implemented including the Emergency Road Repair Program (ERRP) and Sudan Emergency Transport Infrastructure Development Project (SETIDP). The main objective of these projects was to restore and maintain basic links between major towns and regions in the country. As a result, around 5,000 km of trunk roads were constructed/rehabilitated to all-weather gravel roads standard.

However, heavy rains increased levels of traffic; overloaded trucks and inadequate maintenance have often led to the deterioration of the rehabilitated roads in the country. As a result, only 40% of these improved trunk roads are in a good condition, the remaining 60% are deemed to be in a fair condition. The only paved roads are the Juba-Nimule link to Uganda (193 km), which is under construction to a DBST⁷⁴ standard, the 65 km of urban roads that were recently rehabilitated or upgraded in Juba and a few sections of urban roads in Wau and Malakal. The remaining gravel roads, earth roads and tracks are in a state of disrepair with the majority impassable during the rainy season.

Majority (80%) of the population lives in rural areas and most of these have no access to all-weather roads; the Rural Accessibility Index (RAI), which expresses the percentage of the rural population living within two kilometres of an all-season road, is estimated at 5% for the whole Sudan.⁷⁵ This clearly indicates a substantial road infrastructure deficit in the country, both in terms of quantity and quality.

7.2.2 Institutional Arrangements

The Southern Sudan Roads Authority Provisional Order, 2011, which came into force on 7th January, 2011, established the Southern Sudan Roads Authority (SSRA), an autonomous corporate body responsible for the management, development, rehabilitation and maintenance of all interstate and international roads, and the development of roads in war-affected areas in South Sudan. The functions and duties of the SSRA include development planning, construction, maintenance and preparation of annual road work programs. In addition, the Authority shall ensure adherence by motorists to the rules and guidelines on axle load control, and the quality of works in accordance with the standards in force. It will also monitor and evaluate the use of roads under its control

and collect all related data as may be necessary for efficient planning.

The Governing Structures of the SSRA are the Board and the Executive Management. Upon recommendation, the Board members are appointed by a resolution of the Council of Ministers. The Board comprises:

- The Undersecretaries, or their representatives of the Ministries for (a) Transport and Roads, (b) Environment, (c) Finance and Economic Planning, (d) Commerce and Industry, and (e) Regional Cooperation
- The Executive Director of the SSRA
- Six other persons from civil society associations. One of the members of the Board is appointed by the Minister of Transport and Roads as a Chairperson.

The mandate of the Board is to oversee the general direction and supervision of the Authority. The Board also establishes rules and procedures for appointment, promotion, termination, discipline and terms and conditions of service of staff and approves projects and programs proposed by committees and/or directorates. And finally it proposes and manages budget allocations, monitors and evaluates, through technical and financial audits, the delivery of goods, works and services, and monitors road transport, traffic and safety management.

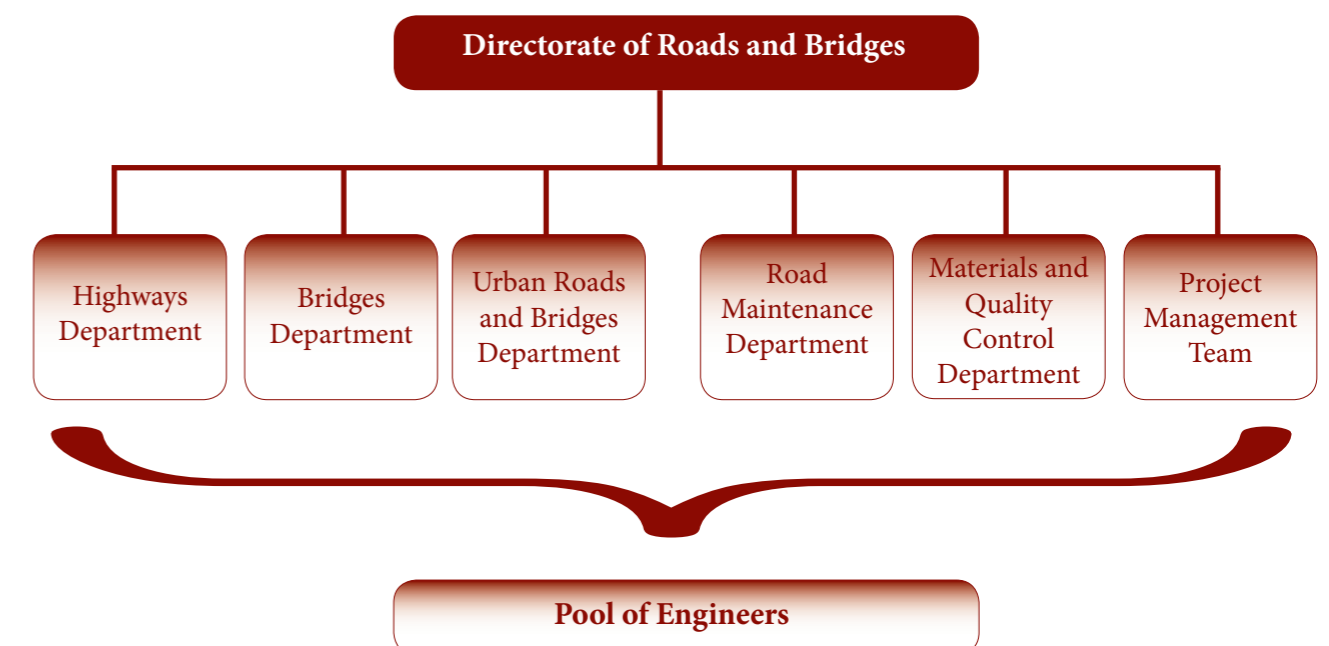
The Executive Management is the primary implementing authority in charge of the daily transactions and operations of the SSRA. It is headed by the Executive Director (ED) who reports to the Board. The ED has administrative, financial and technical powers to manage the Authority,

including but not limited to:

- Developing the operating plan to achieve its objectives;
- Developing an economic, efficient and cost effective internal management structure;
- Designing the organizational chart and internal policies and procedures;
- Appointing staff;
- Drafting policies and framework documents of the Authority;
- Overseeing the use of the funds; and
- Proposing and implementing SSRA's strategic, business and annual plans.

The SSRA will develop a Road Investment Program (RIP), containing both development and maintenance priorities and submit it to the Minister who shall present it for approval to the Council of Ministers. Notably, annual budgets and work programs shall be based on the RIP. Activities outside these approved work programs will only be undertaken with the concurrence of the Board and approval of the Minister.

The establishment of the SSRA is an important milestone in the implementation of the Transport Sector Policy. Pending the start-up of operations by the SSRA, its functions and responsibilities are handled by the Directorate of Roads and Bridges. The organizational structure of the Directorate is shown below:



⁷⁴ Double Bituminous Surface Treatment

⁷⁵ Robin Carruthers, Ranga Rajan Krishnamani and Siobhan Murray (update August 2010), "Improving Connectivity: Investing in Transport Infrastructure in Sub-Saharan Africa." AICD Background Paper 7 (phase II), World Bank, Washington DC,

The Directorate has limited capacity both in terms of numbers and skills. Seven Managers, including the Director General, a Director, three Deputy Directors, and two Chief Engineers, are heading the Directorate and its units. Around five engineers are attached to the departments/units and over 20 Engineers or holders of certificates/diplomas from tertiary education programs are regrouped in a pool and solicited by the units according to their workload. Having said that, over half of these engineers and technicians need to be closely supervised in the course of their duties.

7.2.3 Road Transport Services

Buses and taxis provide urban transport services. Usually, urban transport services are provided by privately owned minivans and motorbikes taxis called boda-boda. There are also sedan car taxis, but they are not commonly used. Interstate and international transport is provided by coaches operated by about a dozen bus companies.

Transport costs in the country are high (Table 7.3). Freight tariffs on trunk roads reach \$0.20 per ton km, roughly three and four times the average tariff of Eastern Africa and Southern Africa countries respectively. The poor infrastructure in the country also increases travel times, this coupled with a significant reduction of loads on several trucks for safety reasons substantially raises the transport costs per ton in South Sudan. As articulated in the South

Sudan Development Plan (SSDP) 2011-2013, “widespread official and unofficial road checkpoints collecting taxes, fees and charges are also a big disincentive to deliver the products to the markets. This increase in costs inhibits investment and renewed growth.”

Additionally, uncertain security situations and the asymmetrical trading patterns between South Sudan and its neighbours’ means that trucks usually return empty from South Sudan and this significantly increases the freight cost per ton. Again at a national level, the poor and inadequate intra-state road network in South Sudan makes domestic transport costs much higher than those in the neighbouring countries. For example the freight rate from Yei to Juba can reach 65 US cents per ton km and as much as 85 US cents per ton km from Malakal to Juba. Compared to the domestic freight rates of about 15-20 US cents per ton km on primary roads in Uganda and Kenya, South Sudan rates are too high.

The recent improvements of roads linking South Sudan to Uganda and Kenya have led to an upsurge in commercial freight traffic using heavily loaded trailers. The lack of effective weighbridge operations on roads to monitor the weights of the trucks is causing rapid deterioration of the upgraded infrastructure in Southern Sudan. To address this, the Government is constructing two weighbridges along Juba-Nimule road and it is also in the process of drafting the traffic act which will guide the traffic control and management in the country.

Table 7.3: Comparison of Freight Rates and Road Condition for South Sudan with Other African Countries

Indicator	South Sudan	Sudan	West African Corridor	Central African Corridor	East African Corridor	Southern African Corridor
Freight tariff (US cents per ton km)	20.0	8.0-10.0	8.0	13.0	7.0	5.0
Roads in good condition (%)	5	26	72	49	82	100

Source: World Bank (2011a).

7.2.4 Vehicle Fleets and Road Safety

The Directorate of Road Transport and Safety is responsible for the implementation of the road transport, traffic management and road safety policy. Its functions and powers include: (i) registration of vehicles and issuance of licenses and permits pursuant to the laws of South Sudan; (ii) establishment of the standards for vehicles so as to comply with road safety standards; (iii) conducting road safety education and sensitization; and (iv) coordination of road safety programs. Presently, this Directorate lacks

the human capacity and financial resources to fulfil its mandate.

The Ministry of Transport registers and issues licences for the Central Government, Non-governmental Organization (NGOs), Aid Agencies and diplomatic missions’ vehicles. While the State Traffic Police register vehicles and issue licenses for the State Government, Private and Commercial vehicles.

According to a feasibility study carried out, the Average Daily Traffic (ADT) was below 20 for most rural roads

surveyed in 2009.⁷⁶ However, the Juba-Yei-Kaya road connecting to Uganda, the ADT was approximately 800 vehicles in 2008 and projected to reach 1,600 in 2016 and 4,000 in 2026. The Juba-Gumbo-Torit-Nadapal linking to

Kenya, the average figure was slightly lower, 700 in 2008, but with much higher growth projections i.e. 2,300 in 2016 and 5,100 in 2026.

Table 7.4: Road Accidents and Fatalities in Juba

Indicator	2005	2006	2007	2008	2009	2010
Number of accidents	960	1 073	1 100	1 200	1 304	1 404
Number of deaths	35	40	65	76	86	92
Accidents per 100 000 people	587	429	406	421	414	407
Deaths per 100 000 people	21	16	24	27	27	27
Memo item:						
Juba population (mid-year ‘000)	163.4	250.0	270.8	285.0	315.0	345.0

Source: Annex Table 1.3; safety statistics, Directorate of Road Transport and Safety

Available information indicates a significant increase in accidents and casualties on some upgraded roads such as the Juba-Nimule route. This worrying trend is confirmed by the available statistics for Juba, as reported in Table 7.4. Fatalities are running at about 27 per 100,000 people. From 2007 to 2010, crashes and fatalities increased by an average of respectively 9% and 12% per year. Besides, 47% of the drivers who caused an accident in March 2010 had no driving licenses; this issue is linked to the high illiteracy levels and the weak enforcement of the traffic regulations in the country. These alarming figures call for urgent action to enhance road safety by: (i) building safety concerns into road design; (ii) enforcing periodic vehicle inspections; and (iii) launching specific initiatives targeting drivers aimed at improving their training programs.

In the meantime, an interim Road Safety Management Committee (RSMC) was set up in 2011 to: (i) establish road safety standards and a data bank for road traffic accidents in South Sudan; (ii) prepare necessary legislation for the establishment of Road Safety Council, consisting of stakeholders; (iii) formulate a comprehensive Road Safety Program (RSP) in close coordination with stakeholders;

and (iv) establish an effective monitoring and evaluation mechanism.

7.2.5 Road Construction Costs

Road construction costs in South Sudan are among the highest on the continent (see Table 7.5). While the average unit cost for a paved standard two lane road is less than US\$ 0.5 million per km in most African countries, it exceeds US\$ 0.9 million per km as reflected in recent road works in South Sudan. Indeed, the engineer’s cost estimate for an AC standard was at \$1.6 million per km for the planned Juba-Yei-Kaya, connecting to Uganda and \$1.2 million for Juba-Torit-Nadapal linking to Kenya. The main factors driving up the costs are: (i) inelastic supply in a post-conflict economy due to a limited supply base for construction work; (ii) large costs associated with import of construction materials; (iii) overhaul costs due to lack of or limited local borrow materials; (iv) limited availability and cost of skilled and unskilled labour; (v) very poor condition of existing roads; (vi) a long rainy season with heavy rainfall; and (vii) insecurity and cost of mine-clearing operations in some areas.⁷⁷

⁷⁶ Africon and BKS (September 2010). “Feasibility Studies for the Phased Rehabilitation of about 7,000 km of Rural Roads in Southern Sudan – Final Development Plan”
⁷⁷ On this last point, up to April 2010, 30.8 sq. km were cleared of mines and around 3,240 km of roads were verified. But a report of the United Nations Mine Action Office (UNMAO) dated June 2, 2011 deplures re-mining operations in Unity State that would be associated with militia rebels actions in conflict areas. It also reports several injuries and deaths due to explosion of landmines on roads from March to June 2011.

Table 7.5: South Sudan - Road Rehabilitation Construction and Maintenance Costs

Item No	Road Type	Cost (\$/km)	Remarks
1	Paved/asphalt road (two lane)	1 100 000 to 1 300 000	Lower margin for DBST
2	Gravel road (two lane) – gravel road with seal or stabilized	350 000 to 400 000	For staged upgrading of roads to paved road
3	Gravel road (two lane)	170 000 to 250 000	Lower margin applies to tertiary/feeder roads – Class A feeder roads designed for 50 vehicles per day, with adequate drainage structures and pavement
4	Class B feeder roads	100 000	Class B for 30 vehicles per day or less, with critical drainage structures, basic surfacing and variable road width. Cost may vary depending on terrain and natural soil type
5	Class C feeder roads	50 000	Class C for 10 vehicles per day or less, with minor provision of drainage, mainly drifts, and spot improvement along an engineered road alignment. Cost may vary depending on terrain and natural soil type
6	Road maintenance	30 000	Including spot improvement and repair works. In the case of routine maintenance, cost may go down to \$10 000 – 15 000

Source: World Bank Staff

Recent studies indicate that the average unit costs for the upgrading to paved standard of the two international roads are US\$1.2 million per km for Juba-Torit-Nadapal and \$1.6 million per km for Juba-Yei-Kaya. To construct or upgrade urban roads to paved standard will cost on the average US\$2.6 million per km for Juba and US\$1.2

million per km for the other towns.⁷⁹ To upgrade interstate and urban roads to all-weather condition costs on average of US\$ 0.2 million per km and US\$0.16 million per km for the rural roads. For comparison, outcomes of a recent African Development Bank (ADB) study are given in Table 7.6.⁸⁰

Table 7.6: Summary of Unit Rate Statistics for Different Types of Road Investment (\$/lane km at 2006 constant prices)

Types of Road Infrastructure Investment	Periodic Maintenance of Unpaved Roads	Periodic Maintenance of Paved Roads	Rehabilitation of Paved Roads	Construction and Upgrading of Paved Roads
<100 lane km				
Quartile 3	10 500	N/A	290 000	425 400
Median	9 600	N/A	180 300	227 800
Quartile 1	8 100	N/A	109 800	166 300

⁷⁹ Juba Urban Transport Infrastructure and Capacity Development Study in the Southern Sudan

⁸⁰ Study on Infrastructure Costs: Analysis of Unit Cost and Cost Over-runs in Road Infrastructure Projects in Africa

Types of Road Infrastructure Investment	Periodic Maintenance of Unpaved Roads	Periodic Maintenance of Paved Roads	Rehabilitation of Paved Roads	Construction and Upgrading of Paved Roads
>100 lane km				
Quartile 3	12 800	72 200	130 500	162 000
Median	11 300	64 600	84 400	147 100
Quartile 1	9 600	56 900	47 400	115 900

Note: All values are given in 2006 USD

The high construction costs are a great concern to the Government and donor community. Therefore the Government has undertaken a number of initiatives to address it and these measures include the adoption of road standards and specifications, and the design manuals of Ethiopia and awarding public contracts in accordance with the Interim Public Procurement and Disposal Regulations published in 2006--despite the weak enforcement.

The country has limited local capacity to provide consulting services, and as a consequence most of the road works contracts are awarded to international firms. To promote the involvement of local contractors, the Government in collaboration with development partners has initiated pilot labour-based maintenance projects. Through these projects, potential small entrepreneurs from each state were selected and trained in labour-based works. After the training, around 30 entrepreneurs under the supervision of qualified technicians were awarded contracts to maintain or open up more than 800km of roads. The results were quite mixed, but the overall performance was satisfactory.

Moving forward, with deeper regional integration it is anticipated that the high construction costs in South Sudan will reduce in the medium-term. The removal of the customs barriers and free movement of people and goods will also foster the country's access to more dynamic and competitive markets and in so doing enable South Sudan to access lower commodity prices.

The implementation of the Short Term Program (STP) should also yield some outcomes. Particularly, regional and national connectivity improvement should drastically reduce Vehicle Operating Costs (VOC) and travel time, facilitate transit transportation and remove significant non tariff barriers along the roads. This would significantly reduce the transportation costs. This coupled with improved security and a competitive environment should lead to a significant reduction in construction costs.

In this context, with the exception of Juba, the average unit costs are estimated at US\$1 million, US\$0.8 million and

US\$0.6 million per km for the construction/upgrading to paved standard of urban, international and interstate roads respectively. In Juba, urban road development follows the recommendations of the Master Plan study which proposes an average unit cost of US\$4 million per km for arterials and collectors. Again, in Juba the proposed costs for the construction or upgrading roads to all-weather conditions are US\$0.2 million per km for interstate roads, 0.18 million per km for primary roads and US\$0.15 million per km for rural roads.

7.2.6 Overview of Proposed Program for Road Transport

The proposed Action Plan for the road transport sector includes a Short Term Program (STP) for 2011-2015, with specific details and a longer-term program for 2016-2020 that is more general. During the STP, a master plan for the roads sub-sector will be drafted and feasibility studies undertaken to provide information for the design and implementation of the proposed program for the longer-term.

This report has also attempted to provide an evaluation of the medium to long term investment needs in the sub-sector. At this stage, the usual transport demand models, which are very data-intensive, are not suitable. A connectivity approach has been adopted in seeking to identify key geographic and demographic features of the country and determine the transport infrastructure needed to connect these features which are of international interest, like capital cities, deep-water ports, and international borders that provide connectivity across the entire region, and others of national interest such as state capitals and large towns. This approach also considers the population distribution and the productive agricultural land which will be affected by this national road network that will link regions and cities in South Sudan. Because of information gaps, proposals for longer-term are based primarily on rough estimates by the authors using a mix of connectivity and benchmarking approaches.

Table 7.7: Summary of Proposed Road Improvement Program

Road category	Total network			Proposed upgrades		
	2011	2015	2020	2012-2015	2016-2020	Beyond 2020
National trunk roads						
Interstate trunk roads						
Paved	193	783	4 158	590	3 375	365
All-weather standard	4 091	4 946	3 211	855	1 640	
Seasonal road	3 085	1 640	-			
Total	7 369	7 369	7 369	1 445	5 015	365
State primary roads						
Paved	-	-	-	-	-	-
All-weather standard	-	-	1 451		1 451	
Seasonal	1 451	1 451	-			
Total	1 451	1 451	1 451	-	1 451	-
Secondary roads						
All -weather standard	-	1 000	3 822	1 000	2 822	
Seasonal road	3 822	2 822	-			
Total	3 822	3 822	3 822	1 000	2 822	-
Tertiary roads						
All -weather standard	-	1 000	2 178	1 000	1 178	123
Seasonal road						
Total				1 000	1 178	123
Urban road network						
Paved	70	270	510	200	240	
All-weather standard				100	200	
Seasonal road						
Total				300	440	-
Total program						
Paved	263	1 053	4 668	790	3 615	365
All-weather standard				2 955	7 291	123
Seasonal				-	-	-
Total				3 745	10 906	488
Memo items:						
Primary network paved (%)	2.2	8.9	47.1			
Primary network AWS (%)	46.4	56.1	52.9			
Urban network paved (%)						
Rural network AWS (%)						

Source: Directorate of Roads and Bridges and estimates by authors.

Of course, proposals, such as Juba Urban Transport Development and Airport Development master plans, were given due consideration during the preparation of these long term programs. The proposals in the South Sudan Development Plan (SSDP) were also reviewed carefully.

“Expanded and improved road transport infrastructure” is one of the top five priority program areas for the Economic Development pillar of the SSDP. The activities listed in the pillar matrices under this program area are included in the proposed STP. Drawing lessons from the performance

of the on-going Juba-Nimule project which is currently facing major cost overrun and a considerable delay. This report has significant differences in the cost estimates used as compared to those in the SSDP.⁸¹ For example, for the construction to paved standard of two interstate roads, Juba-Kaya and Juba-Nadapal, the STP estimates derived from the related design studies are 65% higher than those of SSDP. The related implementation period spans around four years, including lead time for procurement, instead of two in the SSDP. In this regard, Table 7.7 provides a summary of the proposed improvement programs for the roads sub-sector during 2011-2020. The STP proposes to upgrade a total of 3,745 km of roads during 2012-2015. These will include 590 km and 855 km of trunk roads to paved and all-weather standards respectively. It will also upgrade 1,000 km of secondary and 1,000 km of tertiary roads to all-weather standards, thus improving the quality of 2,000 km of rural roads by 2015. And finally, it will also upgrade 300 km of urban roads.

The program for the medium-term (2016-2020) will upgrade a total of 10,906 km of roads, including paving 3,615 km of trunk and urban roads, and converting 7,291 km of road to all-weather standard. Implementation of this program will bring the entire national trunk road network to paved and or all-weather standard by 2020. It will also improve to all-weather standard a total of 4,000 km of rural roads, thereby bringing the total improved rural road network to 6,000 km by 2020. A further 440 km of urban roads will also be improved.

7.2.7 Improving Regional Connectivity

The proposed strategy in this report aims at improving regional connectivity by establishing a road network that links cities, national capitals, international land borders and deep water sea ports. Given that South Sudan is

landlocked, this connectivity will be of strategic importance and will improve access to local, regional and international markets and boost regional trade. Additionally, improved level of service on the existing regional infrastructure will translate into significant declines in the very high transport costs and in turn will reduce the high construction costs, high food prices and high living costs. The proposed links will improve access to Mombasa, Djibouti and Port Sudan and in the long-term facilitate the access to the Atlantic Ocean.

This report also proposes that the improvements in the primary road network are phased to eventually bring them to paved standard. The phases will depend on the standard and condition of existing road, volume of traffic and trade with neighbouring countries, and the potential agricultural production in a given area, as identified in Chapter 6.

Improving regional connectivity in the short-term. Firstly, two all-weather gravel roads in the Central Equatoria State (CES) and Eastern Equatoria State (EES) measuring a 590 km will be upgraded to paved standard (see Table 7.8). So far, feasibility and design studies for both roads have been completed and confirm the high economic interest of the related projects with an Economic Internal Rate of Return of 20% and 22% respectively. The project will include the installation of weighbridges and improvement of transport facilitation measures through promotion of one-stop border posts and removal of multiple checkpoints along the roads. As well as the construction of 9 km of urban roads in Torit and Kapoeta and 23 km of ring road in Yei.

During this phase, it will be strategically important to improve the connectivity to Ethiopia and Djibouti port. To do so, it will be a priority for South Sudan to upgrade to paved standard the Juba-Torit-Kapoeta-Nadapal route which will open up the country in both directions to Kenya to access Mombasa and Port Lamu; and through Kapoeta-Boma to Ethiopia/Djibouti. The estimated cost of this project is \$815 million at 2010 constant prices.

Table 7.8: Regional Connectivity - Upgrading to Paved Standard

Road Details	Length (km)	Location	Cost (\$ million)	Completion date	Remarks
Juba-Torit-Kapoeta-Nadapal	345	CES-EES	420	2015	Link to Kenya and Ethiopia/Djibouti
Juba-Yei-Kaya	245	CES-EES	395	2016	Link to Uganda and Mombasa
Total	590		815		

Note: All values are given in 2006 USD

⁸¹ The SSDP anticipated these type of issues as it noted that “many of the costing requires refining.”

Secondly, feasibility and design studies will be undertaken in preparation for the subsequent upgrade of a total of 965 km of all-weather gravel roads in Upper Nile State (UNS), Jonglei State (JS), Central Equatoria State, Warrap State

(WS) and Western Bahr el Ghazal (WBGs) to bitumen standards (Table 7.9). The cost of this project is estimated at \$7.7 million.

Table 7.9: Regional Connectivity - Feasibility Study and Design to Paved Standard

Roads Details	Length (km)	Location	Current Road Condition	Cost (\$ million)	Completion date	Remarks
Malakal-Jikou	270	UNS	All Weather Gravel Road	2.2	2014	Link to Ethiopia and Djibouti
Malakal-El Renk	300	UNS	All Weather Gravel Road	2.4	2014	Link to Sudan
Wau-Gogrial-Abyei	225	WBGs-WS	All Weather Gravel Road	1.8	2015	Link to Sudan
Kapoeta-Borma	170	EES-JS	Seasonal Road	1.4	2016	Link to Ethiopia and Djibouti
Total	965			7.7		

Source: Directorate of Roads and Bridges and Consultant's Estimates

Table 7.10: Regional Connectivity - Upgrading to All-Weather Condition

Roads Details	Length (km)	Location	Current Road Condition	Cost (\$ million)	Completion date	Remarks
Kapoeta-Borma	170	EES-JS	Seasonal Road	34	2014	Link to Ethiopia and Djibouti
Yei-New Lasu	45	CES	Seasonal Road	9	2014	Link to Democratic Republic of Congo
Juba-Kajo Keji	120	CES	Seasonal Road	24	2014	Link to Uganda
Raja-Boro-Madina	200	WBGs	Seasonal Road	40	2015	Link to Chad and Sudan
Total	535			107		

Source: Directorate of Roads and Bridges and Consultant's Estimates

Thirdly, the regional network which comprises some 535 km of roads in Eastern Equatoria State, Jonglei State,⁸² Central Equatoria State and Western Bahr el Ghazal State will be upgraded to all-weather gravel standard in the short-term (see Table 7.10). The cost of this project is estimated at \$107 million.

The total cost of the proposed project to upgrade the regional network to paved standard or all-weather standard is estimated at \$929.7 million. The total length of roads in the regional network improved will be 1,125 km. Also at this stage, detailed feasibility studies to upgrade an additional 965 km to paved standard in the medium-term will be finalized.

Improving regional connectivity in the medium-term. The proposed program for the medium-term (2016-2020) will comprise road works which will be based on the feasibility and design studies carried out under the STP and subsequent studies during the medium term to bring regional links to paved standard after 2020 and these will include:

- Upgrading to paved standard of 965 km of roads at a cost of \$772 million; and
- Completion of feasibility studies and design of 365 km regional road network to paved standard including: (i) Yei-New Lasu (45 km) linking to DR Congo; (ii) Juba-

Kajo Keji (120 km) linking to Uganda; and (iii) Raja-Boro Madina (200 km) linking to Chad. The estimated total cost of the studies is \$ 2.2 million.

health and education services as well as facilitate economic activities. These roads are experiencing a rapid increase in traffic volumes. This component of the proposed program targets such road infrastructure and it intends to upgrade paved roads to bitumen standard.

7.2.8 Improving National Connectivity

Majority of the interstate or primary roads in South Sudan connect to densely populated areas and provide access to

Improving national connectivity in the short-term. In the short-term program, 320 km of seasonal gravel or earth roads will be upgraded to all-weather gravel condition (Table 7.11).

Table 7.11: National Connectivity - Upgrading to All-Weather Condition

Roads Details	Length (km)	Location	Current Road Condition	Cost (\$ million)	Completion date	Remarks
Yei-Farak Sika Mambe	160	CES-WES	Seasonal Road	32	2015	Connect WES and CES
Mogiri-Lafon-Chalamni	160	CES-EES	Seasonal Road	32	2015	Minerals and Agricultural Potential
Total	320			64		

Source: Directorate of Roads and Bridges and Consultant's Estimates

Feasibility and design studies will be undertaken to assess the viability of upgrading the remaining 2,410 km of roads linking state capitals from all-weather gravel roads to bitumen. The Bor-Malakal link is a major concern, because this section of the northern corridor linking Juba to Malakal is located in the Sudd with black cotton soils unsuitable for road construction. It will therefore

be imperative to conduct a pre-feasibility study that will determine the characteristics of the transport demands on this route and propose optimal solutions to meet these demands, considering all transport modes. The cost of this study is estimated at \$0.5 million and the entire cost of all the studies to upgrade the national connectivity is estimated at \$19.3 million.

Table 7.12: National Connectivity - Feasibility Study and Design to Paved Standard

Roads Details	Length (km)	Location	Cost (\$ million)	Completion date	Remarks
Juba-Mundri-Rumbek-Tonj-Wau	650	CES-WES-LS-WS-WBGs	5.2	2014	Link state capitals with Juba
Mundri-Yambio-Tambura-Wau	710	WES-WBGs	5.7	2015	Link state capitals with Juba
Juba-Bor	180	CES-JS	1.4	2014	Link state capitals with Juba
Juba-Terekeka-Rumbek	450	CES-LS	3.6	2015	Link state capitals with Juba
Rumbek-Maper-Bentui	270	LS-US	2.2	2014	Link state capitals
Wau-Aweil	150	NBGS-WBGs	1.2	2014	Link state capitals
Total	2 410		19.3		

Source: Directorate of Roads and Bridges and Consultant's Estimates

⁸² Kapoeta-Boma, which is currently a seasonal road, would first be upgraded to all weather standard and then the subject of studies to paved standard

The STP proposes an upgrade of a total of 2,730 km of national road network with an estimated total cost of US\$83.3 million, excluding maintenance costs. Periodic maintenance will also be undertaken on roads rehabilitated or upgraded to all-weather condition.

Improving national connectivity in the medium-term.

Basing on the studies carried out during the STP period, an estimated 2,410 km of interstate roads linking state capitals will be upgraded to paved standard over this period (2016-2020). Together with the proposed regional connectivity program this will mean that with the exception of urban areas, the country would have upgraded a total of 4,158 km to primary paved road network by 2020. The remaining 3,091 km of interstate and primary roads will also be brought to at least all-weather gravel road condition during 2016-2020 period.

This will essentially result into a road density by population of around 290 km/million which is still well below the prevailing Sub-Saharan African average of 533 km/million people (See Table 7.1). Cumulatively, the total cost for this national connectivity program is estimated at \$2.046 billion, with \$1.446 billion and \$600 million allocated to the construct roads to paved standard and to all-season gravel conditions respectively.

7.2.9 A Program to Strengthen Rural Connectivity

For the purposes of this Report, rural roads refer to the existing secondary and tertiary roads of South Sudan. Currently, the rural road network is roughly 6,123 km and these connect rural communities to the network of trunk roads. These rural roads are meant to open up rural areas and connect farmers and rural communities to markets to facilitate the flow of agricultural inputs/outputs and provide access to basic services. However, in the recent past, minor improvements have been undertaken through labour-based contract works and the vast majority of traceable rural roads are in very poor condition.

Improving rural connectivity in the short-term. The country needs to develop a rural road network. Between 2009 and 2010, feasibility studies and design of about 7,000 km of rural roads were carried out culminating in the submission of a related Final Development Plan Report (FDPR) in September 2010. Furthermore, the five-year prioritized program to improve rural connectivity also includes some trunk roads which are already part of the STP. The FDPR selection and prioritization is based on a

combined economic evaluation (EIRR and NPV) and a multi-criteria assessment (MCA) that was based on the following scale: (i) level of agricultural production; (ii) degree of regional integration; (iii) average daily traffic (iv) number of non-motorized traffic; and (v) level of cost effectiveness.⁸³

Subsequently, a Feeder Road Technical Committee (FRTC) chaired by the Under Secretary of the Ministry of Roads and Bridges (MoRB) and comprising representatives of development partners and relevant ministries was set up to develop the rural road network. The specific task of the committee is to: (i) liaise with stakeholders to obtain a list of proposed priority roads to develop at National and State level; (ii) design a criteria for selection and prioritization of roads to develop; (iii) produce a list of priority roads to develop; and (iv) develop technical standards and specifications, and implementation plans for the roads. A Feeder Road Steering Committee (FRSC), co-chaired by the Ministry of Agriculture and the MoRB approves the prioritization criteria and a list of priority roads. The outputs from the FRTC/FRSC work will serve as reference in aligning government and development partner interventions in the rural road network.

So far, priority lists submitted by states had a total length of 17,000 km of feeder roads. These lists are being reviewed and screened by the FRTC and below are the characteristics of priority areas: (i) high agricultural productivity, including livestock rearing and fisheries; (ii) ability to develop local capacity as well as have county/state agencies that will be trained in maintenance; (iii) less than 100 km from main truck; (iv) access to appropriate materials for construction such as water and gravel sources; (v) consistent and participatory support from local authorities and communities; and (vi) availability of dependable manual labour.

Clearly, a rural road recommended under the FDPR and validated through the FRTC/FRSC process will most likely qualify for the rural connectivity short-term program. Given the magnitude of the needs, development partners are likely to target roads or areas that have close linkages with their complementary initiatives to deepen synergies in the implementation of the program.

Considering implementation capacity limitations, this Report proposes an ambitious plan to upgrade 2,000 km of rural roads to all-weather status during 2011-2015. The related cost is estimated at US\$330 million. The assumption is that the experience gained from the short-term program will underpin the design and implementation of a much larger program to upgrade 4,000 km of rural roads to

all weather status during 2016-2020. The cost of this is estimated to be \$600 million (at 2010 constant prices and exchange rate). Once, the rural road improvement program of 6,000 km is implemented in the decade ahead it will essentially mean that entire rural road network of the country has been upgraded.

In the short-term, the livestock sub-sector is expected to significantly contribute towards the growth and prosperity of South Sudan.⁸⁴ Therefore priority livestock markets have been proposed as the major focus of the road sector strategy to allow the farmers' access the backbone infrastructure. These markets are located in ten areas, i.e. Greater Kapoeta region in EES; Nyirol and Pibor counties in JS; Nasir, Baliel and Renk in UNS; Panyinjar, Mayom and Leer in US; and Terekeka in CES.

7.2.10 Proposed Urban Road Program

The urban population in South Sudan was estimated at 16% in 2008 and is expected to increase steadily to 23% in 2015 and 26% in 2020. At the same time, urban transport infrastructure, including roads, is severely underdeveloped. With less than 70 km of paved urban roads, there are only about 35 meters of paved road per thousand residents in 2011, compared to an average of 128 metres in Sub-Saharan Africa's cities and 700 metres in the low-income countries of the developing world.⁸⁵

Upgrading program for the short-term. In collaboration with Japan, a Master Plan for Urban Transport Infrastructure was developed for Juba-- the business hub of South Sudan. This plan recognized Juba's rapid expansion and its critical contribution to the development of the country. The study identified the investment requirements to meet the present and future transport demands in Juba and South Sudan. The requirements amount to \$510 million for the first period of seven years (2009-2015). The related physical investment will comprise new construction and upgrading to AC standard of about 190 km of streets and a bridge of 560 metres over the Nile. The proposed investment for the 2012-2015 period will include new construction and upgrading to AC standard of about 100 km of urban roads including 20 km of arterial streets and 80 km of collector and local streets.

Going forward, urban transport infrastructure master plans will be developed for major towns, particularly those with a population close to or exceeding one hundred

thousand and these include Malakal, Wau, Aweil, Bor, and Yei (See Annex Table 3.1). Furthermore, 100 km of urban roads will be upgraded to all-weather condition and another 100 km will also be upgraded to paved standard in these major towns and the remaining state capitals. Roads that access river ports and airports will be among those upgraded.

The total cost of the urban connectivity during the STP is estimated at \$415 million, of this amount \$260 million will be used to extend and upgrade 100 km of urban roads in Juba to AC standard, \$140 million will finance the upgrade of 200 km of urban roads in state capitals and major centres, and \$15 million will support the development of urban transport infrastructure master plans for four major towns and two others state capitals.

Improving urban connectivity in the medium-term. The medium-term program will provide a continuation of the Juba urban road development program and will also support the implementation of the urban transport master plans. In the medium-term, an additional 140 km of paved roads and two bridges will be built in Juba to bring the total length of paved roads in Juba to about 300 km by 2020. The program proposes the construction of a total of 100 km of urban paved roads in the other main cities of the country and another 200 km of urban roads built to all-weather standard. The total cost of this program is estimated at \$1,250 million. Given that the total urban population projections of South Sudan are estimated to be 3.7 million in 2020, representing 26% of the total population, the implementation of this urban road program will translate into 135 metres of paved road per thousand residents, which is almost the same as the current level for Sub-Saharan African cities.

The total cost of the proposed urban connectivity medium-term program amounts to \$700 million, of this amount \$660 million will be used to construct urban roads to paved standard for and \$40 million to upgrade roads to all-weather road condition.

7.2.11 Institutional Development, Capacity Building and Technical Studies

Road safety enhancement. Technical support is required to assist the RSMC and the Directorate of Road Transport and Safety in the formulation and implementation of a

⁸³ Cost effectiveness analysis (CEA) indicator is defined as the cost of upgrading a particular route divided by the number of people served by the route

⁸⁴ OTF Group (March 2011), "Fostering Innovation and Competitiveness in Southern Sudan (FICSS) – Sector Growth Strategies". Prepared for Ministry of Commerce and Industry - GOSS

⁸⁵ Robin Carruthers, Ranga Rajan Krishnamani and Siobhan Murray (2009), "Improving Connectivity: Investing in Transport Infrastructure in Sub-Saharan Africa." AICD Background Paper 7, World Bank, Washington DC, 2009.

comprehensive RSP. The RSP will include: (i) review and improvement of RTA management system; (ii) support to emergency services; (iii) support to law enforcement; (iv) support to vehicle inspection activities; (v) promotion of public awareness campaigns; (vi) support to specific programs targeting commercial vehicle drivers; and introduction of road safety education in schools. The plan estimates that it will cost \$6 million to develop and implement road safety programs. This will cover the cost of equipment, workshops, campaigns, surveys, trainings and technical assistance.

Capacity building and institutional support. The proposed program of capacity building and institutional support will support the following:

- *Technical assistance (TA).* This assistance will complement SSRA capacity to implement the STP as well as support the development of a road maintenance strategy. Essentially technical support will target government agencies to support the handling of the large volume of procurement and financial management. The TA will include procurement experts, financial analysts and civil engineers. Basing on the existing capacity in the Ministry of Roads and Bridges a total of 170 man-months of technical assistance will be required to implement the STP and it is estimated to cost \$4.3 million.
- *Training for ministry technical staff.* The current training of engineers and technicians from MoRB, MoPI and SSRA will continue and going forward, training in planning, contract administration, procurement management, geotechnical, structural and transportation engineering are being planned. This training component is estimated at \$3.5 million.
- *Support to create a road maintenance fund.* A study will be undertaken to prepare for the establishment and initial operation of a Road Maintenance Fund (RMF) and this is estimated to cost \$1 million.

These capacity building programs and technical support will continue in the medium-term, including road safety enhancement (\$5 million), technical assistance (\$5 million), and training (\$ 2.8 million).

Technical studies. A series of studies will be undertaken in the short-term to lay the foundations for expanded levels of support for development of road sector infrastructure and services in the medium- and longer-term. These will include the following:

- *National transport master plan.* The national master plan will provide input for the development of medium- to long-term strategy (MLTS) of the transport sector. A draft national transport master plan was completed in

January 2010; however, there was limited coverage of the requirements for the decade ahead. The new master plan for South Sudan will highlight the characteristics of transport demand; develop projections related to the most likely scenarios; and come up with efficient programs to meet the demand as well as propose a pragmatic and effective institutional framework for the sector.

- *Bor-Malakal link.* A pre-feasibility study will be undertaken to determine the characteristics of the transport requirements and recommend ways to meet the projected future demand along the Bor-Malakal corridor. This activity is estimated to cost \$ 0.5 million.
- *Urban transport master plan.* Urban transport infrastructure master plans will be developed for major towns and these plans are estimated cost to \$15 million.
- *Feasibility and design studies for road upgrades.* The plan proposes studies that will lay a foundation to upgrade 965 km of regional network to a pave standard and 2,410 km of national truck road network. The feasibility studies for regional network and national truck road network will cost \$ 7.7 million and 19.3 million respectively and are expected to be completed during 2012-2015 period.

Over the medium and longer term, the estimated costs of the feasibility and design studies to upgrade of 365 km of the regional trunk road network will be \$2.2 million and the other road related studies will roughly cost \$6.8 million.

7.2.12 Proposed Development Expenditures for Road Transport

Proposed expenditures. The proposed program for road infrastructure development in the decade ahead amounts to about \$6.2 billion. Capacity building and technical services account for about \$92 million, with capital outlays of road infrastructure accounting for the remaining \$6.1 billion. Of this amount ongoing government and donor programs account for about \$250 million, and it is proposed that the balance \$5.9 billion will be mobilized primarily from government and donor sources.

Sources of funding for the program. During 2009-2011, the average annual donor disbursements for roads programs were \$85 million, while Government annual capital outlays for road works amounted to about \$165 million. Therefore the average annual level of spending on roads infrastructure and related capacity building and technical

studies was \$250 million, meaning that the Government's funding accounted for two-thirds of the cost. As Table 7.13 indicates that in 2012 annual disbursements will remain close to the average of the past three years, and thereafter will continue rise annually to reach a little over US\$500 million by 2015 and close to \$1, 030 million a year by 2020. Clearly, mobilizing the resources of such magnitude to finance the road sector is a massive challenge to the Government.

As discussions in Chapters 2 and 3 indicate, the working assumption used in this Report is that the donor community will allocate 25% of total ODA (excluding humanitarian

assistance) to the infrastructure program for the decade ahead. In recent years donors have been allocating 7% of their total ODA allocations for road sector infrastructure in South Sudan. The funding arrangement included in Table 7.13 calls for donors to increase their allocation to road infrastructure from 7% to 15% of total ODA by 2013. In this scenario, donors' allocations for roads infrastructure will increase annually by \$20 million. However, the Government allocation for the roads program has to increase from the recent annual average of \$165 million to \$280 million by 2013 and roughly \$780 million by 2020. Meaning the Government will fund 68% of the proposed program which was close to its share in 2009-2011.

Table 7.13: Development Expenditure Program for the Roads Sector

Program	2010	2011	2012	2013	2014	2015	2020	Total 2011-20
Capacity building & technical services								
Road safety enhancement	-	-	2 000	2 000	1 000	1 000	1 000	11 000
Capacity building for Roads Authority	5 306	4 720	1 574	-	-	-	-	6 294
Capacity building for road maintenance	-	565	1 125	1 125	935	-	-	3 750
Support for road maintenance Fund	-	-	600	400	-	-	-	1 000
Training	-	-	700	1 000	1 000	800	500	6 300
Technical support	-	-	1 000	1 200	1 100	1 000	1 000	9 300
Nile bridge studies	340	650	329	-	-	-	-	979
Road studies & detailed design	-	-	4 000	10 000	7 000	6 000	-	29 200
Transport master plan	-	-	5 000	9 000	1 000	-	-	15 000
Total	5 646	5 935	16 328	24 725	12 035	8 800	2 500	82 823
Capital expenditures								
Ongoing government road programs	194 640	135 280	-	-	-	-	-	135 280
Ongoing donor road programs	62 080	52 615	50 598	5 000	3 255	-	-	111 468
Proposed new road programs								
Trunk roads	-	-	63 400	200 500	277 900	385 600	704 600	3 804 600
Rural roads	-	-	40 000	80 000	82 500	93 500	150 000	930 000
Urban roads	-	-	88 000	176 000	112 000	24 000	200 000	1 200 000
Sub-total	-	-	191 400	456 500	472 400	503 100	1 054 600	5 934 600
Total	256 720	187 895	241 998	461 500	475 655	503 100	1 054 600	6 181 348
Grand total	262 366	193 830	258 326	486 225	487 690	511 900	1 057 100	6 264 171
Financing arrangements								
Government	194 240	135 280	179 910	345 100	318 500	311 900	747 100	4 286 890
Donor community	68 126	58 550	78 416	141 125	169 190	200 000	310 000	1 977 281
Total	262 366	193 830	258 326	486 225	487 690	511 900	1 057 100	6 264 171
Government share of funding (%)	74.0	69.8	69.6	71.0	65.3	60.9	70.7	68.4

Source: Annex Tables 8.3 and 8.4.

7.2.13 Road Maintenance

Current status of road maintenance. Maintenance activities are currently financed through national budget and donor support. Most of these are handled sporadically without proper planning and coordination. There have been massive demands on the budget which in turn has kept the allocations at the minimum. The 2011 National Budget reported an outlay of about \$28 million and \$16 million for road maintenance in 2010 and 2011 respectively.

Proposed institutional arrangements for maintenance. South Sudan transport policy recognizes the critical importance of road maintenance and is aware of the need to establish a system that will ensure adequate and consistent funding for this activity. The policy also provides for the creation of a Road Maintenance Fund (RMF) which will raise revenues through user charges, primarily in the form of a fuel levy. RMF resources will finance road agencies' activities, and these funds will be kept in separate and discrete accounts, and will be used exclusively for road maintenance activities. The study earlier mentioned of the RMF for the proposed program will address the following issues:

- Propose the fees of user charges and find other innovative ways of raising revenues for the fund;
- Design an appropriate system for charging and collecting the revenue;
- Formulate laws to guide the collection of the road user charges; and
- Investigate existing agreements and applicable rates within COMESA regional arrangements and the effects of applying specific rates for South Sudan.

Currently, the road network classification and inventory which is a prerequisite for an effective road maintenance strategy is incomplete and the implementation of the transport policy has also encountered some delays. The Ministry of Roads and Bridges, through the DRB and soon SSRA, is responsible for the planning and execution of maintenance of trunk and state roads and on the other hand MoPI is in charge of other roads.

The next steps. The expectation is that once the newly established SSRA is operational, the management of maintenance requirements will improve substantially. As articulated in its Provisional Order, the SSRA will first finalize the classification of public roads and draw up and budget for its annual and five-year maintenance plans. SSRA will also carry out a study on road user charges as well as champion the establishment of the RMF and prepare a road maintenance strategy. Over time, a Road Asset Management System (RAMS) will be put in place.

The DRB has prepared a document providing recommendations on the consistent and pragmatic road maintenance strategy. The paper proposes that the strategies deployed should be tailored to resources available, this has compelled the Ministry to undertake an in-depth evaluation of the practicalities of adopting the Output and Performance-based Roads Contracts (OPRC) model as the basis for the maintenance strategy for bitumen surfaced roads.

In this model, "the Contractor is not paid directly for inputs or physical works but for achieving specified outputs or service levels, i.e. the construction or rehabilitation of the road to pre-defined standards, followed by the maintenance of certain minimum service levels on the road throughout the period of the contract, all defined by outcomes expressed in the service level criteria.

Going forward, basing on the same model, the contracting of the design, construction and maintenance of new roads will be done at the same time. This will ensure that these roads are well looked after beyond the construction phase and largely guarantee a certain level of service. The paper further states that "community-based and labour-based methods for the maintenance of gravel roads will provide opportunities to local enterprises and in so doing lead to growth of the firms involved as well reduce the poverty in the country. Whilst this might not be applicable to all of South Sudan's gravel roads it is suggested that the feasibility of implementing a system in which local residents actively participate on a regular basis in the maintenance of the roads in their communities will be worth investigating. Subject to further investigation, it is anticipated that regional depots with limited technical capabilities but strong labour-based capabilities will provide an optimum solution to the maintenance of gravel roads.

Proposed levels of spending on maintenance. The report proposes routine maintenance for roads in relatively good condition. Total maintenance expenditures are projected to be about \$960 million for the next decade. The total periodic road maintenance costs are estimated at \$500 million with annual outlays increasing steadily from \$20 million in 2012 to about \$110 million in 2020 as indicated in Table 7.14. Periodic maintenance is projected to be about \$460 million for 2012-2020, equivalent to an annual average of about \$50 million.

This report proposes that the maintenance expenditures will entirely be financed by the national budget and the RMF. Today's budget allocation for road maintenance in 2011 is \$16 million, the Government will need to quadruple this amount in 2012 so that the roads are kept in good repair. To be able to carry out the same level road maintenance activities, the authorities will need to ensure the increases in the allocations are maintained at the same rate for the successive annual budgets until the RMF is

established and is operational. Having said that, potential RMF revenues are closely correlated with the vehicle fleet, including motor cycles, and road traffic densities, however the current projections indicate these resources are

unlikely to cover the full cost of maintenance in the short-term. Therefore, road maintenance will also be supported by a significant budgetary allocation during most of the IAP period.

Table 7.14: Road Maintenance Expenditures (In \$ at 2010 constant prices and exchange rate)

Category	Unit Cost (\$ '000)	2012		2015		2018		2020		2012-2020
		Length (km)	Cost (\$ million)	Length (km)	Cost (\$ million)	Length (km)	Cost (\$ million)	Length (km)	Cost (\$ million)	
Routine Maintenance										
Interstate and primary roads										
Paved	12			193	23	590	7.1	1897	22.8	61
Gravel	10	1 591	15.9	3 001	30	3652	36.5	5839	58.4	322.4
Rural Roads										
Gravel	5			750	3.8	2100	10.5	3570	17.9	61.5
Urban Roads										
Paved	15	70	11	180	2.7	306	4.6	367	5.5	28.4
Gravel	10	133	1.3	233	2.3	299	3	353	3.5	21.7
Total Routine Maintenance			18.3		41.1		61.7		108	495
Periodic Maintenance										
Interstate and primary roads										
Paved	150					193	29			
Gravel	25	1831	45.8	1831	45.8	2099	52.5	1020	22.5	353.3
Rural Roads										
Gravel	20					500	10	550	11	36
Urban Roads										
Paved	200							30	6	20
Gravel	30	67	2	67	2	67	2	97	2.9	21.9
Total Periodic Maintenance			47.8		47.8		93.4		45.4	460.2
Total Maintenance Expenditures			66.1		88.9		155.1		153.4	955.2

Source: Directorate of Road and Bridges; Consultant estimates

7.3 River Transport and Infrastructure

7.3.1 The Current Situation

River corridors. As noted in Chapter 5, the White Nile extends from Lake Victoria to Khartoum for nearly 3,700 km. It enters South Sudan at Nimule, flows to Juba and Bor and through the vast swamps of the Sudd, and passes major towns such as Malakal, El Renk and Kosti. The section of the White Nile between Juba, El Renk and border with Sudan is navigable and it is about 1,300 km long. The Bahr el Ghazal River is a tributary of the White Nile. It is navigable all year round from the main route where it joins the White Nile to Meshra Achol and for more than half of the year to Wau. The Sobat River, another tributary, is navigable between Malakal and Abwong all year round. Its stretch from Abwong to Nasir, Akobo and Pibor is navigable for more than six months of the year. The Sobat area and indeed most of the flood-prone areas of Upper Nile Region depend on river transport from June to October during the year

The navigable part of White Nile and its tributaries crosses six of the ten states of South Sudan. Given the poor road infrastructure, presence of land mines in some areas and huge swampy areas makes river transport a practical and cost effective option to reach communities along the White Nile and its tributaries. It specifically links Malakal the capital of the Upper Nile State to Juba.

Commercial river transport services are fairly regular on the route known as the “Southern reach” of the White Nile, which stretches from Kosti to Juba (1,436 km), through El Renk, Malakal, Shambe, Diam Diam, Bor and Mongala. The water level slope between Juba and Bor is relatively steep and here the river flow velocities range between 2 to 3 metres per second. Between Malakal and Kosti, water level slopes are very mild and the flow velocity of the river is very low, ranging between 0.5 to 0.7 metres per second.

Inadequate navigations aids and poor river conditions are significant impediments to effective development of river transport. The number of buoys and navigation sign boards installed along the river is insignificant. During navigation, the operators rely on their knowledge of the river physical features to avoid accidents.

On a positive note, companies are increasingly using new technologies, such as Global Positioning System (GPS), satellite phones and high frequency radios to track barge movements. However, there are still major difficulties to pass through areas with rocks, sharp bends and flood plains. The main obstacle is the narrow section with sharp bends between Mongala and Juba. Other major obstacles

along the river include unmarked rocks, wrecks, silt build-ups, shoals, water hyacinth growth, and siltation especially near ports. Risks are higher when the water level is low.

River ports. There are seven main river ports in South Sudan located in El Renk, Malakal, Shambe, Diam Diam, Bor, Mongala and Juba (see Map 7.3). With the support from Japan, South Sudan has constructed a jetty, offices for port officials and open air storage facilities in Juba Embankment Port. The jetty has a gantry crane arm with a 2.5 tonne metric capacity. A shipyard has been built at the Old Juba Port location which was formerly abandoned because of siltation problems. Dredging works will be undertaken to facilitate access of the shipyard. Finally, in collaboration with the Japanese a Juba River Port Expansion Project has been launched and it will transform the Port into a modern well equipped facility with an extended jetty, warehouses and administrative buildings. Currently, Stevedores’ Union has the monopoly to load and offload cargo. Since it is the sole provider it charges high rates and it usually undertakes the activities manually and on average manages to only loading/off loading four barges per day. Occasionally, mobile mechanical lifting equipment is availed on demand. The lack of storage facilities means that fuel is pumped directly from the barges to the waiting tankers. The Port area is also used as a staging point for IDPs returning to the South, en route to their final destination.

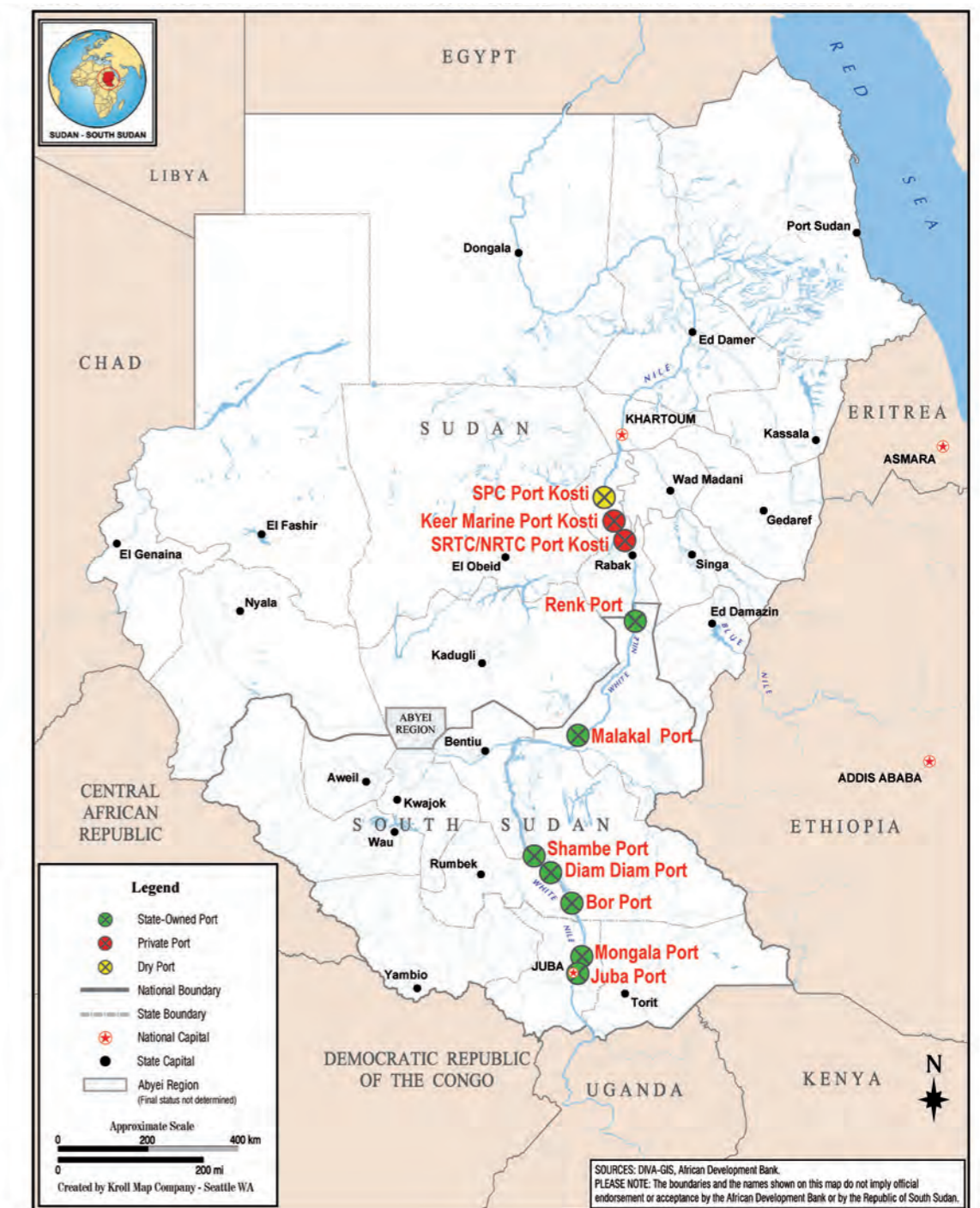
New river ports have recently been built in Mongala, Diam Diam and Shambe. The facilities constructed include a jetty, a gantry crane arm and offices. Shambe port is particularly important as it enables access to the Lakes, Warrap and Unity States. Because of the narrow and winding section between Mongala and Juba, pusher convoys are usually dismantled in Mongala. The river port in Bor consists of a natural embankment for offloading fuel and general cargoes. Bor has also privately owned storage facilities. Independent vendors offering mechanized lifting equipment are occasionally available.

Malakal is a primary transit point between Kosti and Juba. It is served by smaller boats that can access the White Nile tributaries. All major private operators call at Malakal to offload fuel, building materials and general cargoes. The port has silt free a pier of about 300 metres. Cargo handling is mostly done manually by private porters. Mobile mechanized lifting equipment can be acquired on demand. Loading/offloading capacity is around 3 barges per day. Fuel is discharged at a privately-owned depot with a storage capacity of 60,000 litres of diesel and 60,000 litres of petrol.

El Renk was known as a loading facility for Dura. Currently majority of private operators also call at El Renk to offload fuel and general cargoes. The port has a functional jetty which is in poor condition. At times, porters do the manual handling at rates cheaper than those charged in Juba. Mobile mechanized lifting equipment is available

on demand from private vendors. Privately owned storage facilities are available a few kilometres away from the port.

MAP 7.3: White Nile River – Main Ports on Kosti-Juba Corridor



River operators and traffic. The New River Transport Company (NRTC) and Sudan River Transport Company (SRTC) were created by privatizing Government-owned River Transport Corporation (RTC). The majority shareholder in the new venture is Kuwait Gulf Link (KGL) Group with 70% while GoNU and GoSS hold respectively 20% and 10%. Although they operate with different names, both companies have the same top management and headquarters in Khartoum. They have also created

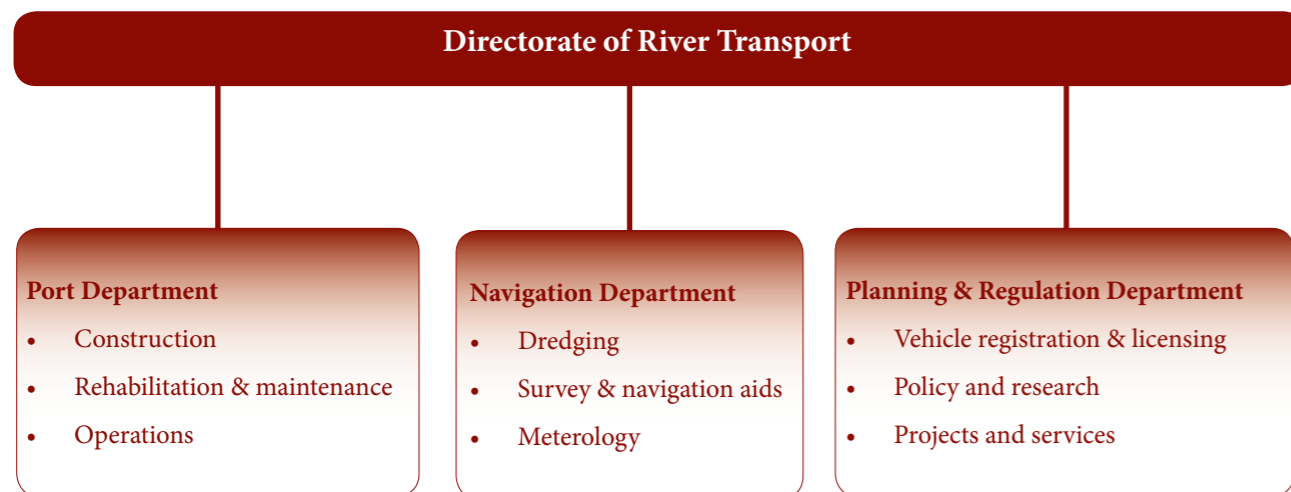
an entity in South Sudan, the Southern Sudan Trans-Nile Company (SSTC) located in Juba. NRTC/SRTC is the largest operator on the White Nile with a large fleet composed of pushers, passenger barges and a mixture of flap top, general cargo and fuel barges. The other major barge operator is the KEER Group which has the same fleet mix except passenger barges. Both operators can transport all types of cargos including containers, fuel, vehicles, construction materials, machinery and food items. Alongside these,

there are a number of smaller private active operators that do not call regularly into the ports. There are also some companies or independent operators with boats of various sizes that operate primarily in the South between Malakal, Bor and Juba and the tributaries in between.

Historically, the traffic volumes reached 300,000 tons per year in the mid-1970s, but by 2008 traffic had fallen way short of 100,000 tons. Despite the lack of compiled data in recent years, it seems unlikely that it will reach the 100,000 ton mark in the near future.

During the first quarter 2011, around 20 NRTC/SRTC trips to and from Juba were registered against an average one per month for KEER. Rates range from US\$250 to \$300 per metric ton or cubic foot- depending on which is larger, from Kosti to Juba. The travel time for cargo barges along this route is around 3-5 weeks excluding loading and off-loading times. The carrying capacity per sail is between 1,200 and 2,000 metric tons. For a return journey from Juba to Kosti, rates are 50% of that for upstream travel and sailing time can drop to one week. For passenger barges, it takes about 10 days.

Figure 7.1: Structure of River Transport



Source: Ministry of Transportation

River transport administration. Until the independence of South Sudan, the Inland River Navigation Department (IRND), based in Khartoum was the Federal Unit which had the overall responsibility on river transport. The main objectives assigned to IRND were to:

- Promote river transport
- Assume an overall control of river transport
- Encourage the private sector to invest in river transport
- Ensure safety of navigation on all the river routes in Sudan

Its functions include registration of crafts, vessel inspection, vessel licenses and crews' licenses. GoSS, through MTR, has claimed progressive delegation of the development, management and operation of river transport system in Southern Sudan. The Directorate of River Transport has the organizational structure set out in Figure 7.1.

Port Managers report to the Port Department Director. In the case of Juba Port, the Port Manager is presently supported by a team of eight technicians; three (3) in charge of maintenance of equipment, three (3) maintaining

infrastructure and cargo handling and two (2) handling security matters. The security function is reinforced by the River Transport Police and other security organs. The directorate staffing is poor, both in terms of quantity and quality.

7.3.2 Proposed Program for River Transport

GoSS signed an agreement with an international company to dredge the river in selected locations including near the jetty in Juba. Bathymetric surveys will be required to update the details of the river sections (depths, widths, bend radii), explore and map the navigable route and precisely identify navigation constraints.

Alignment with SSDP. With the support of Japan, the Juba Port Expansion project will soon be implemented. Furthermore, GoSS has signed an agreement with an international company to dredge the access of Juba shipyard as well as some of selected sections.

Short-term. In the short term, the construction of cargo handling facilities will increase the efficiency of some major ports, such as Malakal and Bor. It is also critical to survey and map White Nile River with a special focus on the 45 km section between Mongala and Juba. It is envisaged that these hydrographic surveys will be the basis for all river engineering studies and subsequent works including dredging and installation of navigation aids. Firstly, a bathymetric survey beginning with Mongala-Juba section will provide inputs to determine the requirements for possible dredging operations and appropriate positioning of navigation aids. Further still, given the high cost implications and far reaching consequences on the hydraulic and morphologic behaviour of the river, in depth reviews will be undertaken prior to the implementation of large-scale dredging operations.

Following the independence, South Sudan has taken full responsibility for river transport on the Southern reach of the White Nile, at least from El Renk to Juba. There is a need to establish and implement a new institutional framework, including a River Transport Authority, which will take over from the Khartoum-based IRND. Legislation and regulation for river transport will be consistent with the regional and international regulations on inland water transport. A training program for staff of the river transport institutions will be developed and implemented. Technical assistance will be needed for these assignments.

The cost of short-term river transport program is estimated at \$36.8 million (2011-2015), including \$7.5 million of budget supported by the Government, \$4 million will finance the handling facilities to major ports, \$9.7 million will support dredging works, \$2.7 million for installation of navigation aids, \$10.8 million for hydro graphic surveys and \$2.1 million for training and technical assistance.

Medium- to long-term. The medium to long-term program will mainly ensure the continuation of support to dredging works, installation of navigation aids, and provision of technical assistance and training. Total expenditures estimated at \$30.1 million, including capital expenditures of \$29 million and capacity building of \$1.1 million.

7.3.3 Expenditure Program and Funding for Water Transport

Total cost of the proposed river transport program is estimated at \$67 million for 2011-2020. This estimate includes on-going projects such as Juba River Port development and specific dredging on selected areas. As reflected in Table 7.15, the first four years include significant outlays on capacity building and technical studies, including the establishment and implementation of a new institutional framework, staff training, and hydro graphic/bathymetric surveys which will give a solid base of primary data on the physical characteristics of the White Nile River and its tributaries.

Table 7.15: Development Expenditures for the River Services and Ports Program
(In \$ millions at 2010 constant prices and exchange rate)

Program	2010	2011	2012	2013	2014	2015	2020	Total 2011-20
Capacity building and technical services								
Technical assistance	-	-	0.3	0.3	0.3	0.3	-	1.6
Training	-	-	0.3	0.2	0.2	0.2	0.1	1.6
Hydrographic survey & studies	1.1	0.8	4.0	1.0	2.0	3.0	-	10.8
Sub-total	1.1	0.8	4.6	1.5	2.5	3.5	0.1	14.0
Capital expenditures								
Ongoing government programs	13.1	7.5	-	-	-	-	-	7.5
Port handling facilities	-	-	2.8	1.2	-	-	-	4.0
Dredging	-	1.6	2.1	2.0	-	4.0	5.4	36.6
Navigational aids	-	-	-	-	1.0	1.7	-	4.7
Sub-total	13.1	9.1	4.9	3.2	1.0	5.7	5.4	52.8
Total	14.2	9.9	9.5	4.7	3.5	9.2	5.5	66.9

Program	2010	2011	2012	2013	2014	2015	2020	Total 2011-20
Financing arrangements								
Government	13.1	7.5	2.8	1.2	1.0	5.7	2.7	31.7
Donors	1.1	2.4	6.7	3.5	2.5	3.5	0.1	19.6
Private sector	-	-	-	-	-	-	2.7	15.5
Total	14.2	9.9	9.5	4.7	3.5	9.2	5.5	66.9

Source: Annex Tables 8.5 and 8.6.

The proposed sources of funding for the river transport program are: (i) national budget for a total amount of \$31.7 million, representing 47% of the total cost, (ii) private sector for \$15.5 million (23%) and (iii) donors for 19.7 million (30%). For the purposes of this Report, it is assumed that by 2014 the required institutions and entities will be fully operational and traffic levels will have increased significantly. A PPP-type arrangement, either as a concessionaire or a lessee of facilities will then be agreed which will allow significant private sector involvement in the financing of capital expenditures. Afterwards, the private sector will finance installation of navigation aids and contribute to half of dredging costs and donors will mainly be involved in capacity building activities.

7.4 Railways Infrastructure and Services

7.4.1 Current Status of the Railways Network

The only railway line in the country is the southern section of the 446 km Babanusa-Aweil-Wau line, which has been part of the 4,578 km Sudan rail network operated by the Sudan Railway Corporation (SRC). This line connects Wau in South Sudan to Babanusa, Khartoum and Port Sudan in Sudan (see Map 7.4). The total length of the railway line in the country is 248 km, from Wau to the border with Sudan. The single track is narrow gauge (1,067 mm) and is based on steel sleepers. The track condition is considered to be poor. Although the initial design speed was 50 km/h, the current speed is very low.

The country's portion of the network was not operational for almost two decades. Following some rehabilitation works supported by funding from the United Nations, the line was reopened in March 2010. However, the service

is irregular and limited; on average it is operational once a month mainly transporting consumer goods from Khartoum.

The Directorate of Railways of the MoT is responsible for promoting railways in South Sudan. It is headed by a Director General who is currently the only senior staff of the directorate. The functions of the directorate include the development of policy and regulations for railway operations in South Sudan.

7.4.2 Proposed Program for Rail Transport

Ongoing programs and the Southern Sudan Development Plan: According to the Southern Sudan Development Plan (SSDP), on-going efforts in the railway transport sub-sector include: (i) rehabilitation of housing along the Wau-Aweil-Babanusa line; carrying out feasibility study of a proposed extension from Wau to Juba and Nimule; and undertaking a modest program of capacity building for the Directorate of Railways. The 2011 National Budget allocated a total of \$1.26 million equivalent of capital outlays for railways. This allocation included \$0.630 million for a feasibility study of an extension of the rail line from Wau to Juba and Uganda, and \$0.630 million for rehabilitation and maintenance of railway facilities.

The SSDP includes a proposed expenditure of \$241 million on the railways sector during 2011-2013. This is will support the creation of a railways regulatory body, purchase equipment for the railways network, and construct the 150 km of new lines in 2013.⁸⁶ However, discussions with Directorate of Railway Transport confirmed that there is no on-going project in the sub-sector, contrary to what is indicated in SSDP. Such a huge investment has to be justified by specific pre-investment studies as proposed below.

⁸⁶ There have been a number of media reports about a proposed rail line extension from Wau to Nimule. See, for example, Odhiambo, Allen (2011), "RVR targets planned Uganda-Sudan railway line." (<http://www.businessdailyafrica.com/Corporate+News/RVR+targets+planned+Uganda+Sudan+railway+line/-/539550/1213656/-n6o0bz/-/>). Business Daily August 5, 2011.

MAP 7.4: Railways Network in South Sudan and Sudan



Proposed strategy for the railways sub-sector. After Independence, a number of issues will need to be addressed. Of particular importance at this stage will be the following:

- Clarification of the ownership arrangements for the section of the rail line in South Sudan.
- Selection of an entity that will operate the railway service. Several PPP options should be investigated taking into consideration political situation between Sudan and South Sudan and the very low level of traffic.

The working assumption that underpins the proposed Action Plan for the railways is that in the Government, represented by the South Sudan Railway Corporation or some such state owned corporation, will own the national rail infrastructure (track and communications network) and will be responsible for rehabilitation and upgrade of the existing network and any possible future expansion of the network. Subject to further detailed study and dialogue with potential investors, the expectation is that the South Sudan Railway Corporation will enter into a PPP-type partnership with a private concessionaire who will own and operate locomotives and rolling stock. The

key objective for the short-term is to develop a realistic program improving the railway service in the country.

The short-term work plan is therefore dominated by capacity building and technical services. It is proposed to carry out a study that will investigate the foregoing issues and review the existing situation of the railway infrastructure in the country. The study will explore and make recommendations on the following issues: (i) legal, institutional and regulatory framework including issues related to infrastructure asset ownership and management; (ii) management of railway operations; (iii) detailed inventory of the track and signalling system; (iv) traffic demand analysis and prospects; and (v) an appropriate development program, including support for the establishment and operation of the new institutional framework.

Expansion of the network in the country has to be underpinned by regional integration benefits and a strategic diversification of access to the sea. In that regard, the proposed Action Plan for railways includes a prefeasibility study of a rail link to one or more seaports. The cost of the proposed short-term program (STP) for railways is estimated at \$5 million, including \$1 million for rehabilitation of houses, \$3 million for studies and a notional amount of \$1 million for the establishment and operation of the new institutional framework.

The program for the longer-term will be built around two initiatives:

- The rehabilitation and improvement of the 248 km of existing line from Wau to Aweil and the Border. The cost of this program is estimated at about \$75 million.
- Basing on prefeasibility study initiated under the STP, undertake a feasibility study of a rail link that connects the country to a deep-water port; for instance, a railway line linking Kampala or Eldoret to Juba and Wau. Such an extension will have the added advantage of connecting the existing Sudan rail network to that of the East African Community.

7.4.3 Development Expenditures Required for the Program

The total estimate of the rail transport program amounts to \$87 million. The cost of new rolling stock and locomotives for the provision of services are not included at this stage, pending further analysis of traffic demand for the medium- and longer-term and creation of an appropriate operating environment for the award of contracts to one or more concessionaires who will be responsible for service provision.

The proposed Action Plan for the decade ahead does not include any provision for construction of a line from Wau to Juba neither to the border with Kenya nor Uganda. According to the World Bank (2010), the cost of constructing a single track, non-electrified railway line on relatively flat terrain is at least \$1.5 million per km, increasing to \$5 million a km in more rugged terrain.

Assuming an extension from Wau to the border with Kenya or Uganda involved about 750 km of a new single track line, the capital cost of the extension will be in the range of \$2-4 billion (at 2010 constant prices). A substantial number of passengers and a significant amount of freight traffic will be required for the economic and financial justification of a capital outlay of this magnitude. The proposed feasibility studies will address these types of concerns prior to serious negotiations with potential concessionaires that will operate on the track once built.

As Table 7.16 indicates, the Government will most likely fund at least 90% of the proposed expenditures for the railways program. The working assumption in this Report is that the Government will cover most of the capital outlay expenditures and largely collaborate with donor community to provide modest support to capacity building activities for the infrastructure sector.

Table 7.16: Development Expenditure Program for the Railways Sector
(In \$ '000 at 2010 constant prices and exchange rate)

Program	2010	2011	2012	2013	2014	2015	2020	Total 2011-20
Capacity building and technical services								
Study of the railways sub-sector	-	-	0.3	0.7	-	-	-	1.0
Support for new institutional arrangements	-	-	-	0.5	0.5	-	-	1.0
Prefeasibility study of rail link to a seaport	-	0.6	1.0	1.0	-	-	-	2.6
Feasibility study for a rail link to a seaport	-	-	-	-	3.0	3.0	-	6.0
Sub-total	-	0.6	1.3	2.2	3.5	3.0	-	10.6

Program	2010	2011	2012	2013	2014	2015	2020	Total 2011-20
Capital expenditures								
Rehabilitation of administrative houses	-	0.6	0.5	0.5	-	-	-	1.6
Improvement of existing rail line	-	-	-	-	-	-	-	75.0
Sub-total	-	0.6	0.5	0.5	-	-	-	76.6
Total	-	1.2	1.8	2.7	3.5	3.0	-	87.2
Financing arrangements								
Government	-	1.2	1.5	1.5	0.5	-	-	79.7
Donors	-	-	0.3	1.2	3.0	3.0	-	7.5
Total	-	1.2	1.8	2.7	3.5	3.0	-	87.2

Source: Ministry of Transportation

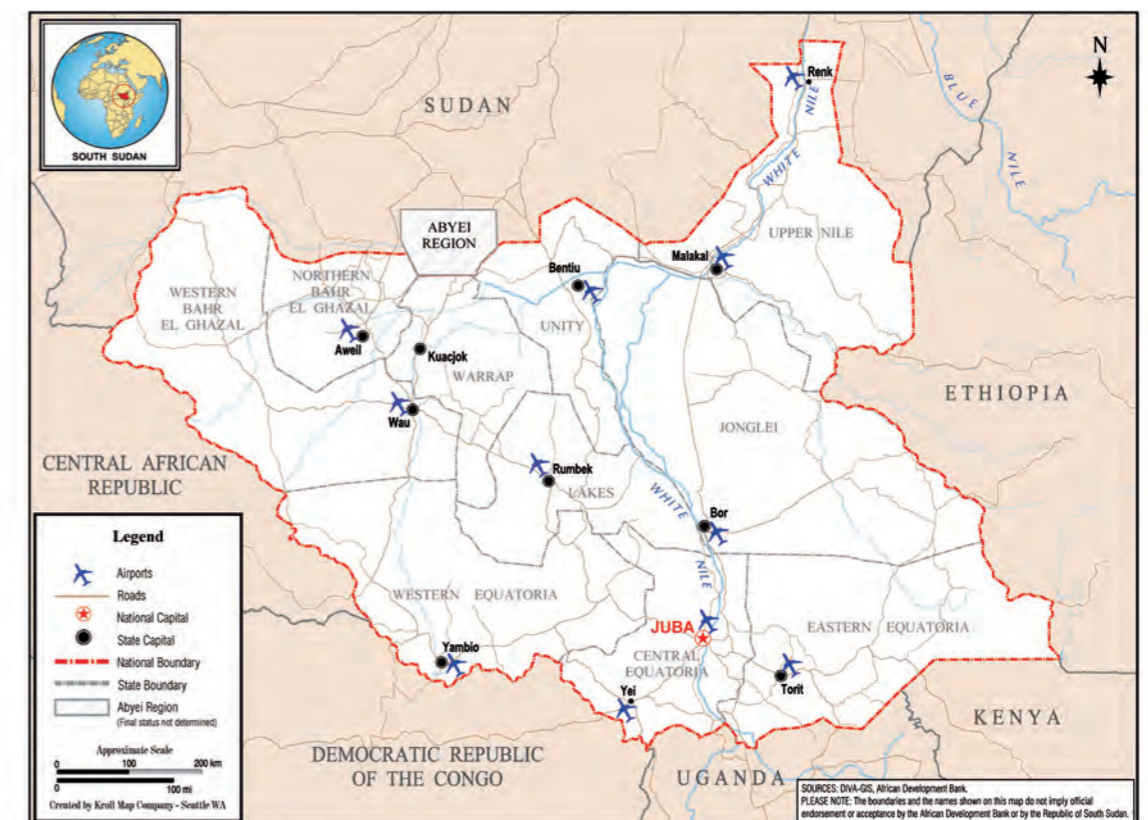
7.5 Air Transport Infrastructure and Services

7.5.1 Current Status of Civil Aviation

Air transport infrastructure. Air Transport infrastructure is composed of an international airport in Juba, a domestic

airport in each state capital of the other nine states and around 300 airstrips (see Map 7.4). These airstrips emerged during the civil strife to provide military logistics bases and served later on, as hubs for humanitarian relief supplies by international relief agencies and NGOs. Only Juba and three domestic airports (Rumbek, Wau and Malakal) are manned. Malakal and Wau receive occasional international flights. Juba and Malakal are the only airports with paved runway, measuring 2,400 and 2,000 meters long respectively. The paved runways are in fair condition. Existing airport facilities, are inadequate and lack proper maintenance.

MAP 7.5: Main Airports in South Sudan



Juba airport is the main gateway to South Sudan. It links the country to the rest of Africa and the world. However, the existing airport conditions are very poor. The airfield does not comply with International Civil Aviation Organization (ICAO) standards. The actual runway of 2,400 meters length and 45 meters width imposes a drastic restriction on aircraft payloads. There is no Instrument Landing System (ILS) and no visual Precision Approach Path Indicator (PAPI); operation only during the day in Visual Meteorological Conditions (VMC).

The runway and apron at Juba airport have significant problems of pavement deterioration. The passenger terminal is used in a mixed process for domestic and international departures and arrivals. The terminal facilities are inadequate: limited capacity of departure lounge and arrival hall, few rudimentary check-in counters, a hand operated balance, no information display for passengers or operators, no stand allocation or planning system, no computer connections to airline reservation systems or to the air traffic control for updated information, no baggage conveyor belts. There were no dedicated cargo facilities despite noticeable cargo traffic. The general aviation uses the same terminal facility as the commercial traffic and passengers. Support facilities are limited to several carts for luggage transport, several services vehicles, few fire fighting vehicles and stockpile of fire extinguishing materials. There is no fuel storage facility which adds another constraint to the aircraft payload.

Institutional arrangements. Prior to Independence, GoSS and GoNU had to cooperate on civil aviation and airports operations in the South. According to ICAO requirements, only one Civil Aviation Authority (CAA) can be established in a country. Therefore, the CAA based in Khartoum had the overall responsibility for the development of civil aviation and air transport services in Sudan, including South Sudan. Regulations, Search And Rescue (SAR) functions, international matters and air traffic management operations were under the CAA, while airstrips operations fall under the responsibility of the States. In addition, CAA operates all international and national airports. This can create major conflict of interest and a clear separation of the functions of regulator and service provider is required.

Notwithstanding overlapping responsibilities, GoSS established the Directorate of Air Transport within MTR with primary functions for policy formulation, approval of tariffs, international conventions, bilateral air services agreements and multilateral and regional agreements. The Directorate was also responsible for the development of international and national airports in South Sudan while the States' airports and airstrips fall under the State MoPI.

The Yamoussoukro Decision and South Sudan. An important initiative for South Sudan is to become a signatory to the Yamoussoukro Decision of 1999 (Sudan is already a signatory), the main objective of which was the gradual liberalization of scheduled and non-scheduled intra-African air services, abolishing limits on the capacity and frequency of international air services within Africa, liberalizing fares and universally granting traffic rights up to the "fifth freedom of the air."⁸⁷ Signatory states were obliged to ensure the fair opportunity to compete on a non-discriminatory basis. Even though the decision was a pan-African agreement to which most states abound, the parties decided that it should be implemented by separate regional economic communities (RECs).

Following the First COMESA-EAC-SADC Tripartite Summit in October 2008, the Joint Competition Authority (JCA) on Air Transport Liberalization was established to oversee the full implementation of the Yamoussoukro Decision in the three RECs. Subsequently the RECs undertook individual assessments of various implications related to full implementation of the Decision. In February 2011, COMESA signed a Grant Protocol Agreement with the AfDB for \$8.6 million for funding the Tripartite Communication, Navigation, Surveillance/Air Traffic Management (CNS/ATM) system project

Air navigation and security. The air navigation infrastructure is substantially lacking. The airspace management was under the responsibility of GoNU. Indeed, all of Sudan makes up one Flight Information Region (FIR) with the Area Control Centre (ACC) located in Khartoum. There is no radar for surveillance purposes and the ACC relies on contact by radio. Air traffic management is thus by voice communication and pilots have to communicate among themselves by HF radio to identify other aircrafts. One shortcoming of the present system is that the radio system does not cover the entire Sudan and many black spots are in South Sudan. Aviation oversight in Sudan is considered poor.

Civil aviation operations. Civil aviation services and air traffic have expanded rapidly in recent years in South Sudan. The presence of United Nations missions and many humanitarian aid donors has contributed significantly to the demand for aviation services. Currently, the country is served by about ten Local Air Operators and thirteen International and Regional Carriers. At Juba airport, aircraft movements increased from 11,652 in 2007 to 33,140 in 2010, an average annual growth of 42%, passenger traffic reached 189,356 in 2010 with an average annual increase of 22% from 2007, and mail traffic witnessed an annual increase of 20% while freight traffic remained stagnant. At the time this Report was prepared there was

no information available on the numbers of passengers passing through the other main terminals in the country.

Assuming that there will be steady improvements in domestic security, sustained strong economic growth and considerable development in tourism potential in South Sudan this may result into an average annual increase of 15% in domestic and international passengers, at this rate the total passenger traffic will increase to about 900,000 by 2020. The proposed Action Plan therefore calls for a substantial investment in upgrading the air navigation system of the country.

7.5.2 Proposed Program for Air Transport

The proposed program for the improvement of civil aviation in South Sudan is crafted around a phased approach that includes high priority programs for implementation in the short-term (2011-2015) and in the medium- and longer-term (2016-2020).

Ongoing improvements in civil aviation infrastructure and the short-term program (STP). The STP will consist of five main components: (i) restructure and upgrade institutional arrangements for the civil aviation industry; (ii) complete the ongoing upgrade of Juba domestic and international airport; (iii) upgrade selected airports in state capitals and other locations; (iv) formulate and implement an air transport policy; and (v) design and implement a capacity building and training program for technical staff.

Restructure and upgrade institutional arrangements for the civil aviation industry. One of the primary tasks of the Government of South Sudan will be to design and implement a new institutional framework for civil aviation, including the establishment of a Civil Aviation Authority (CAA). Through this framework, the Government will set clear and separate functions performed by central Government, state governments, aviation and airport authorities, air transport operators and other private sector activities. Under the proposed new institutional framework, the functions of the regulator and the airport service providers will be clearly separated and performed by distinct entities.

This Report proposes that the new institutional framework and the establishment of the CAA take priority before the rolling out the proposed short-term program. However, South Sudan will remain in the same FIR controlled by the ACC in Khartoum at least for the immediate future. Moreover, the proposed CAA will be responsible for

promoting, regulating and enforcing civil aviation and security standards consistent with the requirements of the ICAO. The authority will be mandated to generate some of its funding requirements from user fees, a charge on departing scheduled passengers and a fuel levy payable by the general aviation industry. Other sources of revenue will include charges for various services, including aircraft registration, examination and registration of pilots, and various licensing activities.

The creation of the CAA will be accompanied by formation of a separate public company, referred to in this Report as the South Sudan Airport Services Company (SSASC). The SSASC will own the airside and some landside facilities at airports on behalf of the government. It will be essential for the SSASC to begin its operations with a strong set of financial accounts.

The ICAO requires member states to charge aeronautical fees on a cost-recovery and not a profit-making basis. Given this requirement, the profitability of airport operations will depend on the amount of income that can be generated from airport concessions and other services such as car rentals and parking services. The likelihood of the continued strong growth in traffic will generate increasing revenues resulting from airport linked services such as landing, parking, passenger fees and other usage fees. This will favour a concession PPP type arrangement in which a private company, perhaps in partnership with the SSASC, will manage selected airports, operate services and undertake required rehabilitation or upgrading of infrastructure. For the purposes of this Report, it is assumed that the concession will be operational from 2015. Until then, sources of funding will be the national budget and public institutions which collect air traffic fees.

Juba domestic and international airport. The master plan of Juba Domestic and International Airport, which was completed in 2007, recommended an orderly development in four phases corresponding to four time horizons, i.e., short-term, medium-term, long-term and very long-term. Each phase of development is planned to meet aviation activity forecast needs in compliance with international design standards as prescribed by ICAO.

A high priority will be accorded to completion of the remaining works under phase 1 of Juba Airport Development Master Plan. The works related to the first phase are on-going and consist mainly of the following: (i) extension of a runway from 2,400 m to 3,100 m to meet B767-200-ER requirements - extension of 700 m, (ii) strength pavement and runway edge light system; (iii) extension of the taxiway; (iv) navigation aids to facilitate approaches and permit night operations⁸⁸;

⁸⁷ The regulation of international air transport is guided by the so-called eight "freedoms of the air." The first and second are technical freedoms to over-fly a foreign country or to land for refueling. The third and fourth are commercial freedoms to carry passengers from a carrier's home country or another or vice versa. The fifth, sixth and seventh freedoms concern the rights to carry passengers between two foreign countries, either as an extension of a flight from the home country (fifth), through as top in the home country (sixth), or without ongoing service to the home base (seventh). The eighth freedom, pure cabotage, is the right to carry traffic between two points in a foreign country.

⁸⁸ Given the current situation between the two countries, South Sudan may look for other arrangements in close coordination with ICAO and neighbouring countries

passenger facilities improvements, including apron and parking extension, and new passenger terminal fully equipped and furnished with distinct areas for domestic and international flights; (v) dedicated cargo facilities, including apron, parking and terminal; (vi) general aviation facilities, including apron, fuel pump; (vii) fuel farm; (viii) fire fighting station; (ix) rehabilitation of the air traffic control tower; (x) aircraft maintenance hangar; (xi) autonomous power supply; (xii) heliport, including helipad, SALS, helipad light system; and (xiii) perimeter fence. The on-going works which have secured financing shall be completed by end-2011. The remaining works of the phase 1 development, including runway extension and passenger terminal equipment will be part of the proposed short-term program for Air Transport.

Upgrade of airports in state capitals and other locations. The SSDP calls for the upgrade of six state airports during 2011-2013 to meet ICAO standards. Actions on this proposal do not appear to be on-going activity, contrary to the indication in the SSDP matrices. As a first step, this Report proposes a study of the aviation infrastructure to: (i) determine the most viable airports and airstrips; and (ii) design rehabilitation or upgrading works for selected airports and airstrips. The airports selected to be upgraded (or) and extended will depend on the outcome of the study. However, for the purposes of this Report, it is assumed that the Malakal and Wau airports will be upgraded to attract more regional flights. Rough estimates of the costs involved are incorporated for the short-term period. These estimates are substantially lower than those of SSDP.

Formulate and implement an air transport policy. The formulation of this component of the proposed program will need to be developed in close collaboration with the ICAO. It will include proposals for: (i) the design and implementation of a system for airspace surveillance and air traffic management that meets ICAO requirements and ensures a safe navigation and airport security; (ii) establishment of a proper funding framework to support aviation industry growth that includes ICAO guidelines on user charges and cost recovery; and (iii) the development of specific measures needed to achieve a strict alignment with ICAO standards and recommended practices (SARP) in the medium-term. A key objective of the proposed Action Plan is to meet the minimum requirements of the ICAO by 2015 and have South Sudan classified by the Federal Aviation Administration (FAA) and the European Aviation Safety Agency (EASA) as Category 1.

Capacity building and training. There is an urgent need for personnel training to ensure safe and secure air transport operations. Firstly, working with the ICAO, identify training needs and design an appropriate training program. The next step will be to implement this

training program and as may be required send personnel to training facilities elsewhere in the region and also in the interim retaining international personnel with the requisite skills for air traffic surveillance and management and airport security.

Proposed program for the medium- and longer-term. Investments proposed for subsequent phases shall enable the upgrade of Juba airport and others selected in order to meet the required international standards in medium-to long-term. To this end, a periodic update of the Juba Airport master plan is necessary to reflect the notable developments and dynamics in a fast changing environment regarding national and regional traffic demands, as well as technology requirements in the air transport.

Given the rampant expansion of Juba town, the option of relocating the airport well beyond the city outskirts will be considered. The consideration will be to have the existing airport dedicated to serving the domestic and some specific flights and developing a more modern international airport elsewhere. This shall be done before initiating phases two and three of the development program. The new international facility will include a larger runway and substantial capacity for both cargo and passenger terminals.

As Chapter 6 indicates, the proposal is for a major expansion in production of high value fruits and vegetables (HVFV) for the domestic and export markets. Successful development of this industry will require substantial private sector investments in cold chain facilities for the domestic and international market. These facilities will require investment in cold storage facilities. As Map 6.4 in Chapter 6 indicates, the three areas identified for major private investment in irrigation development that will support production of these perishable products suggest that such cold chain facilities will be required in Juba, Wau, Malakal and perhaps Rumbek and Yambio.

Potential for private investment in civil aviation. In addition, given the above-mentioned traffic growth prospects for Juba airport and, to a lesser extent, Wau and Malakal airports, there are likely to be good opportunities for the provision of airport services under a PPP-type arrangement in which concessions are awarded to one or more private service providers. The concessionaire will enter into a partnership arrangement with the proposed South Sudan Airport Services Company, owner of airside and some landside assets at the major airports of the country. The proposed Action Plan for civil aviation includes provision for the retention of a transactions advisory team to provide technical support to the government in its negotiations with a potential investor.

7.5.3 Development Expenditures Required for the Program

As indicated in Table 7.17, total development expenditures for the proposed air transport program are estimated at about \$222 million, including a provision of around \$13 million for the much needed capacity building and technical services. The bulk of the new capital outlays will be for the rehabilitation or upgrading of airports, in particular Juba, Malakal and Wau, and the installation of

an air surveillance and air traffic management system that will ensure compliance with ICAO requirements.

The cost of the short-term program for 2011-2015 is projected to be \$105.8 million, including around \$40 million for remaining works on phase 1 of the Juba Airport development, \$2 million for specific HVFV logistics infrastructure, \$45 million for rehabilitation or upgrading of Malakal and Wau airports, \$15 million for installation of airspace surveillance and air traffic management system, and about \$9 million for capacity building and technical services.

Table 7.17: Development Expenditures for the Civil Aviation Program
(In \$ millions at 2010 constant prices and exchange rate)

Program	2010	2011	2012	2013	2014	2015	2020	Total 2011-20
Capacity building and technical services								
Technical assistance	-	-	0.6	0.5	0.5	0.4	0.2	3.3
Training programs	-	-	0.7	0.6	0.6	0.5	0.3	4.1
Civil aviation master plan	-	-	-	1.0	-	-	-	1.0
Airspace surveillance & ATM study	-	-	0.5	0.5	-	-	-	1.0
Airport and airstrip studies	-	-	1.0	1.0	-	-	-	2.0
Transaction advisory team	-	-	-	-	-	0.6	-	1.8
Sub-total	-	-	2.8	3.6	1.1	1.5	0.5	13.2
Capital expenditures								
Juba airport phase 1	3.2	10.9	29.0	-	-	-	-	39.9
Juba airport phases 2 & 3	-	-	-	-	-	-	13.8	48.0
Rehabilitate & upgrade Malakal & Wau airports	-	-	-	10.0	15.0	20.0	-	45.0
Rehabilitate & upgrade of other airports	3.2	-	-	-	-	-	10.0	50.0
Airspace surveillance & ATM	-	-	-	3.0	7.0	5.0	-	20.0
Cold chain facilities at airports	-	-	-	2.0	-	-	-	6.0
Sub-total	6.4	10.9	29.0	15.0	22.0	25.0	23.8	208.9
Total expenditures	6.4	10.9	31.8	18.6	23.1	26.5	24.3	222.1
Financial arrangements								
Government	6.4	10.9	30.5	17.5	22.0	25.6	5.0	141.7
Donors	-	-	1.3	1.1	1.1	0.9	0.5	7.4
Private sector	-	-	-	-	-	-	18.8	73.0
Total expenditures	6.4	10.9	31.8	18.6	23.1	26.5	24.3	222.1

Source: Annex Tables 8.9 and 8.10.

The medium- to longer-term program would comprise: (i) a continuation of the development of Juba airport, phase 2 and 3, subject to clarification about the possible relocation of the international airport; (ii) further improvement of airspace surveillance and the air traffic management system; (iii) rehabilitation or upgrading of selected airports

and airstrips as determined under the STP study and (iv) further capacity building through technical assistance and training. The related cost is estimated at \$115.9 million, including \$111.2 million for capital expenditures and \$3.9 million for capacity building.

7.6 Development Expenditures and Financing for the Transport Sector

7.6.1 Development Expenditures

As Table 7.18 indicates, total development expenditures for the transport sector program are projected to be \$6.55 billion for 2011-2020. These include about \$130 million for capacity building, technical support and studies, and \$6.42 billion for capital outlays. The road transport sub-sector accounts for 94.3% of these outlays, primarily for creation

of a functioning national road network by 2020. Civil aviation accounts for about \$220 million, or 3.4% of the total outlays. The river transport and railways account for the remaining 2.3% of the program. Full implementation of the proposed program will mean that capital outlays will build up rapidly in the short-term, rising from a little less than \$250 million a year in 2010-11 to \$530 million a year by 2015 and almost \$1.1 billion a year by 2020. As the discussion in Chapter 4 indicates, the bulk of the capital works associated with these expenditures will be contracted out to the private sector under competitive procurement procedures. As a result, the transport sector program will offer very substantial business opportunities for the private sector, especially in construction activities and supply of construction materials and equipment.

Table 7.18: Total Development Expenditures for the Transport Sector Program
(In \$ millions at 2010 constant prices and exchange rate)

Category	2010	2011	2012	2013	2014	2015	2020	Total 2011-20
Capacity building & technical support								
Road transport	5.6	5.9	16.3	24.7	12.0	8.8	2.5	82.8
Rivers services and ports	1.1	0.8	4.6	1.5	2.5	3.5	0.1	14.0
Railways	-	0.6	1.3	2.2	3.5	3.0	-	10.6
Civil aviation	-	-	2.8	3.6	1.1	1.5	0.5	13.2
Sub-total	6.8	7.4	25.0	32.0	19.1	16.8	3.1	120.7
Capital expenditures								
Road transport	256.7	187.9	242.0	461.5	475.7	503.1	1 054.6	6 181.3
Rivers services and ports	13.1	9.1	4.9	3.2	1.0	5.7	5.4	52.8
Railways	-	0.6	0.5	0.5	-	-	-	76.6
Civil aviation	6.4	10.9	29.0	15.0	22.0	25.0	23.8	208.9
Sub-total	276.2	208.5	276.3	480.2	498.7	533.8	1 083.8	6 519.7
Total expenditures	283.0	215.9	301.4	512.2	517.8	550.6	1 086.9	6 640.3

Source: Annex Tables 8.9 and 8.10.

The proposed expenditure program for the transport sector differs substantially from that set forth in the SSDP. The latter proposes total development expenditures of \$2.8 billion for 2011-2013, including an amount of \$1.7 billion for air transport infrastructure. The proposed total development expenditures for the same period under the IAP are \$1.03 billion with \$55 million for air transport. As discussed in Section 7.5 above, the cost of airport upgrading appear to have been substantially overestimated in SSDP; the need for prior feasibility

studies that examine the economic costs and benefits of these investments would defer decisions on some of these SSDP proposals. The latter applies also to the construction of an additional rail line and, to a lesser extent, to the large program of dredging along the Nile. Conversely, as discussed in Section 7.2, the IAP proposes a larger program for the roads sector, particularly for rural and urban roads; moreover, the SSDP appears to underestimate substantially the costs of the major trunk road projects.

7.6.2 Funding Arrangements for the Program

The proposed funding arrangements for the transport sector program are set out in Table 7.19. The proposed program calls for a substantial increase in the allocation of donors funds for the transport sector, and in particular the roads sector as discussed above in Section 7.2. In recent years the donor community has, on average, been funding about 25% of the development expenditures under the ongoing transport development program. The proposed program put forward in this Report calls for the international donor community to fund about 30% of the program during 2011-2020 – equivalent to a total of about \$2 billion at 2010 constant prices and exchange rate. The expectation is that donors would fund the bulk of the \$130 million of capacity building and technical support proposed for the program, and a little less than 30% of the proposed capital works programs for the transport sector, especially in road transport. The areas where donors could perhaps make a major contribution are in support of regional integration, particularly through the upgrade to

paved standard of major links to neighbouring countries and the rural roads program of close to \$1 billion for the decade ahead.

The expectation is that PPP-type arrangements can be introduced in the civil aviation and river transport sub-sectors by about 2015 after the requisite legal and regulatory frameworks are in place and reliable public partners have been built up in the form of financially sound state enterprises. The amount mobilized from the private sector under these arrangements are likely to be quite modest in the decade ahead, but they will lay the foundations for a substantial enlargement in the provision of private transport services under concession arrangements in the following decade. The position taken in this Report is that the traffic densities on the trunk road network are much too low to be attractive for private investment in toll road arrangements. The rough rule of thumb for these types of arrangements in Sub-Saharan countries is that a traffic flow of at least 15,000 vehicles a day is required for toll road investments that will be attractive to the private sector. Even on the most heavily trafficked routes, South Sudan is a decade or more away from such traffic volumes.

Table 7.19: Funding Arrangements for the Transport Sector Program
(In \$ millions at 2010 constant prices and exchange rate)

Category	2010	2011	2012	2013	2014	2015	2020	Total 2011-20
Government	213.7	154.9	214.7	365.3	342.0	343.2	754.8	4 540.0
Donors	69.2	60.9	86.7	146.9	175.8	207.4	310.6	2 011.8
Private sector	-	-	-	-	-	-	21.5	88.5
Total	283.0	215.9	301.4	512.2	517.8	550.6	1 086.9	6 640.3

Source: Tables 7.13, 7.15, 7.16 and 7.17.

The implication is that the Government will have to step up its budget allocations for capital works programs for the transport sector. As Table 7.19 indicates, government outlays for capital works and related development programs are currently running at the equivalent of about \$200 million a year. Under the proposed funding arrangement set forth in this Report, government spending on capital works and related activities would rise to about \$340 million a year by 2015 and \$750 million a year by 2020. If the foregoing proposals for the allocation of donor funding for the transport sector were adopted, the government would assume primary responsibility for the funding of the bulk of urban roads and the rehabilitation and upgrade of the national trunk road network of the country.

7.7 Maintenance of Transport Infrastructure

Lack of maintenance by national and state governments of existing transport infrastructure is an issue of major concern. According to the rough estimates made for the purposes of this Report, the value of transport sector infrastructure assets was in the range of \$950 million at end 2010. Desirable levels of routine maintenance on a public asset of this magnitude would typically call for budget allocations in the range of \$30-35 million a year. Budgets records suggest that actual allocations in 2011 were at best half of this level. If this underfunding of

routine maintenance were to persist, rehabilitated and upgraded infrastructure will soon deteriorate and the economy will then face a repeat of the need for much larger capital expenditures on rehabilitation to get the assets back into proper working condition. It is expected that the new

institutional arrangements for the sector, as discussed elsewhere in this Chapter, will ensure that much greater attention is given to routine and periodic maintenance of these transport infrastructure assets than has been the case in the past.

Table 7.20: Routine Maintenance Expenditures for Transport Sector Infrastructure
(In \$ millions at 2010 constant prices and exchange rate)

Sub-sector	Capital outlays				Capital stock					Maintenance expenditures				
	2012	2015	2016	2020	2011	2012	2015	2016	2020	2012	2015	2016	2020	Total 2012-20
Roads	242	503	726	1 055	913	1 155	2 595	3 321	6 906	18.3	41.1	48.0	108.8	496.5
Waterways & river ports	5	6	6	5	40	45	55	61	84	1.8	2.2	2.5	3.4	22.5
Railways	1	-	25	-	113	113	114	139	189	4.5	4.5	5.5	7.5	52.8
Civil aviation	29	25	28	24	88	117	179	207	286	4.7	7.2	8.3	11.4	72.1
Total	276	534	785	1 084	1 154	1 430	2 943	3 727	7 465	29.3	55.0	64.3	131.1	643.9

Source: Annex Table 8.11, Table 7.18 and estimates by authors.

As Table 7.20 indicates, if the proposed Action Plan for transport infrastructure is implemented in full in the decade ahead, the replacement value of these assets will be about \$7.3 billion in 2020 (at 2010 constant prices and exchange rate). These transport infrastructure assets will be among the most important publicly-owned assets in the country. They will require substantial annual outlays for routine maintenance. Routine maintenance expenditures are projected to be about \$30 million in 2012, rising steadily thereafter to about \$130 million a year by 2020. For the decade as a whole, outlays on routine maintenance will need to be about \$650 million if these assets are to be maintained in good working condition and in that way, support sustained strong economic growth in the country.

As much as possible, maintenance activities should be outsourced to the private sector through multi-year contracts. The build up in public spending on maintenance to about \$130 million a year by 2020 offers another substantial opportunity for the development of new business activity in South Sudan and the creation of substantial amounts of employment for unskilled and semi-skilled workers. Chapter 4 includes a more detailed discussion of these emerging business opportunities and the actions that will be required to promote the role of the domestic business community in these opportunities.

7.8 Management of Risks and Uncertainties

There are a number of risks and uncertainties associated with the proposed program for the transport sector. The major ones relate to the design, funding and implementation of a program of such magnitude. Design is severely hampered by information gaps. Funding availability is a major uncertainty given the significant build-up in the proposed annual development and maintenance expenditures, as compared to pre-independence years. Weak institutional and human capacities are cross-cutting issues in this new nation and affect particularly the transport sector where key institutions are being built up or are to be established. Thus, key concerns centre on the capacity of National Government and local authorities to oversee the design and implementation of this Action Plan for the development of the transport infrastructure needed in the country for sustained strong economic growth. Strengthening these capacities in the public sector will be a major challenge as will be the development of programs to strengthen the capacity of an embryonic domestic private sector to respond to the substantial business opportunities offered by the program.

7.8.1 Design Uncertainties

Roads. Very limited data on traffic and vehicle fleet, and lack of inventory and classification of the road network lead to significant uncertainties which affect mainly maintenance and medium- to long-term development programs. For the short-term program, economic importance and current conditions of the proposed roads are well known and the construction/upgrading to paved standard of two international roads and of urban roads in Juba, which represents 63% of the total short-term road capital expenditures program, was the subject of detailed studies.

Completion of the on-going inventory and classification exercise and contractual obligation for the newly established Road Authority to develop a five-year Road Investment Program, including development and maintenance priorities, and to prepare an annual work program, including maintenance, would offer opportunities to reduce uncertainties through proper adjustment of maintenance and the medium- to long-term development program. Moreover, the proposed development of a national transport master plan, which would be completed in the short-term period, would give more light and specificities for the direction ahead.

Rail, river and air transport. With regard infrastructures under the Ministry of Transport, limited information is available on existing rail track condition, morphological and hydrographic data on the White Nile River and its tributaries, and current condition of most airports and airstrips. Federal Units based in Khartoum had overall responsibility for air, rail and river transport before South Sudan independence. Limited delegation was given to the GoSS Ministry of Transport and Roads through the Directorates of Rail Transport, River Transport and Air Transport. One of the main and urgent challenges of the new Ministry of Transport is to set up the proposed new institutional framework for these three sub-sectors and make it operational.

Studies and technical assistance are proposed to have a better knowledge of the infrastructure, to deal with legal, institutional and regulatory framework including issues related to infrastructure asset ownership and management, and to explore the prospects for suitable PPP-type arrangements for private provision of services. These actions would help remove major uncertainties and allow timely adjustments to the programs.

7.8.2 Availability of Funding

As discussed above, it is imperative to close the huge gap in transport infrastructure to open up permanently several regions of this wide country, allow access to social services, improve connectivity between markets and potential agricultural lands, reduce significantly transport costs and remove the major impediments that transportation represents in doing business in South Sudan. Against this setting, the proposed Action Plan for transport infrastructure calls for a program of \$6.5 billion of development expenditures and \$1.1 billion of routine and periodic maintenance expenditures during 2011-2020. Even so, key transport sector indicator for South Sudan in 2020 will still be lower than the current indicators of comparator countries. The exceptional efforts required from the donor community and from the Government have to be put in this context. The proposed financing of the development expenditures for the program calls for about \$2 billion of donor funding, \$4.5 billion of funding by government and public entities, and a very modest amount of private funding under PPP-type arrangements. The program calls for a build-up in donor funding for the transport sector from an average of about \$65 million a year to about \$220 million a year from 2013. This build-up poses significant challenges for the donor community. In the past few years, donor allocations for infrastructure have accounted for about 7% of total donor disbursements of development assistance (excludes humanitarian assistance). Under the program proposed in this Report the donor allocation for transport infrastructure would rise to about 15% of total development assistance during 2013-2020, after which demands on donor support for infrastructure would decline steadily.

Funding for maintenance. There cannot be strong support from the donor community for the transport program without a clear and firm commitment to plan, finance and implement the necessary maintenance to preserve these transport assets. As indicated earlier, for example, a road which is not maintained routinely will cause significant traffic disruptions, increase vehicle operating costs and will have to be rehabilitated at a cost several times higher than the cumulative cost of maintenance. Financing requirements evolve with the length of roads in maintainable condition.

The main source of funding for maintenance is the Government budget. Given the pressing demands on the budget, maintenance works, which have had low political

and social visibility, were neglected. To ensure a more reliable and consistent source of funding, the transport policy provides for the creation of a Road Maintenance Fund (RMF) with revenue deriving from road user charges. RMF resources should be ring-fenced to prevent use for purposes other than road maintenance. Establishment and start-up of the RMF, following the related study, are essential components of the short-term program and central to mitigate the high risk of under-spending on road maintenance. The key challenge here is to determine fair levels of charges to be applied for the use of the road, given the limited vehicle fleet at this time. There is a need to implement sound public information programs to explain how user fees will generate substantial benefits in improving road maintenance.

There is a similar need to build a maintenance culture in the other sub-sectors and to put it into practice. Maintenance cost recovery from pricing policy, under the primary responsibility of the River Transport Authority, Airport Authority and Rail Operator, would help to ensure that the required funding would be available.

Funding from government and public entities sources. Capital budget for transport was about 9% to 10% of national budget in 2010 and 2011. Relative to non-oil GDP, it stood at around 3%. At this level of spending there is no prospect to close the huge gap in transport capacities; at these levels of spending transportation would remain a major impediment to economic development. The challenge is to transform this vicious circle into a virtuous one which implies a significant increase in spending on maintenance and development of transport infrastructure.

In the proposed financing plan, Government and public entities funding would start at around \$1500 million in 2012, which is close to 2011, and increase steadily to about \$790 million in 2020. If funding could not be mobilized on the required scale, the implementation period of some components, like the much needed construction/upgrading to of national trunk roads, would have to be extended. This would have implications for the development of domestic and regional markets for agricultural products and hence for incomes, employment and livelihoods.

Private funding. Transport services are provided by private operators. All the works and consultancy services in the program will be contracted to the private sector. The program also gives room for the private sector to be involved in the funding for the provision of infrastructure through suitable PPP-type arrangements. The proposed

levels of private spending are modest in the decade ahead, but these initiatives would set the stage for a substantial expansion in the role of the private sector in the following decade.

The attractiveness of PPP options is closely linked to traffic volumes. Juba, Wau and Malakal airports offer good prospects of traffic growth. Transaction advisory team services are proposed for the presumed concession arrangements for one or more airports. Current volumes of traffic on rail and river are major concern. It is hoped that, with time, relations with the North would be normalized, enabling significant traffic growths. Planned studies, training and technical assistance in the short term would also help to reduce risks and uncertainties on private funding availability in giving more light and details in the way forward and supporting the implementation of the required actions.

7.8.3 Implementation Capacities

The newly established Road Authority, State MoPIs and other new entities that are being set up, will have a central role in building the implementation capacities of line agencies, in particular in the area of procurement and financial oversight during the design and implementation of the program. Multiple specific skills are needed at a time when the country is faced with a general dearth of qualified individuals. There are significant risks of misprocurement, delays in start-up and completion, and cost overruns. As indicated elsewhere in this Chapter, the program provides for a significant technical support.

In the past, some donors decided to entrust international consultants with the overall management of projects they were funding, instead of going through the established Project Management Team under DRB. Such situations should be avoided in the future. Line agencies and authorities should be backed up in their official roles and responsibilities while providing them with strong institutional support thus, contributing effectively to capacity building.

Support to domestic private sector development would continue through multi-year maintenance contracts, small-scale labour force works and incentives in procurement procedures to encourage international and local joint ventures or sub-contracting. Donors should aim to manage workloads by agreeing on common rules of procedure, implementation modalities and shared reporting.

Provision of Electricity and Rural Energy

8 Provision of Electricity and Rural Energy

8.1 Current Status of the Energy Sector

8.1.1 Role of the Energy Sector

The majority of the population in the country uses biomass including fuel-wood, charcoal and grass for lighting and cooking. About 99% and 50% of the population use these resources for cooking and lighting, respectively. Modern energy is solely used for lighting purposes with about 14% of the population using petroleum products and close to 4% of the population using electricity⁸⁹. Biomass will continue to be the dominant source of energy for some time to come. It is necessary to replace biomass energy use gradually by modern energy in order to: (i) promote socio-economic development; (ii) minimize forest degradation which is a cause for global warming; and (iii) reduce the hardship as well as health hazards involved in household activities and hence improve quality of life. In addition, it is essential to use the fuel-wood, which entails deforestation, in a sustainable manner through cost effective resource management and end use efficiency.

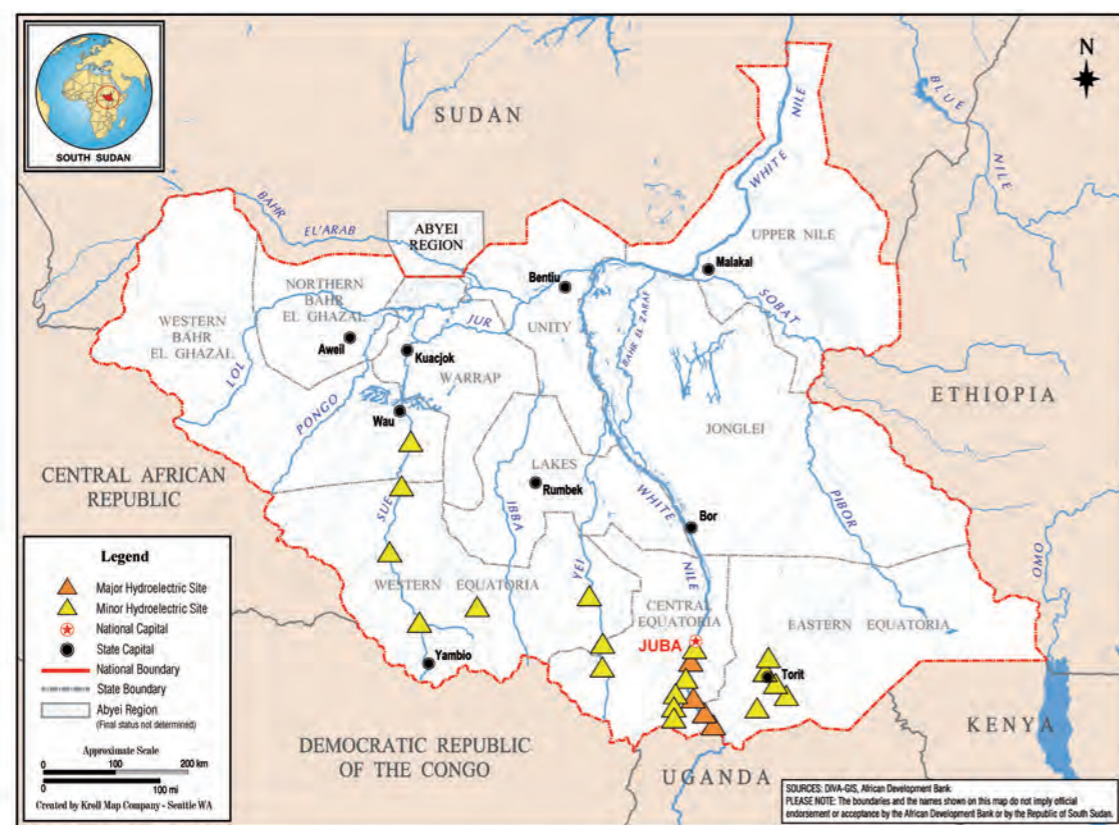
The revenues generated from petroleum production constitute a dominant part of the income of the country currently contributing about 98% to the national budget. Although the goal of the government is to develop alternative sources of income and reduce oil sector dependency, the petroleum revenues will continue to dominate the national budget in the medium term. The Government further recognises that petroleum is a non-renewable resource and subject to volatile international

market prices, and hence understands the need to manage the resources for the benefit of both the present and future generations while minimizing the strain on the government budget. The Government also intends to implement a Petroleum Stabilization Fund to dampen the impact of volatile oil prices on the budget. The Government has now drafted the National Petroleum Policy (SSNPP) Paper to guide the effective and sustainable management of the petroleum sources in the country. The Petroleum Bill is presently under preparation which will be enacted soon after.

Every productive sector of the economy relies on the provision of electrical energy. Electricity plays a vital role in social and economic development as it is a critical factor of production whose cost directly impacts other services and the competitiveness of enterprises. Consequently, the state of provision of reliable electricity has a direct bearing on the generation of employment and growth in the national income. About 50% of big firms and 70% of small firms reported that electricity was a major constraint on doing business in the country⁹⁰. Hence, electricity supply shortages/interruptions have serious repercussions on any effort to turn around the economy and achieve sustainable economic and social growth. In recognition of the critical role electricity plays in the economy, the Government has adopted the South Sudan National Electricity Policy (SSNEP) Paper (May 2007) that outlines the framework for the development and operation of the Electricity Supply Industry (ESI). Specifically, the Paper defines the Government's sector priorities and development strategies, and relationships and scope for Public-Private Partnerships (PPPs). The policy provisions have been addressed in the draft Electricity Bill which will be enacted soon.

⁸⁹ Statistical year-book, South Sudan (2010); the electricity use includes private sector generation.
⁹⁰ AICD, June 2011.

MAP 8.1: Location of Potential Hydropower Sites in South Sudan



8.1.2 Energy Sources and Infrastructure

Oil and gas. As the discussion in Chapter 2 indicates, the country has significant reserves of oil and gas. These sources are not currently used to meet domestic demand for energy. Exports of petroleum crude are the main source of foreign exchange earnings for the country. The crude is carried by pipeline through Sudan to Port Sudan.

Hydropower. The country is endowed with a number of potential hydropower sites which are all situated on the White Nile River. The following five mega hydropower sites with a cumulative capacity of 2,590 MW have been identified: Bedden (720 MW), Fula (1,080 MW), Lekki (420 MW), Shukoli (250 MW) and Juba barrage (120 MW). Map 8.1 indicates the location of these sites. Regarding mega hydropower development, all the potential sites have been studied at pre-feasibility study level. Recently, the government funded the services of a consulting firm to prepare a feasibility study for the mega Fula hydropower plant. In the short-term program, a feasibility level comparative study of the five sites will be undertaken to determine

the sequence of development of the plants. Such study will allow the development of the hydropower sites in an optimal manner and facilitate the mobilization of financial resources for their development. The initial phase project is expected to be developed in the medium term. Six small hydropower plants (sizes ranging between 2MW and 40 MW) with a cumulative capacity of 100 MW have also been identified for development. None of the hydropower sites has been developed as yet.

Fula Small Hydropower Plant (SHP) is planned to be developed in the short-term. A feasibility study of the project is ongoing with financial support by the Government of Norway. The study is planned to be completed in May 2012. Fula SHP will have a capacity in the range of 40 to 60 MW and is intended to supply Juba.

8.1.3 Energy Consumption

Currently, the energy consumption is mainly from biomass with over 99% of the population using fuel-wood and grass for lighting and cooking⁹¹. The percentage of population using the various types of national energy sources for lighting and cooking are presented in Table 8.1.

Table 8.1: Type of Fuel Used by Percentage of Population

Type of use	Wood or Charcoal	Grass	Cow dung	Electricity	Petroleum product	Candle	No lighting	Total
Lighting	35.4	14.7		3.9	13.5	5.8	26.9	100
Cooking	95.9	3.3	0.1	0.3	0.3		0.3	100

Source: Statistical year-book for southern Sudan, 2010.

The majority of the population uses fuel-wood, charcoal and grass for lighting and cooking. As indicated earlier, about 99% and 50% of the population use these resources for cooking and lighting, respectively. Modern energy is solely used for lighting purposes with about 14% of the population using petroleum products and close to 4% of the population using electricity.

curtailed by the two civil wars in the past 50 years. Despite the rich hydropower potential, power generation is from expensive diesel generation and the supply is limited to a few towns. The installed generation capacity is around 24 MW or about 3 MW per million people. This is a tenth of what has been installed in the Eastern African region.⁹² Table 8.2 compares key indicators of power supply of South Sudan with that of countries in Eastern Africa region.

8.1.4 Present Electricity Supply Situation

Existing supply situation. The power infrastructure in the country is in an embryonic state with its development

Table 8.2: Regional Comparative Performance Indicators

Country	Population (Million)	Installed Capacity (MW)	Per Capita Installed Capacity (MW)	Electrification (%)	Losses (%)	Average Tariff \$/kWh	Customer No	Employee No	Customer to Employee Ratio	Debtors Days
Burundi	8.3	48.5	5.8	2	20	0.08	44 718	692	65	258.0
Djibouti	0.9	123	136.7	50	25	0.35	42 625	917	47	382.00
Ethiopia	82.2	1 491	18.1	11	22	0.05	1831000	12 292	149	48.00
Kenya	39.1	1349.3	34.5	22	16	0.18	1267198	7 014	181	42.9
Rwanda	9.9	81	8.2	5	17	0.19	168789	1 657	102	112.0
Sudan	42.3	2846	67.3	...	20	...	...	...	...	...
Tanzania	43.7	1008	23.1	11	22	0.10	671110	5 257	128	240.0
Uganda	30.7	482	15.7	6	36	0.16	313299	1 777	176	...
South Sudan	9.5	23.8	2.5	2	25	0.22	19100	571	33	...
Total/Average	266.6	7452.6	28.0	14	23	0.17	4357839	30177	144	180.5

Memo items
2009 figures of all countries except SS of 2010

Source: Regional Integration for Eastern Africa (Energy), AfDB

⁹² Eastern Africa Region: countries: Burundi, Ethiopia, Kenya, Rwanda, Sudan, South Sudan, Tanzania and Uganda; and Regional Integration Strategic Paper (RISP) for Eastern Africa (Energy), AfDB, September 2010.

⁹¹ Statistical year-book for Southern Sudan, 2010.

As the country's production capacity is well below the minimum efficient scale size of around 200 MW⁹³, it faces high production cost. The ESI in South Sudan is characterized by: (i) main electricity supply provided from captive generation; (ii) low electrification levels of less than 1% based on areas supplied by South Sudan Electricity Corporation (SSEC) with virtually no one in the rural areas having electricity;⁹⁴ and (iii) supply shortage, and intermittent supply of electricity within SSEC's areas of operations (supply is not available through a full 24-hour period).

SSEC is operating in 3 of the 10 state capitals (Juba, Malakal and Wau) and Renk town. SSEC's distributional losses (technical and non-technical losses) estimated at 25% (2010) were two and half times the best practice of 10% benchmark,⁹⁵ contributing to its

hidden operational costs. Although the number of staff requirements of SSEC has been identified to be 745, only 571 positions are filled to date. The customer to staff ratio (35), which is an indication of the effective utilization of staff in power utilities, is much less than the benchmark (150-250)⁹⁶ for developing countries acceptable to financing institutions. SSEC's financial performance is weak with the utility's operations heavily subsidized by the government (about 75% of operational expenses are subsidized)⁹⁷. The financial, human capacity and systems constraints in SSEC have also limited its ability to operate, maintain and expand the generation facilities and distribution networks.

Present supply and demand. Table 8.3 below presents the installed generation capacities in the operational areas of SSEC.

Table 8.3: SSEC's Installed Generation Capacity

Location	No. of Units	Unit Capacity (MW)	Total Capacity (Mw)	Remark
Juba (Wartsila Engine)	8	1.5	12	Operational
Juba (Cummins Engine)	5	1	5	Not Operational
Malakal	6	0.8	4.8	Operational
Wau	2	1	2	Operational
Bor	2	1	2	Under construction
Yambio	2	1	2	Under construction
Rumbek	2	1	2	Under construction
Renk	Only 3 MW of 40 MVA (32 MV) used			Interconnection with Sudan

Source: Statistical year-book for Southern Sudan, 2010 and SSEC

The current demand in SSEC's supply areas is much higher than the power utility can provide. For instance, based on 2009 SSEC surveys, the assessment estimated the 2010 effective generation demand in Juba and Malakal at 32 MW and 15 MW, respectively. The corresponding SSEC's installed generation capacities (operational) were 12 MW and 4.8 MW. Hence, the supply gap has forced the businesses and high class households to meet their supply deficit from own generation.

In spite of abundant sources for electricity generation (hydro and oil), the present power supply by SSEC is limited to three state capitals (Juba, Malakal and Wau) and Renk town. The state capitals are supplied from diesel power generators (installed capacity 23.8 MW), while Renk town is supplied from import from Sudan. Although South Sudan is interconnected with the Sudan to import 40 MVA (about 32 MW) of power, the import is limited to about 3 MW (supply to Renk town) since the commercial

agricultural development projects envisaged around Renk have not been realized and/or the network has not been extended to supply other major load centres. Presently, SSEC is installing 2 MW each diesel generators and the associated distribution networks to supply three state capitals (Bor, Yambio and Rumbek) which are expected to be commissioned in 2012. This program is funded by the Government of Egypt.

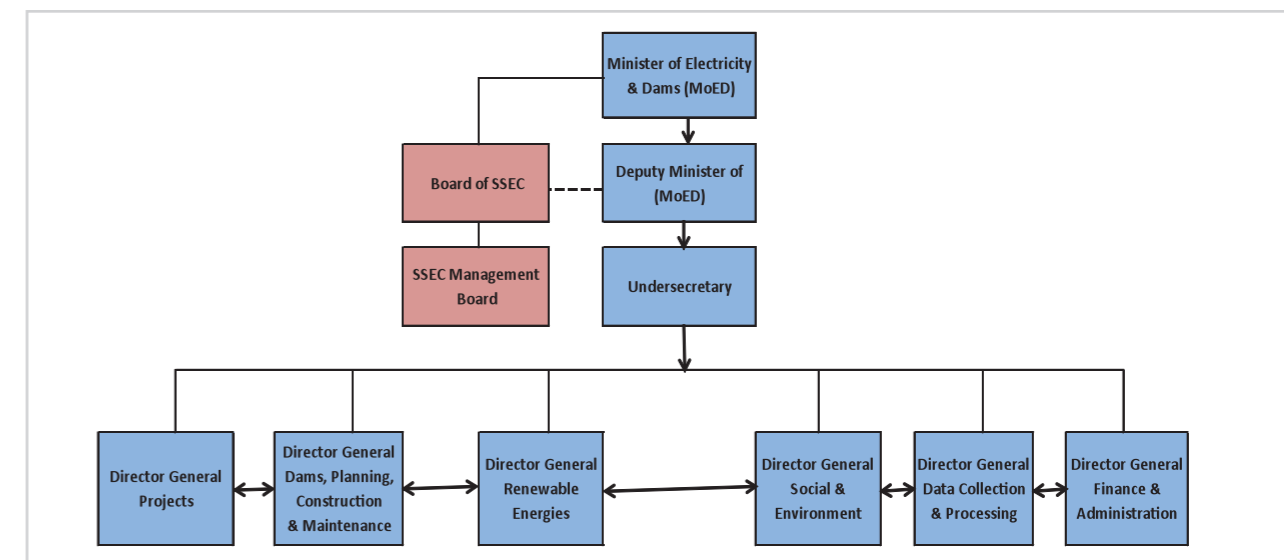
Outside SSEC supply area, the townships of Yei, Maridi and Kapoeta are supplied with electricity from USAID funded diesel power plants run by local cooperatives. The installed capacities of the diesel generators in these towns are 1.2 MW, 0.8 MW and 0.8 MW, respectively. The corresponding customers are 1,100; 250 and 85. Given that the cooperatives had to recover the full cost of supply, the tariffs in the towns (average tariff of 53 US cents/kWh) are more than double that of SSEC's average tariff of 22 US cents/kWh. The high tariffs have become

constraints to connecting significant number of household customers.

8.1.5 Institutional Arrangements

Until the recent past, the energy sector was the responsibility of the Ministry of Energy and Mines (MEM). Following independence, a restructuring of the public institutions was implemented; as a result, MEM was divided into two ministries, namely, MoED and Ministry of Petroleum and Mining (MoPM). The other main players in the energy sector are SSEC and Nile Petroleum Corporation (Nilepet) dealing with electricity and oil, respectively. The former parastatal reports to MoED while the latter reports to MoPM. It is expected that an Electricity Regulatory Agency and Petroleum Regulatory Agency will be established following the enactment of the respective Bill. The institution structure for the ESI is provided in Figure 8.1 below.

Figure 8.1: Institution Structure of the Electricity Sector



Source: Ministry of Electricity and Dams.

It is further expected that until a revised mandates are put in place, the newly formed energy institutions will operate on the basis of the mandates given to the energy sector operations before the restructuring. Based on the mandates of the energy institutions before transformation, the mandates and responsibilities of the restructured energy institutions as relates to energy are described below.

Ministry of Electricity and Dams (MoED): MoED is responsible for ESI including the development of hydro dams for multipurpose use counting hydropower generation. It is also responsible for the development of renewable energies. MoED is responsible for the

formulation of the necessary legislation and regulation for the management, development and maintenance of the ESI and hydro dams as well as development and implementation of GoRSS policies and strategies on power generation and distribution. Specifically, MoED is mandated to: (i) formulate and develop policies, regulations and strategies on management and development of the ESI and hydro dams; (ii) oversee the compliance of the various actors to the relevant Acts in their operation as relates to the development of ESI and hydro dam development; (iii) set tariffs, identify electricity sources and facilitate their exploitation; and (iv) identify potential commercial partners and facilitate their participation in energy sector development. The Minister of MoED is assisted by Deputy

⁹³ AICD, June 2011.

⁹⁴ SSEC used 2008 census data for the 2010 population. The number of households connected in 2010 was 19,100 of which 70% is domestic; the end 2010 population was put at 9,494,000 and average national household size in the same year was estimated at 5.9.

⁹⁵ Sudan's Infrastructure: A Country Perspective by Africa Infrastructure Country Diagnostic (AICD).

⁹⁶ Target performance indicator for Sub-Saharan low income countries, Joint World Bank/IFC Seminar, 07 July 1994.

⁹⁷ Revenue from sales of bills (2010) amounted to SDG 13,064,508 while the operational expenses in the same year were SDG 50,850,835.

Minister, Undersecretary and six Directorates, including: Director General (DG) Projects; DG Dam Planning, Construction, & Maintenance; DG Renewable Energies; DG Social & Environmental; DG Data Collection and Processing; and DG Administration & Finance.

Ministry of Petroleum and Mining (MoPM): The Ministry in charge of petroleum and gas is the policy implementing body of the government with respect to petroleum affairs. The functions of the Ministry include the following:

- negotiate all oil contracts for the exploration and development of oil, and ensuring that they are consistent with its principles, policies and guidelines;
- initiate legislation, rules, and regulations regarding the petroleum and gas sector;
- manage the relations of the government with petroleum and gas companies operating in South Sudan;
- formulate strategies and programs for the development and management of the petroleum and gas sector;
- develop the necessary technical cadres for the petroleum and gas sector;
- consult with affected communities, to ensure that all petroleum and gas projects be subjected to environmental and social impact assessment; and
- sign contracts on behalf of the government upon the approval of the National Petroleum Council.

National Petroleum and Gas Council: The National Petroleum and Gas Council is a policy making body with respect to petroleum and gas resources reporting to the Council of Ministers. The National Petroleum and Gas Council shall consist of relevant national Ministers, representatives of oil-producing states and institutions as shall be regulated by law. The national government and the oil producing states shall be represented in the National Petroleum and Gas Council in accordance with the law. The National Petroleum and Gas Council has the following functions:

- formulate policies and guidelines in relation to the development and management of the petroleum and gas sector;
- monitor and assess the implementation of the policies mentioned in a. above by the relevant implementing institutions to ensure that they work in the best interest of the people of South Sudan and to determine their impact on the communities in the areas of petroleum or gas development;

- approve all oil contracts for the exploration and development of oil and ensure that they are consistent with its principles, policies and guidelines;
- review environmental and social impact of existing and future oil developments;
- develop its internal regulations and procedures; and
- perform any other functions or duties as may be prescribed by law.

National Oil Company (Nilepet): Nilepet is the technical, operational and commercial arm of MoPM dealing with all upstream, midstream and downstream activities of the petroleum sub-sector. Nilepet is mandated to promote and coordinate the development and operation of the oil and gas sources, and the related infrastructure. It is expected to operate on a commercial basis.

South Sudan Electricity Corporation (SSEC): SSEC was established on 19 December 2006 vide Council of Ministers Order No. 30/2006. A draft Electricity Corporate Bill has been drafted towards giving legal entity to SSEC. According to the draft Bill, SSEC will be an independent government corporation responsible for generation and transmission and sales of electricity to distributors. It will also have the mandate to purchase power from IPPs and promote electricity interconnection with neighbouring countries. Presently, SSEC is generating and distributing electricity in four operational areas of Juba, Malakal, Wau and Renk.

State Electrical Distribution Companies: The draft Electricity Act further specifies that the Minister, in consultation with the governments of each of the States of South Sudan, may incorporate separate State Electricity Distribution Companies. Electric power distribution services will be managed by State Electricity Distribution Companies, rural electricity cooperatives, and community-owned and operated distribution entities, as approved and licensed by MoED/Regulating Authority. Electricity distribution companies and cooperatives will be supported by a special purpose department within the Ministry or Rural Electrification Agency that the Government may establish.

8.1.6 Policy and Regulatory Framework

The relevant policy and regulation papers available for review include South Sudan Investment Promotion Act (2009) which is discussed in Chapter 2, South Sudan National Electric Sector Policy Paper (May 2007), draft South Sudan Electricity Bill (2010), draft South Sudan Petroleum Policy Paper (December 2010), draft South

Sudan National Environment Policy Paper (2010) and South Sudan National Environmental Bill (2010). It is expected that draft Policy Papers will be adopted and Bills enacted in the 1st quarter of 2012.

South Sudan National Electricity Sector Policy (May 2007)/ Draft South Sudan Electricity Bill (2010). The National Electricity Sector Policy recognises the need to establish and maintain objective regulatory oversight to create investor confidence in order to attract private capital for the development of the sub-sector, in particular the hydropower development. The policy highlights the need to establish a highly competent and independent regulatory body. Accordingly, the Regulatory Agency is expected to operate free of the government control and political influence. The Policy Paper specifies the responsibility of the Regulator by and large to include, licensing electricity service providers, enforcement of quality of service, as well as compliance of environmental standards, review of tariff applications, regulatory reporting and oversight functions.

An Electricity Bill has been drafted based on the Policy Paper adopted in May 2007. It was intended to provide for the establishment and governance of the South Sudan Electricity Regulatory Authority (SSERA) and the licensing and regulation of the generation, transmission, distribution and supply of electricity within South Sudan. The Bill specifies that SSERA shall be an autonomous corporate body, with perpetual succession. It is further specified that board members and the Executive Director shall be appointed by the Council of Ministers, upon recommendation of the Minister.

According to the Bill, SSERA shall be entrusted with the following responsibilities: (i) introducing and maintaining a secure and stable electricity supply for South Sudan while continuing to improve the quality and coverage of the electricity industry; (ii) protecting the interests of consumers and other users with respect to the prices charged, the quality, service levels, permanence and variety of services provided in the electricity industry; (iii) encouraging and promoting PSP in the electricity market towards ensuring the allocation of sufficient resources for the electricity industry; (iv) lessening, wherever possible, any adverse impact of electricity activities on the environment; and (v) encouraging and promoting energy efficiency and the use of renewable energy. Towards discharging its responsibilities, SSERA shall: (i) review and approve tariffs and charges for the supply of electricity; (ii) regulate the electricity market by granting licenses; (iii) monitor and enforce the performance of regulated entities and the functioning of the electricity market; (iv) facilitate the settlement of disputes between regulated entities; (v) prevent the abuse of monopoly or market power in relation to the electricity in the ESI.

The Bill limits the responsibility of SSEC to deal with the development and operation of generation and transmission networks within South Sudan. The Bill is silent on who will be responsible for transmission network development outside South Sudan (interconnections). As SSEC is still dealing with the existing Sudan-South Sudan interconnection, it is expected that the mandate for developing interconnections will be entrusted on SSEC. The Bill gives the responsibility of development and operation of distribution networks to the State governments, cooperatives and communities with support to be provided by the Ministry. Given that SSEC has been running the distribution networks in South Sudan for the last five years it is well placed to support the local mainstream distribution activities. It is therefore worthwhile to consider involving SSEC in the mainstream distribution activities. The Bill also provides the Ministry the responsibility of dealing with rural electrification. As rural electrification is a non-profit operation, it is understandable that the development and operation of rural electrification are dealt with by Ministry and the State governments until such time that a Rural Electrification Agency is established.

The government has recognized that development of a hydropower plant of such scale would require a large investment which would be difficult to raise fully from internal and multilateral/bilateral sources. The Electricity Policy Paper therefore stipulates that the major hydropower projects will be developed with PSP. The electrification of the state capitals (short-term) and the development of mega hydropower plants (medium-term) will be implemented with private sector involvement. It is therefore necessary to build the necessary capacity and establish the Independent Regulatory Agency (detached from the Ministry) as soon as possible in order to attract private sector investment for the projects at favourable concession to the government.

Given that SSERA reports to the Ministry and that the board members of the Regulator are appointed with the initiation of the Ministry, there is concern about the independence of the Regulator. However, in spite of such arrangements, it would be necessary to maintain the autonomy of the Regulator in order to gain investor confidence. It is therefore worth considering establishing an independent tribunal which looks into conflicts that might arise between SSERA and the Ministry as being practice in some countries in the region.

South Sudan Petroleum Policy Paper (December 2010). To date, the Petroleum Policy Paper has been drafted while the Petroleum Act is under preparation. The draft Petroleum Policy Paper stipulates that the petroleum institutional structure shall reflect a desired separation between policy functions and the regulatory functions which ensure policy implementation. Most importantly, the

commercial functions of the State, such as the State equity held by Nilepet, shall be separate from the institutions charged with policy or regulatory functions. It further indicates that the regulatory body may be organized as a Directorate under the MoPM or as an Authority under the same Ministry. The Regulator is further entrusted with the responsibility of regulating and controlling the activities and operations carried out by oil and service companies. The regulatory body acts on behalf of the Ministry of Labour on health and safety matters and on behalf of the Ministry of Environment on environmental regulations.

As indicated earlier, the Policy Paper and Bill are expected to be put in place soon (by end of 1st quarter 2012). It is critical that the Regulator be independent in order to attract investment at favorable concession to the government. Assigning the regulatory functions to a Directorate in the Ministry might compromise the independence of the regulatory body. It is therefore advisable to establish the Regulator as an entity detached from the Ministry.

South Sudan National Environment Policy Paper (2010)/ South Sudan National Environmental Bill (2010). The South Sudan National Environment Policy Paper and South Sudan National Environmental Bill exist in draft form. The South Sudan National Environment Policy aims at ensuring protection and conservation of the environment and sustainable management of renewable natural resources in order to meet the present population and future generation needs. Towards this end, the policy calls for: (i) enacting legislations and regulations on the management of the environment to implement this policy; (ii) defining the responsibilities at different levels of governance including those of private sector institutions; (iii) ensuring that environmental legal frameworks developed at different levels of the government are consistent with each other and with sound environmental management; (iv) ensuring that sectoral environmental legal frameworks are in conformity with the requirements of environmental management; (v) incorporating in domestic legislation the provisions of multi-lateral agreements that are relevant to South Sudan; and (vi) setting up environmental standards, guidelines and indicators.

The existing Ministry of Environment is the lead institution for the protection and management of the environment. It is responsible for environmental protection and management, planning, development of action plans, monitoring and evaluation of the policy implementation programs. It also reviews both Environmental and Social Impact Assessment (ESIA) and issues relating to environmental permits. Following the approval of the South Sudan National Environment Policy, the Ministry of Environment will develop an implementation plan for this policy. All sector line government institutions, non-governmental stakeholders and other relevant agencies at

different levels of governance in South Sudan will also be involved in the implementation of the Environment Policy guidance statements that relate to their respective sectors.

The National Environmental Bill establishes the South Sudan Environmental Management Authority. The Authority shall be an autonomous corporate body with perpetual succession. It shall be under the general supervision of the President, considering that environment is a cross-cutting matter. Until it is created, the Authority's function shall be delegated to the Minister. The Authority is established to exercise general supervision and coordination over matters relating to the environment and to be the principal instrument of the government in implementing all policies relating to the environment. The Authority once created shall develop detailed Environmental Guidelines/Regulations/Standards relating to the various activities under its purview. It is critical that these Guidelines/Regulations/Standards be published as soon as possible so that investors know the environmental costs of their new ventures. This will avoid inflated concessional prices due to investor speculation.

8.2 Major Challenges for the Power Sector

8.2.1 Limited Capacities for Supply of Power

The limited generation capacity, coupled with weak distribution networks, has resulted in shortage of supply leading to forced blackouts and load shedding in the country. Consequently, most households and businesses are supplied from constrained, costly and unreliable captive power generation. This has affected the quality of life of the population and restrained the economic development in the country. Considering the lead time associated with commissioning of the new power generation plants, the risk of supply shortage in the immediate future remains high. The challenge for the Government is therefore to implement accelerated programs to deliver sufficient, reliable and affordable supply to augment socio-economic growth in the country.

The proposed Action Plan for the power sector includes a program to address the electricity supply constraints in the short- and medium- to long-term. Given the time constraints, the electricity supply in the short to-medium term can be improved through rehabilitation of the existing supply systems, installation of reliable diesel and small hydropower plants; and strengthening interconnection with the neighbouring countries. The interconnection supply will involve more import from

Sudan through the existing interconnector and supply from Ethiopia by constructing new interconnector. In the medium-to-long term, the assessment proposes for the government to focus on augmenting the development of South Sudan's hydropower potential and strengthening interconnections with the neighbouring countries by constructing Uganda-South Sudan, Kenya-South Sudan and additional Ethiopia-South Sudan interconnectors. Such strategy will make available cheap, reliable and environmentally clean electricity for socio-economic growth in South Sudan and provide an opportunity for the country to export its surplus power to the regional countries. As the country's demand may not justify the development of the hydropower plants in a significant way, GoRSS should target the regional market to create the necessary economies of scale to justify the investment.

8.2.2 Building Institutional Capacities in the Sector

One of the most urgent challenges is to build institutional capacity within Ministry of Electricity and Dams (MoED) and SSEC to implement the short- and medium-term programs and improve the operational performance of the ministry and the power utility. To address this challenge, the short-term program will build institutional capacity within the energy institutions. The capacity building will involve developing human capacity as well as improving the operational system within the ESI. The human capacity building will comprise providing on job training with support of Technical Assistance (TA) and attaching of staff to energy institutions/power utilities. The institutional capacity building will also introduce in SSEC the best operational systems practiced in the industry.

8.2.3 Funding Arrangements for the Program

The other major challenge is to mobilize the financial resources required for the program. The magnitude of the funding requirements in the near-term as well as for the medium and longer-term is likely to exceed the current funding capacities of the Government and donor community. The Government will have to target the private sector for investment in the development of the major projects. In the short-term, the program proposes Private Sector Participation (PSP) in a big way in the development of the diesel power plants and Fula SHP. To this end, GoRSS will give priority to putting in place the necessary legislation and regulatory frameworks in order to attract private sector investment for the short- to medium-term program.

8.3 Demand Forecast and Electrification

8.3.1 Electrification in South Sudan

The proposed electrification program covers the period 2011-2025. The program for the short-term (2011-2015) is detailed and proposes concrete projects. It has not been possible to propose an elaborate program at this point in time for the medium- to long-term (2016-2025) as detailed studies would be required for the development of the major projects including the mega hydropower plants, interconnectors and a nation grid. The short term program has included studies of those major projects to be implemented in the medium- to long-term. The proposed medium-to-long term program should therefore be taken as indicative only at this point in time and they will be concretized when their studies are complete.

The Electricity Policy Paper gives priority to electrification of the state capitals in the short term. Accordingly, the NDP has considered the electrification of the state capitals as part of the infrastructure development areas. The short-term program has been designed in line with the NDP except the implementation period has been extended from 2011-2013 to 2011-2015. The short-term investment program will involve primarily a three-pronged approach: (i) electrification of the state capitals through the extension of the existing Sudan-South Sudan interconnection to Malakal; (ii) installation of reliable diesel generators in each state capital; and (iii) development of Fula SHP. The short-term program will also strengthen the supply condition in towns supplied by cooperatives (Yei, Maridi and Kapoeta). It also involves the immediate rehabilitation/expansion of the existing supply systems in order to connect more customers and improve the efficiency, quality and reliability of supply.

8.3.2 Demand Forecasts

There has not been any standard load forecast study carried out in the past for any of the states except for a few studies in certain townships as a part of localised electrification projects under various donors. In addition to mismatch between installed capacities and power demand, the generation from SSEC's existing installation has been intermittent due to low availability of the plants. For instance, in 2010, the effective demand in Juba was estimated at 32 MW (based on SSEC's surveys) while the available installed capacity was 10 MW (over 50,000 MWh). As can be seen in Table 8.4 below, in Juba supply area the energy sold in 2010 was 10,000 MWh which is a tenth of the yearly potential generation capability.

Table 8.4: SSEC's Juba Supply Area: Historical Sales and Customers Growth Rate

Category	2007	2008	2009	2010	Percentage Distribution (2010)	Annual Average Growth Rate (%)
Sales (kWh)						
Domestic	8871425	5597958	23472220	5488482	56	(14.7)
Commercial	3815999	5676761	3583235	3921472	40	0.9
Governmental	4770367	1379633	27792588	320846	3	(59.0)
Total	17457791	12654352	54848044	9730800	100	(17.5)
Number of Customers						
Domestic	4190	4521	5192	6288	70	14.3
Commercial	1216	1436	1808	2309	26	23.6
Governmental	243	263	278	346	4	12.4
Total	5649	6220	7278	8943	100	16.4
Consumption per account (kWh)						
Households	2117	1238	4521	873		(25.4)
Commercial	3138	3953	1982	1698		(18.3)
Government	19631	5246	99973	927		(63.5)

Source: SSEC.

The demand forecast prepared for this Report covers the period 2011-2025. It relates to demand of the state capitals and towns which are to be electrified under the short-term program. The forecast considers the power supply constraints in the supply centres. The demand growth in the short-term (2011-2015) is estimated based on the historical demand growth trend in SSEC. Even though SSEC's provides electricity in Juba, Malakal, Wau and Renk, the historical breakdown of customers and consumption was available only for Juba supply centre during the field mission. Therefore, breakdown of customers and consumption (2010) by tariff category for the existing supply centres (Malakal, Wau, Renk, Yei, Maridi and kapoeta) and the towns (Bor, Yambio and Rumbek) to be supplied as of 2012 was estimated based on the percentage distribution of customers in Juba. Furthermore, in the period 2011-2015, the number of customers and consumption in these towns are projected to grow at the average historical growth rate in Juba supply area.

The demand forecast for the medium- to long-term (2016-2025) has been prepared based on consumption by customer and tariff category including domestic/household, commercial and government. Given supply constraints, the consumption (consumption/account) in SSEC's system does not reflect the true electricity demand. It would therefore be misleading to project the demand on the basis of the existing SSEC's sales per account and tariff category. Hence, the consumption by account and tariff category was estimated based on the potential demand of Juba and Malakal collected in field surveys undertaken by SSEC. Accordingly, the consumption/customer for domestic and commercial customers was estimated at 3,125 kWh/annum and 20,550/annum, respectively. The consumption/customer in the government tariff category was estimated at 200,600 kWh/annum and 65,000 kWh/annum for Juba and the remaining supply centres, respectively. The demand by supply centre and tariff category is then determined by multiplying the consumption per account by the projected number of customers. Table 8.5 presents the summary of the demand forecast by supply centre.

Table 8.5: Demand Forecast by Supply Centre

Supply Centres	Category	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Malakal	Consumption (GWh)	79	93	111	132	157	198	265	309	355	402	452	507	566	626	690	669
	Generation (GWh)	105	122	144	169	199	248	327	377	427	479	532	590	650	712	784	761
	Generation (MW)	18.4	21.3	24.8	29.0	33.8	41.9	54.9	62.8	70.7	78.7	86.7	95.5	104.5	113.6	124.4	119.7
Bor	Consumption (GWh)	30	30	26	30	36	43	54	66	78	90	103	116	129	143	158	173
	Generation (GWh)	33	33	33	39	46	54	67	80	94	107	121	135	149	163	179	197
	Generation (MW)	5.7	5.7	5.7	6.7	7.8	9.1	11.3	13.4	15.5	17.6	19.7	21.8	23.9	26.0	28.4	30.9
Bentiu	Consumption (GWh)	26	34	41	50	60	69	79	87	95	103	111	119	127	135	143	151
	Generation (GWh)	32	41	50	60	69	79	87	95	103	111	119	127	135	143	151	159
	Generation (MW)	5.4	6.9	8.3	9.8	11.2	12.6	14.1	15.5	16.9	18.3	19.7	21.1	22.5	23.9	25.3	26.7
Kuajok	Consumption (GWh)	28	37	47	56	66	76	86	96	106	116	126	136	146	156	166	176
	Generation (GWh)	34	45	56	67	78	89	99	110	121	132	143	154	165	176	187	198
	Generation (MW)	5.7	7.5	9.3	11.0	12.7	14.4	16.1	17.8	19.5	21.2	22.9	24.6	26.3	28.0	29.7	31.4
Aweil	Consumption (GWh)	44	65	86	107	127	147	167	187	207	227	247	267	287	307	327	347
	Generation (GWh)	7.4	10.9	14.3	17.5	20.7	23.9	27.1	30.3	33.5	36.7	39.9	43.1	46.3	49.5	52.7	55.9
	Generation (MW)	1.6	2.2	2.9	3.5	4.1	4.7	5.3	5.9	6.5	7.1	7.7	8.3	8.9	9.5	10.1	10.7
Wau	Consumption (GWh)	26	30	36	43	51	62	80	99	118	137	157	177	198	219	240	263
	Generation (GWh)	34	40	47	55	65	77	99	120	142	163	185	206	227	248	273	298
	Generation (MW)	6.0	7.0	8.1	9.5	11.1	13.0	16.6	20.0	23.5	26.8	30.2	33.4	36.5	39.7	43.3	47.0
Rumbek	Consumption (GWh)	26	30	36	43	51	62	80	99	118	137	157	177	198	219	240	263
	Generation (GWh)	33	39	46	54	64	75	91	103	114	126	138	151	168	185	203	224
	Generation (MW)	5.7	6.7	7.8	9.1	10.4	11.6	13.4	15.1	16.8	18.5	20.3	22.1	23.8	25.5	27.2	28.9
Yambio	Consumption (GWh)	93	159	186	217	255	299	352	406	461	517	574	633	693	754	818	882
	Generation (GWh)	209	241	279	322	374	435	495	555	615	676	736	796	857	919	982	1043
	Generation (MW)	36.4	41.7	47.8	54.9	63.3	73.0	82.5	91.9	101.1	110.2	119.2	128.1	136.9	147.3	157.9	167.9
Torit	Consumption (GWh)	22	26	31	37	45	54	65	76	88	101	115	130	146	163	181	200
	Generation (GWh)	29	34	40	47	56	66	78	91	105	120	136	153	171	190	210	230
	Generation (MW)	5	6	7	8	10	11	13	15	17	19	21	23	26	29	32	35
Yei	Consumption (GWh)	7	8	9	11	13	16	19	23	28	34	40	45	52	59	65	73
	Generation (GWh)	1.1	1.3	1.6	1.8	2.2	2.7	3.2	3.8	4.5	5.3	6.1	7.0	8.0	9.1	10.3	11.5
	Generation (MW)	0.2	0.3	0.4	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6
Maridi	Consumption (GWh)	2	2	2	2	3	4	6	9	12	15	18	20	23	25	28	31
	Generation (GWh)	2	2	3	3	4	4	8	11	14	18	21	23	26	29	32	35
	Generation (MW)	0.4	0.5	0.5	0.6	0.8	0.8	1.3	1.8	2.4	2.9	3.4	3.8	4.2	4.6	5.0	5.5
Kapoeta	Consumption (GWh)	25	24	23	22	21	20	19	18	17	16	15	14	13	12	12	12
	Generation (GWh)	65	65.5	66	66.5	67	67.5	68	68.5	69	69.5	70	70.5	71	71.5	72	72.5
	Generation (MW)	13.0	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1
Losses (%)	Consumption (GWh)	240	311	443	524	620	747	1058	1277	1500	1729	1965	2208	2458	2717	2984	3173
	Generation (GWh)	321	409	575	671	785	934	1307	1557	1807	2059	2312	2567	2825	3087	3391	3605
	Generation (MW)	56	71	100	115	134	158	219	259	299	338	377	416	454	493	538	568
Total	Consumption (GWh)	240	311	443	524	620	747	1058	1277	1500	1729	1965	2208	2458	2717	2984	3173
	Generation (GWh)	321	409	575	671	785	934	1307	1557	1807	2059	2312	2567	2825	3087	3391	3605
	Generation (MW)	56	71	100	115	134	158	219	259	299	338	377	416	454	493	538	568

Source: Annex Table 9.4, 9.5 and 9.6

The number of customers by tariff category was projected on the basis of the following considerations;

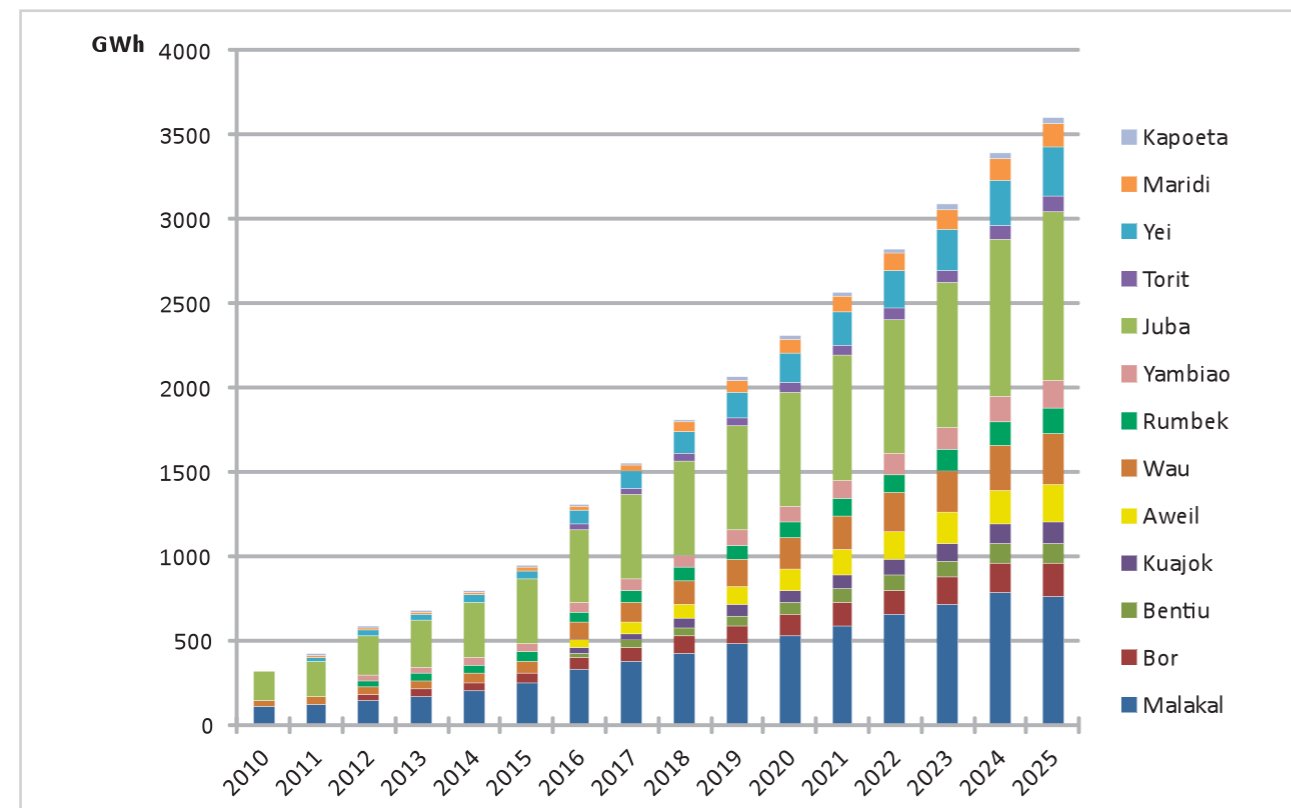
- **Domestic/household customers:** Initially, a target is set for electrification rate of the capitals and selected town in 2020 and 2025. Accordingly, the proposed target is for 60% of the households of these urban centres to have electricity by 2020. Based on this target, the households to be connected and the corresponding consumption were determined for the period 2016-2020. The demand forecast for the period 2021-2025 was forecast using the same methodology but targeting an electrification rate of 80% in the urban centres by 2025.
- **Commercial customers:** Although continuous supply has not been provided by SSEC, all the commercial customers are connected to SSEC's supply systems. It is therefore assumed that the existing SSEC's commercial customers will continue to be supplied from improved generation when the new supply

system is put in place in 2016. All commercial customers will then get sufficient and reliable supplies in 2016 and beyond. Considering increased reliability of supply and competitiveness of electricity prices, as a result of hydropower development and regional interconnections, it is further assumed that the number of commercial customers will grow at an average growth rate of 10% a year during 2016-2025. This growth rate is comparable with the economic growth of 9% a year (in real terms) projected for the medium- and longer-term.

- **Government customers:** The assumption and methodology of the commercial demand forecast was adopted in forecasting the government customers and the corresponding demand. However, the government demand is projected to grow at an average growth rate of 6% a year during 2016-2025.

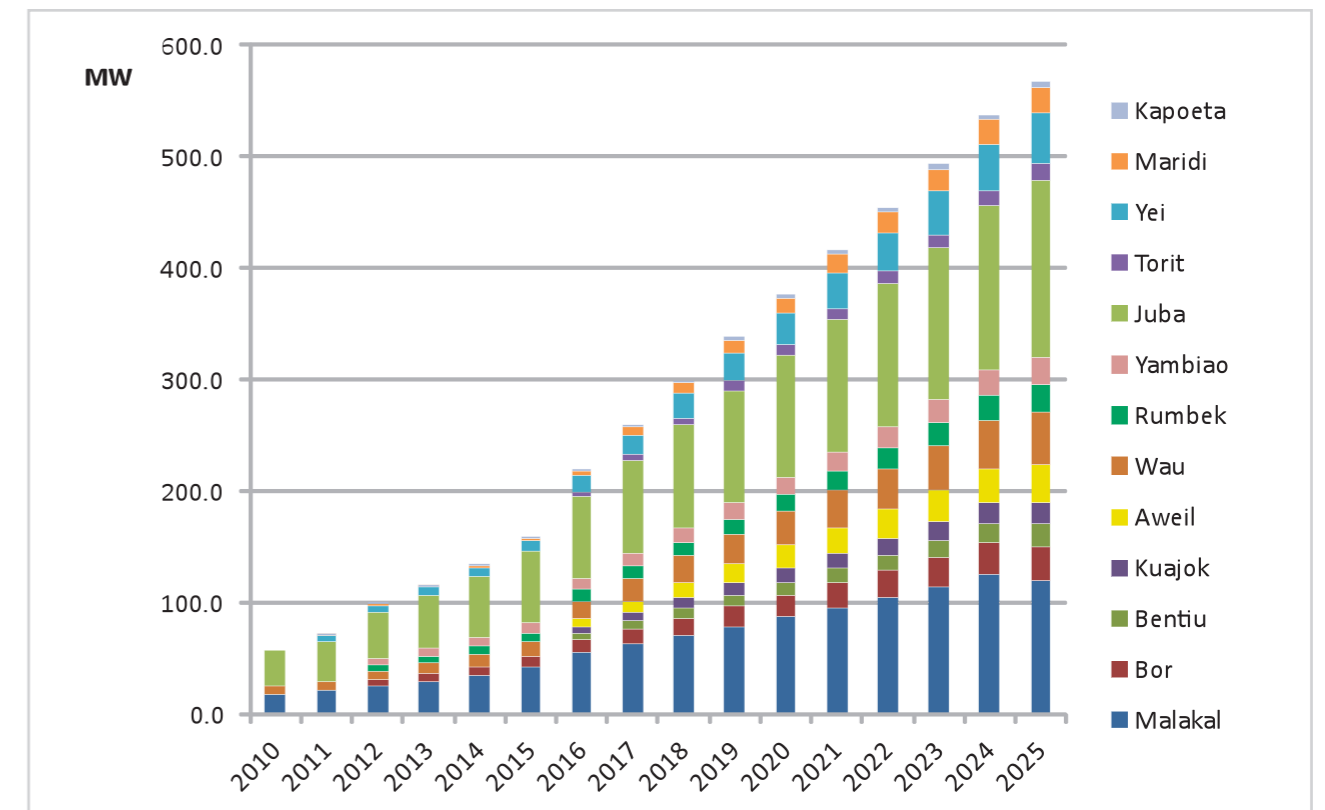
Figures 8.2 and 8.3 present at a glance the trend of demand growth.

Figure 8.2: Energy Demand Forecast (Sent Out Energy)



Source: Annex Figure 8.2a.

Figure 8.3: Peak Demand Forecast (Sent Out Peak)



Source: Annex Figure 8.2 b.

The forecast shows that the generation demand for the whole supply centres in 2010 (321 GWh) is projected to grow at an average rate of 18% a year over the period 2011-2025 reaching 934 GWh in 2015, 2,312 GWh 2020 and 3605 GWh in 2025. This translates into generation peak capacity of 158 MW (2015), 377 MW (2020) and 568 MW (2025) and corresponds to an average growth rate of 17% a year from the 2010 peak demand of 56 MW.

“Juba Regional Grid”) and the other centred in Malakal (hereafter called “Malakal Regional Grid”). Except those connected to one of the regional grids, all centres will be supplied from isolated diesel generating stations. Therefore the supply-demand balance is prepared separately for each regional grid as well as for each of the other centres supplied from isolated diesel plants.

8.3.3 Supply-Demand Balance

In the short-to-medium term, two regional grids will be formed with one centred in Juba (hereafter called

MAP 8.2: Existing Electric Power Transmission Grid for the Region



Source: Annex Figure 8.2 b.

Juba regional grid: In the short term, the demand in Juba Regional Grid will be partially met through supply from the existing diesel generators. In the medium term, it will be supplied from the enhanced diesel generation and Fula SHP. In the long term, the supply will be strengthened through development of mega hydropower plant (possibly Lekki hydropower plant)⁹⁸ and interconnection with Uganda. Table 8.6 below provides the supply-demand balance for Juba Regional Grid. As can be seen in the

table, there will be increased supply deficit both in energy and peak demand until 2016 when the planned diesel generators (80 MW) and Fula SHP (40 MW) are erected; and these will accommodate the demand until 2020. It is envisaged that Lekki Hydropower Plant and the Uganda-South Sudan Interconnector will be put in service in 2021 to supply 300 MW and 100 MW, respectively. The supply in the Juba Regional Grid will thus be sufficient to meet the demand until 2025.

⁹⁸ The prefeasibility Study undertaken by SMEC (October 2009) recommended the Lekki Hydropower Plant for initial development.

Table 8.6: Juba Regional Grid: Supply-Demand Balance

Category	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Demand																
Consumption (GWh)	136	159	186	217	255	299	352	406	461	517	574	633	693	754	818	882
Generation (GWh)	182	209	241	279	322	374	435	495	555	615	676	736	796	857	929	1003
Generation (MW)	31.9	36.4	41.7	47.8	54.9	63.3	73.0	82.5	91.9	101.1	110.2	119.2	128.1	136.9	147.3	157.9
Installed/Import Supply (MW)																
Diesel	17	17	17	17	17	17	80	80	80	80	80	80	80	80	80	80
Hydropower (Fula/Lekki/Shukoli)							40	40	40	40	40	340	340	340	340	340
Potential Import from Uganda												100	100	100	100	100
Total	17	17	17	17	17	17	120	120	120	120	120	520	520	520	520	520
Dependable Capacity (MW)																
Diesel	10	10	10	10	10	10	70	70	70	70	70					
Hydropower (Fula SHP)							40	40	40	40	40	306	306	306	306	306
Potential Import from Uganda												100	100	100	100	100
Total	10	10	10	10	10	10	110	110	110	110	110	406	406	406	406	406
Energy Capability (GWh)	57	57	58	58	59	59	655	660	665	670	675	2507	2525	2543	2561	2579
Supply-Demand Balance																
Capacity (MW)	(22)	(26)	(32)	(38)	(45)	(53)	37	27	18	9	0	287	278	269	259	248
Energy (GWh)	(125)	(152)	(183)	(220)	(264)	(315)	220	165	110	54	(1)	1772	1729	1686	1632	1576

Source: Annex Table 9.7.

Malakal regional grid: Malakal Regional Grid will be supplied from the existing diesel plants in the short term, and increased supply from enhanced diesel generation and interconnections (Sudan-South Sudan Interconnector and Ethiopia-South Sudan Interconnector) in the medium-to-long term. Table 8.7 below presents the supply-demand balance for the Malakal Regional Grid. The existing supply deficit will continue until the planned Sudan-South Sudan interconnector extension to Malakal is complete and put in service in 2016. It is expected that the import from Sudan will be increased to 100 MW with a revised Power Purchase Agreement (PPA) planned to be negotiated soon. The increased power import from Sudan will

fully meet the demand in the regional grid in the medium term. It is also expected that about 100 MW power will be available to the Regional Grid when Ethiopia-South Sudan Interconnector is in operation in 2020. The interconnection with the two sources of supply will improve reliability of supply and create competition to reduce the price of imported power. With such arrangement, the supply in the regional grid will be sufficient to meet the demand up to 2025. In addition, 20 MW diesel plant will be installed in the state capital in order to improve the technical performance of the regional grid and mitigate the risk of power import interruptions.

Table 8.7: Malakal Regional Grid: Supply-Demand Balance

Category	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Demand																
Consumption (GWh)	79	93	111	132	157	198	265	309	355	402	452	507	566	626	690	669
Generation (GWh)	105	122	144	169	199	248	327	377	427	479	532	590	650	712	784	761
Generation (MW)	18.4	21.3	24.8	29.0	33.8	41.9	54.9	62.8	70.7	78.7	86.7	95.5	104.5	113.6	124.4	119.7
Installed/Import Supply (MW)																
Diesel	4.8	4.8	4.8	4.8	4.8	4.8	20	20	20	20	20	20	20	20	20	20
Potential Import from Sudan	3	3	3	3	3	3	100	100	100	100	100	100	100	100	100	100
Potential Import from Ethiopia											100	100	100	100	100	100
Total	7.8	7.8	7.8	7.8	7.8	7.8	120	120	120	120	220	220	220	220	220	220
Dependable Capacity (MW)																
Diesel	4	4	4	4	4	4	10	10	10	10	10	100	100	100	100	100
Potential Import from Sudan	3	3	3	3	3	3	100	100	100	100	100	100	100	100	100	100
Potential Import from Ethiopia											100	100	100	100	100	100
Total	7	7	7	7	7	7	110	110	110	110	210	200	200	200	200	200
Energy Capability (GWh)	40	40	40	41	41	41	655	660	665	670	1288	1235	1244	1253	1261	1270
Supply-Demand Balance																
Capacity (MW)	(11)	(14)	(18)	(22)	(27)	(35)	55	47	39	31	123	104	95	86	76	80
Energy (GWh)	(65)	(82)	(103)	(128)	(158)	(206)	328	283	238	191	756	645	594	541	477	510

Source: Annex Table 9.8.

Other supply centres: Presently, Wau is supplied by SSEC. In the short-term, the three state capitals (Bor, Yambio and Rumbek) will be supplied from diesel generation when the plants under erection are in operation in 2012. Yei, Maridi and Kapoeta, which are supplied from generation run by cooperatives (put in service in 2011), will continue to be supplied under the present arrangement until the supply from SSEC is available in 2016. In the medium- to long- term, all the supply centres outside Juba and Malakal regional grids will continue to be

supplied from isolated diesel generation. As can be seen in Table 8.8, Wau, Bor, Rumbek, Yambio will experience supply deficit in the short term. The supply in the three supply centres (Yei, Maridi and Kapoeta) will be sufficient enough to accommodate the demand in the short term. The diesels installed under the short-term program will meet the demand of all towns in the period 2016-2020. Additional diesel generators will be installed in the medium-term to meet the demand in the long-term.

Table 8.8: Eleven Supply Centres: Supply-Demand Balance

Supply Centres	Category	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Bor	Generation Peak (MW)						9.1										
	Available Supply (MW)			5.7	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	Surplus (Deficit) (MW)			(3.7)	(4.7)	(5.8)	(7.1)										
Bentiu	Generation Peak (MW)																
	Available Supply (MW)																
	Surplus (Deficit) (MW)																
Kauajok	Generation Peak (MW)																
	Available Supply (MW)																
	Surplus (Deficit) (MW)																
Aweil	Generation Peak (MW)																
	Available Supply (MW)																
	Surplus (Deficit) (MW)																
Wau	Generation Peak (MW)	6.0	7.0	8.1	9.5	11.1	13.0										
	Available Supply (MW)	2	2	2	2	2	2										
	Surplus (Deficit) (MW)	(4.0)	(5.0)	(6.1)	(7.5)	(9.1)	(11.0)										
Rumbek	Generation Peak (MW)																
	Available Supply (MW)																
	Surplus (Deficit) (MW)																
Yambio	Generation Peak (MW)																
	Available Supply (MW)																
	Surplus (Deficit) (MW)																
Torit	Generation Peak (MW)																
	Available Supply (MW)																
	Surplus (Deficit) (MW)																
Yei	Generation Peak (MW)																
	Available Supply (MW)																
	Surplus (Deficit) (MW)																
Maridi	Generation Peak (MW)																
	Available Supply (MW)																
	Surplus (Deficit) (MW)																
Kapoeta	Generation Peak (MW)																
	Available Supply (MW)																
	Surplus (Deficit) (MW)																

Source: Annex Table 9.9.

8.4 Expansion of Power Supply Capacities

8.4.1 Implementation of the National Development Plan (NDP) Targets

GoRSS has now developed NDP, which covers the period 2011-2013, with the objective, among others, to improve the infrastructure condition in the country. The main thrust of NDP as it relates to infrastructure is to improve the provision of electric, transport, ICT and water services, and prepare an action plan for the restoration and sustenance of basic services in the short-to- medium-term. The investment projects implemented under NDP will improve the electricity supply situation by tripling the generation capacity and expanding & rehabilitating the distribution networks. The increase in generation comes from rehabilitating the existing generation assets, installing new diesel generators, and tripling import energy from Sudan by further extending the existing interconnector to supply more towns. The NDP, if and when completed in 2013, will double the electrification level of 2010. It is further expected that preparatory works, including: (i) adoption of relevant policies and enactment of legislation; (ii) preparation of analytical studies; and (iii) building of institutional capacity within the energy institutions will be undertaken. These would facilitate mobilization of resources for the medium term projects and management of their implementation.

For the purposes of this Report, the timeframe for meeting the energy infrastructure targets set out in the NDP has been extended to 2015. The financial resources for most of the energy projects identified under NDP have not been committed. In the event that the projects are funded with participation of donors and/or private sector, it is estimated that the process from preparation of the project document up to commissioning of the project would take about 36 months. With project implementation formally initiated at the beginning of 2012, the implementation of front-end activities (preparation of project documents, ToRs and bid documents) will be completed by the 2nd quarter of 2012. With the funding secured and the Project Engineer/Study Consultant appointed by the 3rd quarter 2012, the contract award for all investment projects will be completed by the 3rd quarter of 2013. All studies will be completed by the 3rd quarter of 2014 while the capacity building and investment projects will be completed by the end of 2015.

The Action Plan proposed in this Report therefore consists of three phases: programs for the short-term (2011-2015), the medium-term (2016-2020) and the long-term (2021-2025). A key objective for the medium- and longer-term is to expand access to a national power grid and to improve the reliability of power supply. The proposed targets for electrification for 2011-2025 are set out in Table 8.9. During the planning period about 573,000 new customers will be connected to SSEC's network. Of these customers, about 38,000 will be connected in the short- term, about 266,000 in the medium-term and about 270,000 in the long-term. The development program will increase the national electrification level from 1% in 2010 to 4% in 2016, 12% in 2020 and 20% in 2025.

The proposed program will involve a large amount of capital investment. It is expected that GoRSS will finance the program in partnership with donors and the private sector. Specifically, the private sector is expected to participate in financing the major generation projects.

8.4.2 Program for the Short-term (2012-2015)

The projects identified under NDP will be implemented during 2012-2015. In the short-term, along with the rehabilitation of the existing SSEC's networks and developing new and renewable energies (NREs), new networks (generation, transmission and distribution networks) will be constructed to meet the demand in the medium-term. In addition, studies will be prepared for projects that will be implemented in the medium- to long-term and institution capacity building needs in SSEC and MoED will be identified. Furthermore, institutional capacities will be built in SSEC and MoED to improve their operational performance and project management skills.

Expansion of generation capacity in the short-term. The proposed program for the short-term includes the following: (i) the existing generation facilities will be rehabilitated; (ii) new diesel power plants (336 MW) will be installed in 13 towns; and (iii) the Fula SHP (40 MW) will be constructed to supply the Juba Regional Grid. The generation projects will be commissioned by the end of 2015 and put in service at the beginning of 2016. The capacities of the newly installed diesel generating plants are designed to meet the generation demand for five years beyond the project commissioning date of 2015. Furthermore, the ongoing erection of 2 MW each in Bor, Rumbek and Yambio diesel generators will be commissioned during the short-term.

Expansion of the transmission grid in the short-term. Two regional grids will be formed in the short-term. The southern regional grid (hereafter called "Juba Regional Grid") will initially be fed from Fula SHP and diesel

generators to supply Juba and the neighboring towns. The northern grid (hereafter called "Malakal Regional Grid") will be fed from interconnection supplies and diesel generators to supply Malakal and the surrounding towns. As the demand in the country grows, these grids will be expanded to form a national grid. In the short-term, a 132 kV transmission network will be constructed to transport the power generated at Fula SHP to Juba. Construction of the transmission network related to the development of Fula SHP will entail installation of 170 km of 132 kV line and erection of 2 of 132 kV substations (switchyard station at generation site substation in Juba). Furthermore, the existing 220 kV Sudan-South Sudan Interconnector will be extended to supply Malakal and the intermediately located towns of Jalhak and Melut. The extension of Sudan-South Sudan Interconnector will involve construction of 320 km of 220 kV line (D/S) and erection of 3 of 220 kV substations. Map 8.2 provides picture of the regional grids on completion of the short-term program.

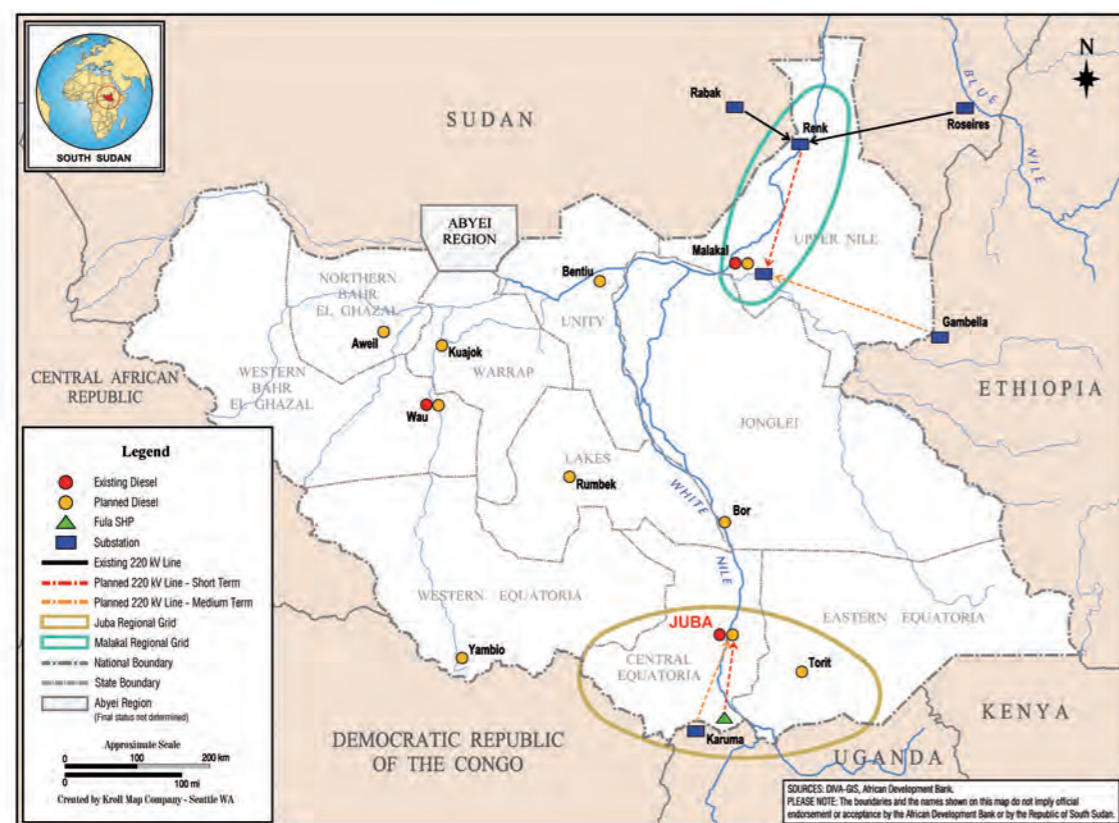
Strengthening the distribution network in the near-term. Electricity supply in Juba, Malakal and Wau is distributed in 11 kV and 0.415/0.230 kV networks. The existing distribution networks suffer from a number of deficiencies: (i) there is limited capacity to accommodate new customers; (ii) energy meters malfunction; and (iii) the distribution networks have high technical and non-technical losses. SSEC intends to introduce a 33 kV distribution network in order to increase the capacity of the networks to supply more customers, including those far away from the generation centres, and reduce the network losses. In the short-term, the existing distribution networks will be strengthened and expanded to enable SSEC to effectively distribute the generation from the existing plants and connect more customers. Accordingly, 40 km of 33/11kV line, 70 km of 11 kV line, 60 transformer stations (10 of 33/11 kV and 50 of 11/0.415/0.230 kV transformers), 130 km of 0.415/0.230 kV line and 22,000 pre-paid energy meters will be installed in the existing supply centres (Juba, Malakal and Wau). In addition to those indicated above, new distribution networks will be constructed as part of the installation of diesel generators in all the supply centres.

Table 8.9: Customer Accounts and Electrification Rate

Category	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
1. Population ('000)																
Urban	1737	1980	2225	2439	2618	2776	2937	3105	3281	3465	3656	3857	4069	4293	4529	4778
Rural	7757	8069	8369	8677	8971	9235	9477	9714	9952	10188	10422	10662	10907	11158	11414	11677
National	9494	10049	10594	11116	11589	12011	12414	12819	13233	13653	14078	14514	14964	15428	15907	16400
2. Households ('000)																
Urban	259	296	332	364	391	414	438	463	490	517	546	576	607	641	676	713
Rural	1637	1733	1827	1917	1998	2071	2140	2210	2282	2354	2427	2502	2580	2660	2743	2828
National	1609	1703	1796	1822	1900	1969	2035	2101	2169	2238	2308	2379	2453	2529	2608	2688
3. Accounts																
Commercial	4930	6954	10573	13068	16152	19964	25675	27987	30513	33273	36288	39584	43186	47124	51429	56137
Government	739	975	1393	1565	1760	1978	2689	2849	3019	3198	3389	3590	3804	4030	4270	4524
Households																
Urban Rural	13427	15777	23418	26767	30595	34971	84563	134155	183747	233339	282959	332649	382339	432029	481719	531438
Subtotal	13427	15777	23418	26767	30595	34971	84563	134155	183747	233339	282959	332649	382339	432029	481719	531438
Total	19096	23706	35383	41400	48506	56912	112927	164991	217278	269810	322636	375823	429329	483183	537418	592099
4. Electrification rate (%)																
Urban Rural	5	5	7	7	8	8	19	29	38	45	52	58	63	67	71	75
National	1	1	1	1	2	2	4	6	8	10	12	14	16	17	18	20

Source: Annex Table 9.8.

MAP 8.3: Proposed Transmission Grid for the Short- and Medium-Term



growth in South Sudan will accelerate. These are linked to implementation and financing capacities in the economy at large. Package 3 for the power sector would be implemented in the event that the economic recovery in the economy is slower than planned. A summary of capital outlays under these options is given in Table 8.8. Detailed work breakdown and corresponding refined cost estimates would be prepared during preparation and/or appraisal of these projects.

Package 1 includes the following: (i) the rehabilitation of the existing networks and dissemination of rural energy technologies; (ii) analytical studies; and (iii) implementation of institutional capacity building projects. The first priority will be given to these projects as they would generate immediate benefits (quick-wins). It is expected that the rehabilitation of the existing networks will immediately improve SSEC's technical performance and allow connection of more customers. The development and dissemination of rural technologies will provide rural communities with immediate access to renewable energies and efficient cooking stoves. The proposed studies would facilitate the mobilization of resources for short- to medium-term investment projects. The institutional capacity building projects would create capacity in MoED and SSEC to implement the short- to medium-term programs and improve the operational performance of the energy institutions.

Package 2 projects include all those projects identified under high base case scenario, including the installation of thermal power plants and related distribution networks, installation of Fula SHP and related transmission network, and extension of Sudan-South Sudan Interconnector to Malakal town. The projects under Package 2 will be implemented in the event that the demand envisaged under the high base scenario is realized and the required financing is secured. The short-term development program for this high base scenario will involve total outlays of about \$1,183 million. The generation investment amounting to \$667 million (56%) is targeted at installing diesel power plants in the state capitals and developing Fula SHP. The investment for the transmission network development amounting to \$207 million (18%) will be used to extend the Sudan-South Sudan Interconnector to supply more towns in the northern part of South Sudan and transmit the Fula power to Juba. The investment on distribution network development amounting to \$240 million (about 20%) will be used to rehabilitate the existing network in Juba, Malakal and Wau; and construct distribution networks to evacuate the power from the new diesel generators. The investment amounting to \$41 million (4%) will be used for rural energy supply. The investment amounting to \$28 million (about 2%) will be used for preparation of studies of projects to be implemented in the medium- to long-term, and to strengthen the capacity SSEC and MoED to implement projects and improve their operational performance.

Table 8.10: Priority of Short term Investment ((In Million \$ at 2010 Constant Prices)

Priority 1 Program (Immediate Priority)		Priority 2 Program (Low Scenario)		Priority 3 program (High/Base Scenario)	
Project Expenditure		Project Expenditure		Project Expenditure	
Rehabilitation and extension of distribution networks in Juba, Malakal and Wau	36.5	Development of Fula Small Hydropower Plant	70.5	1. Development of Fula Small Hydropower Plant	70.5
Rural Energy	41.2	Installation of diesel generators in state capitals	444.3	2. Installation of diesel generators in state capitals	596.0
Analytical studies: mega hydropower, transmission and distribution master plan, regional interconnections	12.3	Renk-Malakal transmission line	153.7	3. Renk-Malakal transmission line	153.7
Institutional study and capacity building in MoED and SSEC	15.7	Construction of Fula-Juba transmission line	53.3	4. Construction of Fula-Juba transmission line	53.3
		Distribution for new diesel plants	151.9	6. Distribution for new diesel plants	203.7
Total	105.8	Total	873.7	Total	1077.1

Design of the short-term program and related uncertainties. The financing requirements for the short-term program are large (\$980 million). Close attention will therefore have to be given to the prioritization of the proposed programs within the overall funding envelope. The projects earmarked for implementation in the short-term are categorized into three packages and will be

implemented on priority basis. These are referred to as Package 1, Package 2, and Package 3. Package 1 includes high priority interventions that need to proceed as soon as possible. Package 2 is a high growth scenario aligned to the strong economic growth outlook discussed in Chapters 2, 3 and 4. As that discussion indicates, there are major uncertainties about the pace at which economic

Table 8.11: Expenditure Schedule of Short Term Program (In Millions \$ at 2010 Constant Prices)

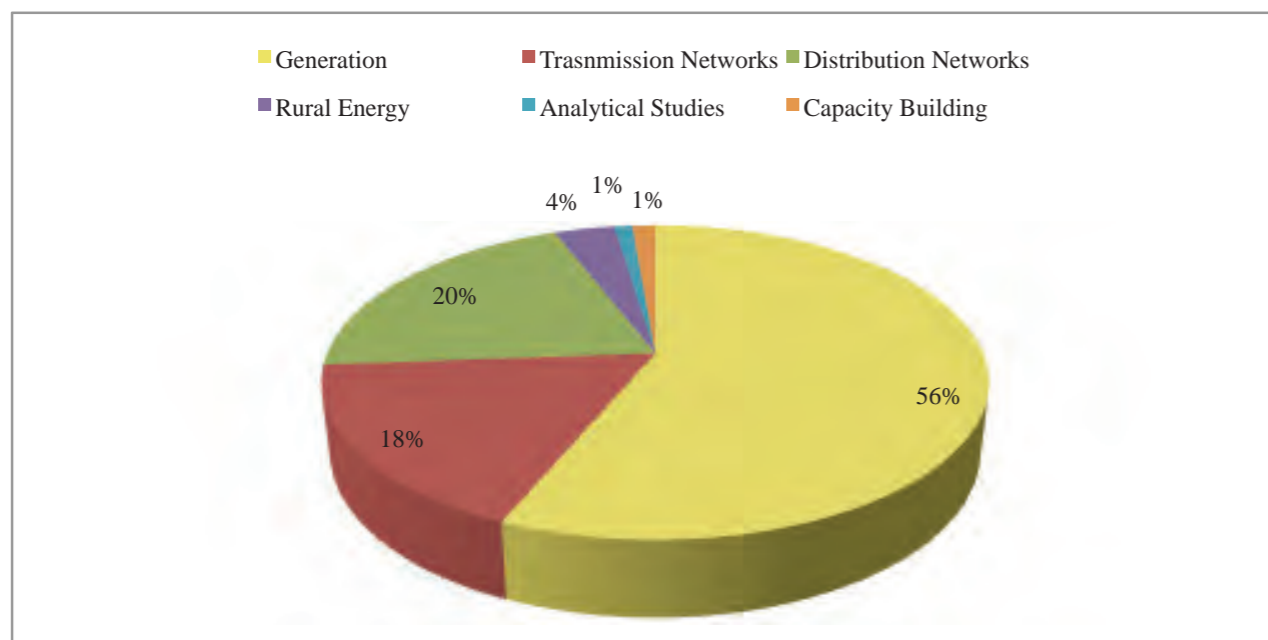
Projects	Total	2012	2013	2014	2015
1. Generation					
Installation of diesel generators	596.0	8.32	178.79	234.23	174.64
Development of Fula Hydropower Plant	70.5	0.98	21.14	24.42	23.93
Total	666.5	9.3	199.9	258.7	198.6
2. Transmission Networks					
Construction of Renk-Malakal line	153.7	1.46	31.47	75.37	45.37
Construction of Fula-Juba line	53.3	0.40	16.0	18.5	18.3
Total	207.0	1.9	47.5	93.9	63.7
3. Distribution Networks					
Distribution for new diesel plants	203.7	1.94	61.12	80.53	60.15
Rehabilitation of Juba, Malakal and Wau networks	36.5	14.60	10.96	10.96	
Total	240.3	16.5	72.1	91.5	60.2
4. Rural Energy	41.2	6.10	11.70	11.70	11.70
5. Total Analytical Studies	12.3	2.38	4.90	5.05	
6. Total Capacity Building	15.7	3.81	4.71	4.16	3.06
Grand Total	1182.93	39.99	340.79	464.96	337.19
%		3	29	39	29

Source: Annex Table 8.16.

The initial expenditure in 2012 of 3% of the budget relates to: (i) advance payments to consultants, transaction advisors and contractors/suppliers of the distribution networks rehabilitation; and (ii) activity-based payments for the initial stage of the rural energy development and dissemination program. The expenditure in 2013 of 29% of the capital outlays

is mainly to make advance payment to contractors of the major projects of the program. The bulk of the outlays (39%) will be disbursed in 2014 when most of the materials are delivered and significant work is implemented on site. The final expenditure of 29% relates to payment for the finishing work and settlement of final payments.

Figure 8.4: Expenditure Schedule for Short-Term Program



Source: Annex Figure 8.4.

Package 3 projects are those identified under a low case scenario for supply and demand. The program would provide sufficient and reliable supply to customers projected under a low growth scenario. The details for this scenario are outlined below in the section on the management of risks and uncertainties.

It includes the following: (i) installation of a scaled down program of thermal power plants and related distribution networks; (ii) installation of Fula SHP and related transmission network; and (iii) extension of Sudan-South Sudan Interconnector to Malakal town.

Table 8.12: Generation Expansion Plan

Supply Centers	Demand (MW)		Installed Capacity (MW) (2015-2020)			Installed Capacity (MW) (2021-2025)		
	2020	2025 (Incremental)	Diesel Set No.x MW	Hydropower	Total	Diesel Set No.x MW	Hydropower	Total
Malakal	86.7	33	4x5					
Bor	19.7	11.2	5x5			3x4		
Bentiu	11.2	8.1	4x4			2x4		
Kuajok	12.7	7.5	4x5			2x4		
Aweil	20.7	13.1	5x5+1x2			2x5+2x2		
Wau	30.2	16.8	7x5			3x5+1x2		
Rumbek	15.1	9.4	4x5			2x5		
Yambio	15.5	9.9	5x4			2x5		
Juba	110.2	47.7	4x10+8x5					

Supply Centers	Demand (MW)		Installed Capacity (MW) (2015-2020)			Installed Capacity (MW) (2021-2025)		
	2020	2025 (Incremental)	Diesel Set No.x MW	Hydropower	Total	Diesel Set No.x MW	Hydropower	Total
Torit	8.7	5.6	4x3			2x3		
Yei	28.8	16.9	7x5			3x5+1x2		
Maridi	14.2	9.2	4x5			2x5		
Kapoeta	3.4	2.1	3x2			2x1.5		
Total	377.1	190.5	336	40	376	115	300	415
Memo item								
2x1 MW diesel generators will be erected in Bor, Rumbek and Yambio in 2012								

Source: Annex Table 9.17.

8.4.3 Program for the Medium-Term (2016-2020) and Long-Term (2021-2025)

In the medium-term, in addition to the continued preparation of studies for future projects, capacity building in the energy institutions and dissemination of NREs, the projects prepared in the short-term will be implemented to meet the demand in the long-term.

Expansion of generation capacities. The generation capacities in all the supply centres outside Juba and Malakal grids will be strengthened by installing additional diesel units (115 MW) in order to meet demands in the long-term. It is also expected that part of the mega hydropower potential (possibly Lekki 300 MW Hydropower Plant) will be developed in the medium-term to supply the Juba Regional Grid. Table 8.2 provides the summary of the generation expansion plan. In the long-term, the activities to be implemented are relatively limited and involve connecting new customers, preparation of analytical studies, capacity building in the energy institutions, and dissemination of NREs.

Expansion of the transmission network. In the medium term, it is expected that the interconnection with the neighboring countries will expand with the Ethiopia-South Sudan (220 kV D/S) and Uganda-South Sudan Interconnectors (220 kV D/S) commissioned by the end of 2019 and 2020, respectively. The Ethiopia-South Sudan Interconnector will provide about 100 MW to Malakal Regional Grid while the Uganda-South Sudan Interconnector will supply about 100 MW to Juba Regional Grid. Domestic generation combined with

interconnection supply will make available relatively cheap power to the regional grids. It is expected that some of the surrounding towns will be connected to the regional grids during this period. In such event, the government could either keep the diesel generators at the existing sites to serve as a backup supply or move them to supply other un-electrified towns. Map 8.3 the location of the transmission grid on completion of the medium-term program.

In the period 2015-2025, the generation demand will be met through imports from the Sudan, installation of diesel generators in the supply centres, development of Fula SHP, and imports from Ethiopia and Uganda. Therefore, major transmission networks will not be developed during this period to form a meaningful national grid. Beyond 2025, as the economy grows, it is envisaged that a critical mass demand will be created to justify the formation of a national grid. The national grid will be formed through the development of the hydropower resources; expansion of the national transmission networks; and strengthening the interconnection with the neighboring countries. Map 8.4 provides an indicative/preliminary development plan beyond 2025. Accordingly, the north and southern part of South Sudan will be connected in 400/500 kV networks and the remaining major load centres in the country will be supplied in 220/132 kV networks. The interconnection with the neighboring countries will be strengthened through interconnecting the central part of the grid with Ethiopia and southern grid with Kenya. The 500 kV Tepi substation (Ethiopia), which will be constructed as part of the Renaissance Dam (5,250 MW) and commissioned in the next decade, will serve as a take-off point for major interconnection (interconnection in 400/500 kV) with South Sudan. The proposed Transmission and Distribution Master Plan will determine the final shape of the national grid.

MAP 8.4: Indicative Transmission for South Sudan in the Longer-Term

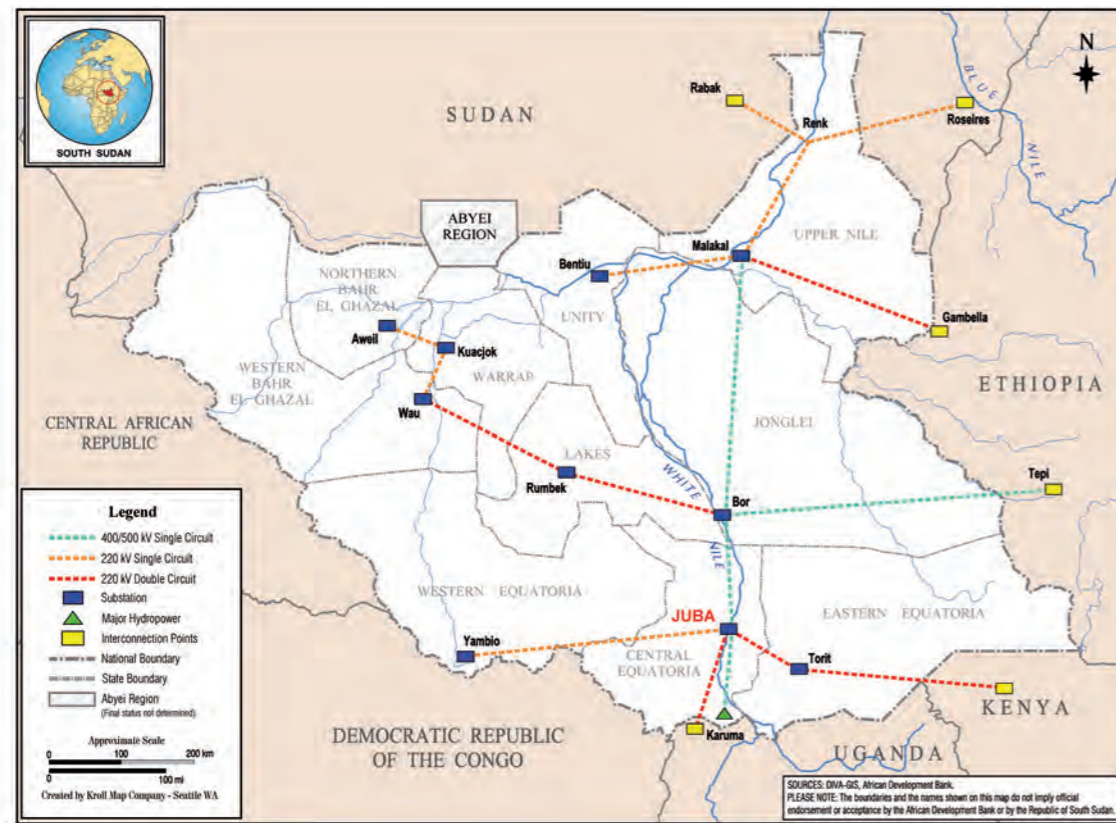
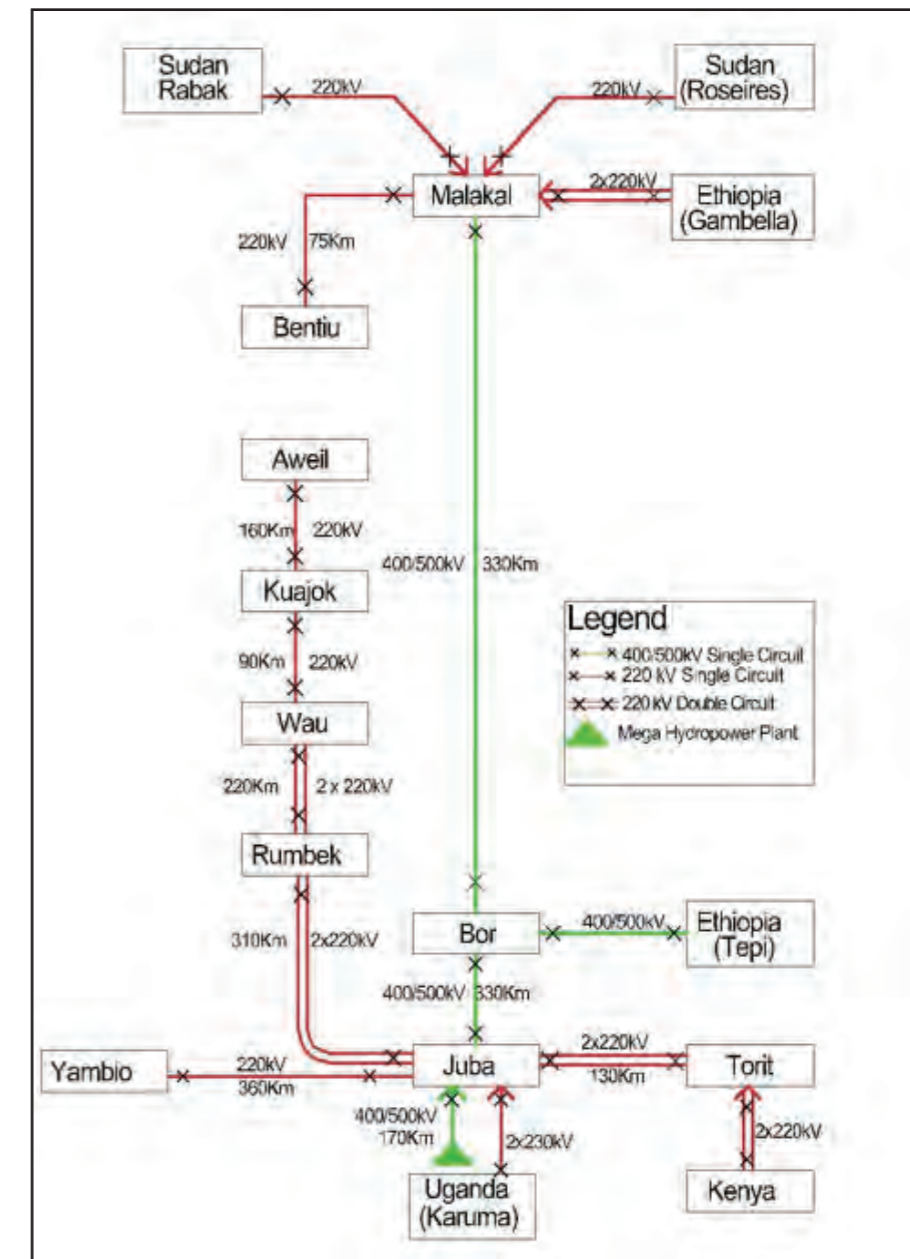


Figure 8.5: South Sudan Indicative Long Term : National Grid



In the medium-to-long term, the distribution networks will further be developed to evacuate the power from the various substations and connect new customers.

8.4.4 Rural Energy Supply

The rural communities reside in widely dispersed areas which makes it costly to supply them power through grid extension and/or building cost effective diesel generators. Consequently, it is expected that the energy consumption in the rural areas will be derived mainly

from biomass for some time to come. As such, it is necessary to promote appropriate technologies, including efficient cooking stoves, biogas and solar energies, to supply clean and effective energy to the rural population. As far as biomass utilization is concerned, the proposed program included the development and dissemination of efficient cooking stoves and biogas digesters for effective utilization of the biomass resources. The program will also develop and disseminate photovoltaic (PV) electricity supply systems to the households and social services. The program to be implemented is summarized in Table 8.13.

Table 8.13: Rural Energy Supply Program and Access

Category	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Rural Households ('000)	1443	1496	1547	1592	1634	1675	1716	1757	1797	1838	1881	1924	1968	2013
1. Cooking stove ('000)	50	100	100	100	100	100	100	100	100	100	100	100	100	100
Cumulative total ('000')	50	150	250	350	450	550	650	750	850	950	1050	1150	1250	1350
Access to rural households (%)	3.5	10.0	16.2	22.0	27.5	32.8	37.9	42.7	47.3	51.7	55.8	59.8	63.5	67.1
2. Biogas Digesters ('000)	2.8	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Cumulative total ('000)	2.8	8.3	13.8	19.3	24.8	30.3	35.8	41.3	46.8	52.3	57.8	63.3	68.8	74.3
Access to rural households (%)	0.2	0.6	0.9	1.2	1.5	1.8	2.1	2.3	2.6	2.8	3.1	3.3	3.5	3.7
3. Solar Electricity ('000)														
PV small home systems	2.5	5	5	5	5	5	5	5	5	5	5	5	5	5
Solar lantern (1 bulb+mobile)	2.5	5	5	5	5	5	5	5	5	5	5	5	5	5
Solar lantern (3 bulbs+mobile)	2.5	5	5	5	5	5	5	5	5	5	5	5	5	5
Cumulative total	7.5	22.5	37.5	52.5	67.5	82.5	97.5	112.5	127.5	142.5	157.5	172.5	187.5	202.5
Access to rural households (%)	0.5	1.5	2.4	3.3	4.1	4.9	5.7	6.4	7.1	7.8	8.4	9.0	9.5	10.1
4. Institutional PV ('000)	0.3	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Cumulative total	0.3	0.75	1.3	1.8	2.3	2.8	3.3	3.8	4.3	4.8	5.3	5.8	6.3	6.8
5. Small thermal water heaters ('000)	0.3	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Cumulative total	0.3	0.8	1.3	1.8	2.3	2.8	3.3	3.8	4.3	4.8	5.3	5.8	6.3	6.8
6. Solar cookers ('000)	2.5	5	5	5	5	5	5	5	5	5	5	5	5	5
Cumulative total	2.5	7.5	13	18	23	28	33	38	43	48	53	58	63	68
7. Solar pumps ('000)	0.25	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Cumulative total	0.3	0.8	1.3	1.8	2.3	2.8	3.3	3.8	4.3	4.8	5.3	5.8	6.3	6.8

Source: Author's proposal.

During 2012-2025, 1,350,000 improved cooking stoves; 74,300 biogas digesters; 202,500 solar home electricity; 6,800 institutional solar electricity; 6,800 small thermal water heaters; 68,000 solar cookers; and 6,800 solar irrigation pumps (each irrigating a quarter of hectare) will be disseminated in the rural areas. On completion of the short- to medium- and long-term programs, access of rural households to improved cooking stoves, biogas digesters and solar electricity will be close to 67%, 4% and 10%, respectively.

8.5 Capacity Building and Technical Studies

8.5.1 Capacity Building

In the short-term program, private sector participation is proposed in the development of Fula SHP and construction of diesel generators in the 13 supply centres. It is therefore critical that the necessary legislation and regulatory frameworks be put in place upfront in order to tap the private sector investment at favourable concession to the government for the development of the targeted electricity projects. As noted earlier, GoRSS has taken a number of steps to address these concerns, including: (i) promulgation of an Investment Promotion Act; (ii) adoption of a National Electricity Policy in May 2007; (iii)

draft of a National Electricity Bill; (iv) draft of a Petroleum Policy Paper and Bill; and (v) draft of an Environment Policy Paper and Act. The government will have to adopt/enact all outstanding Policy Papers and Bills by the 1st quarter of 2012 to help mobilize more of cheap private sector resources towards the realization of the short- term program.

There is currently a lack of capacity in the energy institutions for activities related to planning, negotiation and project implementation as well as operations in the ESI. The proposed Action Plan includes initiatives for capacity building in the SSEC and MoED in the short-term to enable them implement the short- to medium-term programs and improve operational and financial performance of the SSEC so that it becomes a credible partner in the development of projects under PPP arrangements. The short-term capacity building program will be implemented based on the recommendations of an institutional study which will be undertaken upfront. The human capacity building will involve providing on the job training with support of TA, and attachment of staff to energy institutions/power utilities to familiarize them with good practices of running a power utility.

The necessary TA support will therefore be put in place to train the staff in energy institutions in order to improve performance and implement the institutional reforms and operationalize the policy and regulatory frameworks. The

training will involve technical, financial and commercial aspects as it relates to the operation of a power utility. The technical training will cover energy sector planning and design, project management, and operation and maintenance of energy facilities. The training as it relates to finance and commercial disciplines will involve financial management and control (including IT system development for data base and excel based financial forecasting models), billing and collection as well as management of customer services. The capacity building program will also focus on introducing best practices in SSEC as it relates to: (i) financial management control; (ii) bill production and collection; (iii) customer services; and (iv) operation and maintenance of electricity networks. In the medium- to long-term, it is expected that the capacity of these institutions will be strengthened further through implementation of a follow-up institutional capacity building program.

8.5.2 Technical Studies

In the short-term, studies will be undertaken to determine the sequence of expansion of generation plants, and transmission and distribution networks. A feasibility study will also be carried out for projects to be developed in the medium- to long-term. Furthermore, an institutional study will also be prepared to identify the capacity building needs in the energy institutions and to establish an implementation action plan. In the medium- to long-term, it is expected additional studies will be identified and implemented. The short-term studies are briefly described below:

- *Preparation of least cost expansion plan for mega hydropower development:* South Sudan has vast hydropower potential which has been identified at a pre-feasibility level. Some of these prospective hydropower sites include: Bedden (720 MW), Fula (1,080 MW), Lekki (420 MW), Shukoli (250 MW) and Juba barrage (120 MW). The Government has recently hired a consulting firm to undertake a feasibility study for Fula mega hydropower plant. In the short term, a feasibility level comparative study will be undertaken in order to establish a least cost development plan of these sites and determine the project(s) for development in the medium term (initial phase development).
- *Feasibility study of regional interconnection:* The potential countries whose power systems can be interconnected with South Sudan are Uganda, Ethiopia and Kenya. The interconnection with Uganda will involve construction of a transmission line from Karuma Hydropower Plant (Uganda) to Juba while the interconnection with Ethiopia will involve construction of a transmission line from Gambella Substation (Ethiopia) to Malakal and from Tepi (Ethiopia) to Bor;

and from the northern part of Kenya to Juba via Torit. Feasibility studies of these projects will be undertaken in the short-to-medium term and implemented in the medium-to-long term.

- *Preparation of transmission and distribution master plan:* A Master Plan will be prepared to establish the staged development of the transmission and distribution networks in the medium-to-long term. The transmission component of the study will provide a strategy and program for the development of a national grid in the medium-to-long term.
- *Institutional study:* The study will identify the human and institutional capacity building needs in SSEC and MoED and prepare an action plan for the implementation of the study recommendations.

8.6 Program Implementation

8.6.1 Implementation Schedule

The proposed program implementation would be formally initiated in 2012 with appointment of an individual consultant who will assist in the implementation of the front-end activities and supervision of the overall project. The implementation of most of the front-end activities (project document, ToRs and bid documents) would be completed by the 2nd quarter of 2012. With funding secured and the Project Engineer/Study Consultant/Transaction Advisor put in place by the end of the 3rd quarter of 2012, the contracts for investment projects will be awarded by the 3rd quarter of 2013. All studies will be completed by the 3rd quarter of 2014 while the capacity building and investment projects will be completed by the end of 2015. Commissioning of new plants would then follow.

8.6.2 Packaging and Implementation Arrangements

The Action Plan proposes that a project implementation unit (PIU) be established to deal with the overall implementation of the short term program. The PIU would be staffed by relevant SSEC's staff and supported by an individual consultant with extensive experience in procurement and supervision of projects. Specifically, the PIU will be responsible for the procurement and supervision of the distribution networks rehabilitation project; selection of consultants to assist in the implementation of the other projects of the program; and implementation coordination of the various projects. Sufficient counterpart staff will be attached to the PIU as well as to the projects to get on the job training in the various disciplines.

Table 8.14: Implementation Schedule for Short-Term Program

Activity	2012					2013					2014					2015																			
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1. Individual Consultant Appointment of Consultant Services of Consultant																																			
2. Distribution Network Rehabilitation Preparation of project and bid document Sourcing of Funds Selection of Supplier/Contractor Supply of Goods/Works Construction, commissioning																																			
3. Capacity Building Preparation of ToR Sources of financing Appointment of Consultant Institutional Study Reforms in SSEC's operations Training																																			
4. Analytical Studies Preparation of ToR Sourcing of finance Appointment of Consultant Preparation of studies																																			
5. Renk-Malakal Transmission Line Conclusion of PPA Sourcing of funds Appointment of Engineer Preparation of tender documents Selection of Contractor Construction surveys, design Manufacture of Equipment Construction, commissioning																																			
6. Fula Small Hydropower Plant Feasibility study, design RPTs, bid documents Appointment of Transaction Advisor Tendering, selection of private investor/Contractor Manufacturing and supply of equipment Construction, commissioning																																			
7. Fula-Juba Transmission Line Sourcing of funds for transmission line Appointment of Engineer Tendering, selection of Contractor Construction surveys and design Manufacture of Equipment Construction and Commissioning																																			
8. Installation of Diesel Generators Preparation of project document, ToR Appointment of Transaction Advisor, Engineer Preparation of bid documents Tendering, selection of private investor/Contractor Manufacture and supply of equipment Installation and commissioning																																			
9. Distribution in State Capitals Preparation of project document, ToR Sourcing of funds Appointment of Engineer Preparation of bid documents Tendering, selection of Contractor Manufacture and supply of equipment Installation and commissioning																																			
10. Rural Energy Tendering, appointment of Consultant Sourcing of funds Appointment of Contractor Delivery and dissemination																																			
Memo item For donor funded projects, advance procurement action assumed.																																			

The implementation arrangements for the various projects are described below:

- **Erection of diesel generators:** Under the short-term program, 13 diesel power stations, 69 medium/slow diesel generators of aggregate capacity of 366 MW will be installed. The power stations, which is estimated to cost about \$596 million (50% of short-term investment), will be constructed in two years after commencement of work. Considering the large investment requirements,

the short implementation period and extensive skills requirements for the development and operation & maintenance, it is proposed that the power plant is constructed with PSP under IPP arrangements. The development of the project under such arrangement will involve hiring an engineering firm to assist in the preparation of the tender documents and supervision of the project. A multidisciplinary transaction advisor group to assist in negotiations of concessions would also be retained.

- **Erection of Fula SHP:** Under the short-term program, a 40 MW Fula SHP will be constructed. The project is estimated to cost about \$70 million (6% of short-term investment) will be implemented in two and half years after commencement of work. Considering the significant investment requirements, the short implementation period and extensive skills requirements for the development and operation & maintenance, it is proposed that the hydropower plant is developed with PSP under IPP arrangements. The ongoing study funded by the Government of Norway is expected to produce detailed design and bid documents for the project. An engineering firm would be appointed to assist in the tendering process and supervision of the project. A multidisciplinary transaction advisor group would also be appointed to assist in negotiations of the concession.
- **Renk-Malakal transmission networks:** The project will involve construction of 320 km 220 kV line, erection of three of 220 kV substations. The project is estimated to cost about \$154 million (13% of short term investment). The project, which will be constructed by international contractors, will be completed in two and half years after award of contract. The project will be contracted in two packages including transmission and substation. These arrangements will help in getting competitive contract prices and ensuring the timely completion of the project. An engineering firm will be appointed to assist in the preparation of detailed design and bid document, tendering process, and supervision and commissioning of the project. SSEC's staff will be attached to the project to get on the job trainings in order to develop capacity within the utility to effectively manage the project during its operation.
- **Fula-Juba transmission:** The project will involve construction of 170 km of 132 kV transmission line and erection of two of 132 kV substations. The project is estimated to cost \$53 million (5% of short-term investment). The project, which will be constructed by international contractors, will be completed in two and half years after contract award. The project will be contracted in two packages including transmission and substation. Such arrangement will help getting competitive contract prices and ensuring the timely completion of the project. An engineering firm will be appointed to assist in the preparation of detailed design and bid document, the tendering process and supervision and commissioning of the project. SSEC's staff will be attached to the project to get on the job in order to develop capacity within the utility to effectively manage the project during operation.

Distribution networks for evacuating power from power plants: The distribution networks in state capitals, which will be constructed along with the diesel generators,

involves putting medium voltage (33 kV and 11 kV) networks, low voltage (415/240 Volts) networks. The cost of the project is estimated at \$204 million (17% of short term investment). An engineering firm will be appointed to assist in the preparation of detailed design and bid document, the tendering process, and supervision and commissioning of the project. The project, which will be constructed by an international contractor, will be completed in two years after contract award. Given that the volume of work is big and the implementation period short, SSEC needs to consider packaging the project into lots and award them to different contractors to ensure the completion of the work within the specified time frame.

Connection of new customers: It is expected that 266,000 customers (53,200 customers per annum) will be connected in the medium-term. The cost of the project is estimated at \$93 million. Given that historically SSEC was connecting less than 5,000 customers every year, it would not have sufficient capacity (number of technicians and logistics) in the short-term to connect 53,200 customers per year during 2016-2020. It is therefore proposed to consider subcontracting the work to local or regional companies in order complete the project on schedule and attain the targeted connections/electrification level by 2020.

Rehabilitation of the existing networks: In the short-term, the distribution networks and generating stations in Juba, Malakal and Wau will be rehabilitated. The project will involve the following: procurement of distribution materials (112 km medium voltage and 140 km of low voltage lines; 58 distribution transformers; 21,000 energy meters; materials to connect 17,000 customers; 3,000 street light poles with fixtures) and diesel generator spare parts. The project is estimated to cost \$36.5 million which is about 3% of the short term investment. SSEC may not have sufficient capacity to complete such large works within the planned construction period of 2 year. In the event of such capacity constraints, SSEC will have to outsource the services of external contractor to construct the distribution networks and overhaul the diesel generators.

Rural energy development: In the short- to medium-term, 850,000 improved cooking stoves, 46,800 biogas digesters, 127,500 solar home electricity, 4,300 institutional solar electricity, 4,300 small thermal water heaters, 43,000 solar cookers and 4,300 solar irrigation pumps will be disseminated in the rural areas. The short term program, which is estimated to cost about \$41 million (4%), will be implemented with private sector participation. MoED will initially prepare the project and the bid documents with support from a consultant. It is expected that the project document will incorporate the modality of government-private partnership to jointly implement the project.

Technical studies: The studies include preparation of least cost development plan for mega hydropower; feasibility

study of regional interconnectors; preparation of transmission and distribution master plan and institutional study. The studies, which cost about \$12 million (1%), will be completed in two years after commencement of work. The studies will be carried out by international consultants with each study separately contracted. As the capacity building in the energy institutions will be based on the outcome of the institutional study, the consultant who prepares the study will be retained to implement the institutional capacity building project.

Capacity building: The short-term capacity building program will be implemented based on the recommendations of an institutional study. The capacity building, which costs \$16 million (1.4%), will be implemented by the consultant who prepares the institutional study. The project will be implemented in 33 months.

8.7 Development and Maintenance Costs and Financing

8.7.1 Development Costs

The cost estimates have been prepared separately for the short term (2011-2015), medium term (2016-2020) and long term (2021-2025) programs. The cost estimates have been prepared for the generation, transmission, distribution, rural energy, analytical studies and capacity building projects. Summary of the cost estimates are provided in Table 8.15.

Table 8.15: Investments for Short-To-Medium-To and Long Term Programs
(In million \$ at 2010 Constant Prices)

No.	Projects	2011-2015	2016-2020	2021-2025	Total
1	Generation				
1.1	New Diesel Generator	596.0	203.9		799.9
1.2	Fula Small Hydropower Plant	70.5			70.5
1.3	Lekki Hydropower Plant		480		480
	Subtotal	666.5	683.9		1350.3
2	Transmission Networks				
2.1	Renk-Malakal line	153.7			153.7
2.2	Fula-Juba line	53.3			53.3
2.3	Lekki-Juba line		53.8		53.8
2.4	Ethiopia -SS Interconnector		101.7		101.7
2.5	Uganda-SS Interconnector		53		53.04
	Subtotal	207.0	208.6		415.5
3	Distribution Networks				
3.1	Distribution for new diesel plants	203.7	69.7		273.4
3.2	Juba, Malakal and Wau rehabilitation	36.5			36.5
3.3	Customer connections		93.0	94.3	187.3
	Subtotal	240.2	162.7	94.3	497.2
4	Rural Energy	41.2	58.7	58.7	158.6
5	Soft Projects				
5.1	Analytical Studies	12.3	15	15	42.3
5.2	Capacity Building	15.7	15	15	45.7
	Subtotal	28.0	30	30	88.0
	Total	1182.9	1143.8	183.0	2510
Memo items					
Cost estimates for Ethiopia-SS and Ugada-SS include the South Sudan part only					
Average drop line (connection) Costs US\$ 350/connection					

Source: Estimate by authors

The proposed development program for the power sector will involve total outlays in the range of \$2.5 billion during 2011-2025. The major part of the outlays will be invested in the short-term (\$1,183 million) and medium-term (\$1,144 million), mainly to build the trunk networks to accommodate the demand until 2025. The long-term outlay amounting to \$183 million is targeted at connecting new customers; expanding the capacity building program and rural energy supply; and undertaking additional studies.

Generation program: In the period 2011-2025, Fula SHP, diesel generators and Lekki hydropower will be constructed. The projects take a significant portion of the power infrastructure investment, which is valued at \$1.35 billion million, corresponding to 54% of the investment cost. The generation projects will be funded by private investors through PSP under IPP arrangements. The private sector could build the power plants under various modes of concession agreement including BOT (Build Operate and Transfer), BOO (Build, Operate and Own), etc. Given that the power market in the country has not matured, it is envisaged that the developer will build the plant under a single buyer off-take arrangement with payment to be settled on take or pay contractual agreement. It is therefore necessary that SSEC operate on sound business principle to generate the revenue required to regularly settle the bill for power purchased from the private developer. Normally, implementation delays of project developed through PSP most often result from delays in establishing upfront the necessary policy, legislation and regulatory frameworks to encourage private sector investment. It is therefore necessary to put in place appropriate legislation and regulatory frameworks as soon as possible in order to attract private investment at favorable concession to the government resulting in bulk power supply at competitive prices.

Transmission networks: In the period 2011-2025, Renk-Malakal transmission network, Fula-Juba transmission network, Ethiopia-South Sudan Interconnector and Uganda-South Sudan Interconnector will be constructed. Total funding requirements for the transmission program is estimated at \$416 million which is equivalent to 17% of the investment cost. Considering the transmission grid a strategic asset, it is expected that the asset will remain under the ownership of the government during the planning period. It is therefore expected that the transmission networks will be funded by the government in partnership with multilateral and bilateral financiers.

Distribution networks: In the period 2011-2025, distribution networks will be constructed to improve the supply conditions of the existing supply centres, and in state capitals to evacuate the power generated from the new power plants. It is also expected to connect about 573,000 new customers (57,300 customers per annum)

to the distribution networks. The investment for the distribution expansion program amounts to \$497 million corresponding to 20% of the investment cost. It is expected that the distribution networks, which fall under the government ownership, will be funded by the government in partnership with bilateral and multilateral financiers.

Rural energy: The rural energy program (2011-2025) will develop and disseminate energy efficiency technologies and renewable energies (efficient biomass stoves, biogas digesters and solar energy technologies) in the rural areas to provide clean and quality energy to the rural communities. The program is estimated to cost \$159 million (equivalent to 6% of the investment cost). The program will contribute to the mitigation of climate change by reducing greenhouse gas emissions through the use of efficient biomass stoves and dissemination of biogas and solar technologies. Hence, the program can benefit from the various funding mechanisms established to support the development of environmentally clean energies. The program will therefore be funded by the government with support from establishments which support clean energy development including Global Environmental Facility (GEF).

Technical studies and capacity building: Various studies will be undertaken to generate projects that will be implemented during the program period. The studies to be carried out include: least cost development plan for mega hydropower plants; feasibility study of regional interconnectors; transmission and distribution master plan and institutional study. A capacity building program will also be implemented to develop capacity in SSEC and MoED in order to develop capacity to implement project and improve the operational performance the institutions. The studies and capacity building program will cost \$ 28 million which is about 1% of the total investment. Past trends indicate that funding for capacity building can easily be mobilized from donors in the form of grant. It is therefore expected that the government will implement the studies and capacity building projects with support from donors.

8.7.2 Maintenance Programs

With the proposed major expansion in the physical assets of the power sector and substantial increase in allocations for routine and periodic maintenance of these facilities will be essential to ensure reliable performance and service delivery. The absence or deficiency in routine maintenance on infrastructure would reduce its economic life and affect the level and quality of service provision. The proposed Action Plan takes into account the cost of routine maintenance as part of the infrastructure development program to allow the optimal use of the these assets.

Table 8.16: Routine Maintenance Expenditure (In Million \$ at 2010 Constant Prices)

Category	Cost of Routine Maintenance			Total	%
	2011-2015	2016-2020	2021-2025		
Private Developer	26.7	160.7	270.1	457.4	59.9
GoRSS	27.3	116.0	156.5	299.7	39.3
Rural Communities	1.7	2.3	2.3	6.3	0.8
Total	55.6	279.0	428.9	763.4	100.0
%	7.3	36.5	56.2	100.0	

Source: Annex Table 8.11.

For the purpose of this Report, the yearly cost of routing maintenance of infrastructure is estimated as a percentage of the capital stock at 2010 constant prices. Given that most of the assets were either destroyed during the civil war, mined, or were in very poor condition at the time of the CPA in 2005, the starting value of the capital stock is quite small. The starting point in determining the capital stock was to make a very rough estimate of the capital stock at end 2006. The value of these assets in 2006 was put at \$1 million. To these estimates of the value of the capital stock at end 2006, is then added the new spending on capital rehabilitation and new assets for 2007-2010. This then gives an estimate of the value of the capital stock at the end of 2010. The replacement value of assets at end 2010 was put at \$8 million. To this estimate is then added the capital expenditures proposed for 2011-2025 to get the value of the capital stock at the end of 2025 (at 2010 constant prices). For each of the capital stock estimates is then applied a particular percentage to obtain the required amount of annual spending on routine maintenance. It is expected that there will not be major investment on power infrastructure outside the proposed program except for the investment of \$30 million being undertaken with funding from the Government of Egypt to erect diesel plants in Bor, Yambio and Rumbek. These will be commissioned by the end of 2011.

Typically, for the present type infrastructure assets, the required level of routine maintenance each year is in the range of 3.5% to 5.0% of the value of the capital stock. In the present case the percentage used is 4% which is nearly the average value. On this basis the summury cost of routine maintenance for the power infrastructure covering the planning period (2011-2025) is presented in Table 8.16. It is estimated that \$56 million and \$279 million will be required to undertake regular routine maintenance on the power infrastructure during 2011-

2015 and 2016-2020 respectively. The maintenance of the generation infrastructure will take about 56% of this budget which will be covered by the private developer. About 43% of the budget is required for maintenance of the transmission and distribution assets which is owned by the Government. This expenditure will therefore be covered from the public sector budget. The remaining approximately 1% of the budget is required for maintaining the rural energy facilities which will be covered by the rural communities.

8.7.3 Sources of Finance

Ongoing donor support. Since the CPA, several donors have been active in supporting the power sector in South Sudan. The USAID funded the preparation of the Electricity Policy Paper and the Electricity Act, the assessment of South Sudan's hydropower potential (pre-feasibility level), and electrification of three towns (Yei, Maridi and Kapoeta) which are being run under cooperative arrangements. The Government of Egypt has supported the ESI by funding the supply of three state capitals (Bor, Yambio and Rumbek) through installation of diesel generators and the associated distribution networks. The Government of China has been engaging with the government to support the extension of Renk-Malakal transmission line but the financial closure has not been realized as yet. It is expected that these donors will continue to support the ESI, including the short-term programs.

Funding arrangements for the proposed program. The power infrastructure investment in the period (2011-2025) is estimated at \$ 2.5 billion. It is expected that the overall program will be funded from the National Budget, the donor community and private investors. The realization of the program partly depends on

how successful the government is in mobilizing the respective financial resources. The success of mobilizing the investment from different financiers will depend on a sustainable and investment friendly environment in South Sudan. Donors' contributions to such investment may be limited considering the large requirements for various sectors in the country. It is therefore necessary to target private investment for the major projects of the program. The government would therefore need to put in place the necessary investment policy and regulatory frameworks with a view to demonstrating to financiers that a sustainable investment climate exists in the country.

To implement the short-term program, GoRSS will need to mobilize \$1,183 million in new funding. At this stage, an important objective is to mobilize the \$106 million

of funding required for the short-term program with focus on the Priority 1 Program. It is expected that the short-term program will be funded from public budget, Official Development Assistance (ODA) from OECD partners on a bilateral basis, loans (concessionary and non-concessionary) and grants from international and regional financial institutions (World Bank, AfDB, etc.), official loans from non-OECD financiers including the BRICs (Brazil, Russia, India and China), and equity contribution from the private sector. The private sector has the financial resources and capacity to implement projects. Hence, it is worthwhile to consider raising the funds for the generation projects from the private sector under PPP arrangements. The financial needs and indicative sources of finance for the short-term program are provided in Table 8.17 below.

Table 8.17: Indicative Sources of Finance for Short Term Program In Millions \$ (At 2011 Constant Prices)

Sources of Financing %	Project	Total Cost	2012	2013	2014	2015
100	1. Diesel Plants	596.0	8.3	178.8	234.2	174.6
	Private	595.9	8.3	178.8	234.2	174.6
100	2. Fula Small Hydropower Plant	70.5	1.0	21.1	24.4	23.9
	Private	70.5	1.0	21.1	24.4	23.9
100	3. Renk-Malakal T. Line	153.7	1.5	31.5	75.4	45.4
	GoRSS	153.7	1.5	31.5	75.4	45.4
20	4. Fula-Juba T. Line	53.3	0.4	16	18.5	18.3
		GoRSS	10.7	0.1	3.2	3.7	3.7
80	Donors	42.6	0.3	12.8	14.8	14.7
20	5. Distribution for New Diesel plants	203.7	2	61	80.5	60.2
		GoRSS	40.7	0.4	12	16	12
80	Donors	163.0	2	49	64.4	48.1
10	6. Distribution Rehabilitation	36.5	14.6	10.96	10.96	
		GoRSS	3.7	1.5	1.1	1.10
90	Donors	32.9	13.1	9.9	9.86	
60	7. Rural Energy	41.2	6.1	11.7	11.7	11.7
		GoSS	24.7	3.7	7	7	7
40	Donors	16.5	2.4	4.7	4.7	4.7
10	8. Analytical Studies	12.33	2.38	4.9	5.05	
		GoRSS	1.2	0.2	0.5	0.5
90	Donors	11.1	2.1	4.4	4.5	
10	9. Capacity Building	15.74	3.81	4.71	4.16	3.06
		GoRSS	1.6	0.4	0.5	0.4	0.3
90	Donors	14.2	3.4	4.2	3.7	2.8
Total		1182.9	40.0	340.8	465.0	337.2

Source: Estimates by authors.

Early implementation of the short-term capacity building program is critical to improving the operation of SSEC and putting in place the necessary studies and institutional capacity to assist in the implementation of the program over the medium-term. Therefore, GoRSS needs to give priority to mobilization of financing for the capacity building program. Past trends indicate that funding for analytical studies and capacity building can be mobilized from donors in the form of grants.

The development of the new generation projects will require substantial amounts of capital investment. It will be difficult to raise the full amount from internal and multilateral and/or bilateral sources. Therefore, the government will have to target at mobilizing the major part from the private sector. Towards this end, GoRSS has to put in place the needed policy and regulatory frameworks and good governance to create confidence in the private sector to attract investment.

Considering the transmission grid a strategic asset, it is expected that the asset will remain under the ownership of the government during the planning period. The short-term distribution expansion and rehabilitation program is unlikely to be attractive for private sector investment. It is therefore expected that the transmission expansion program and distribution network rehabilitation will be financed by GoRSS in partnership with multilateral and bilateral financiers. In the near-term, at least, the financial position of the public utility is such that it will not be in a position to generate operating surpluses that will allow it to contribute to the capital cost of the public power sector program. Allocations for the program will therefore have to come from the National Budget for some years to come.

8.8 Management of Risks and Uncertainties

8.8.1 Major Risks that Confront the Program

The risks related to the program implementation can be categorized into political, economic, institutional and financial.

Funding constraints. The working assumption that underpins this Report is that stability in the region will be maintained with efforts of the regional countries and support of the international communities and hence mitigate this potential risk to the program. However, political and economic instability in the region may restrict the oil revenue and force the government to allocate a substantial portion of its budget to deal with security-related issues. This will limit the amount

that the government could contribute to power sector development. Furthermore, instability in the region could discourage foreign investment in the country. Inability of the government to provide financial support for the power program and limitation in foreign direct investment are risks that could have negative impact on the realization of the short-term program.

At present, SSEC does not generate sufficient revenue to cover its operation and maintenance costs let alone to generate additional funds for investment. SSEC is therefore heavily subsidized by the government which compromised the government's support to the other sectors. Furthermore, the existing low tariff would discourage PSP in power infrastructure development as such low tariff would not cover the return on investment expected by the private investors. It is therefore critical to adjust tariff to cost reflective tariff for SSEC's sustainable performance and promote power infrastructure development in the country. However, the Regulator should ensure that the power utility operates efficiently so that the costs of its operational inefficiencies are not embedded in the pricing of supply.

It is also critical to bring down the cost reflective tariff to a minimum level possible through the efficient operation of the ESI in order for electricity become affordable to the household customers and competitive to promote businesses. Unless tariffs become affordable the planned household connections may not be realized to achieve the target electrification rates. Lessons could be learnt from the supply provided by cooperatives in Yei, Maridi and Kapoeta. It has been observed that the level of household connections in these supply centres has been very low because of high tariff (average tariff of 53 US cents/kWh). It is expected that the cost reflective tariff in SSEC will become comparable to those with diesel thermal generation dominated supply system (in the range of 20 US cents per kWh), when the operational efficiency of SSEC is improved and the proposed large diesel generators are installed.

Weak operating environment for private investment. The short-term program will be implemented by GoRSS in partnership with donors and private investors. There is a risk of limiting the mobilization of the co-financing for the program unless a conducive climate for investment is created in the country. It is therefore imperative to adopt the necessary policies and enact the relevant laws in order to create confidence among donors and investors to support the short term program. To this end, the Electricity Bills, and Environmental Bill and amended Investment Bill should be enacted and operationalized. In order to promote investment, it is critical to maintain the autonomy of the Regulator to be established to be considered by investors as a fair arbitrator in conflict resolution in the ESI.

Capacity limitations in government entities. Lack of institutional capacities in the energy institutions would negatively affect their operational performance and project implementation capacities. The non-viable operations in the institutions would further compromise the credibility of the institutions to co-sponsor the program. This will affect the implementation of the short term program in terms of mobilizing resources and completing the program on schedule. The short-term program has identified the

basic institutional capacity needs in the energy institutions and designed a program to address them. The short-term capacity building program would involve undertaking institutional study, and implementing reform and training based the study recommendations. The expeditious implementation of the institutional capacity program is therefore critical for the realization of the short-term program.

Table 8.18: Comparison of High and Low Cases for Power and Demand

Category	Base/High Scenario		Low Scenario		Variance (%)	
	2020	2025	2020	2025	2020	2025
1. Customers Connected	282959	531438	151485	348261	(46.5)	(34.5)
Households	36288	56137	31495	41947	(13.2)	(25.3)
Commercial	3389	4524	3389	4524	0.0	0.0
Government	322636	592099	186369	394732	(42.2)	(33.3)
Total						
2. Electrification Rate (%)	52	75	28	49	(46.2)	(34.7)
Urban	12	20	7	13	(41.7)	(35.0)
Rural						
National						
3. Demand	2312	3605	1708	2718	(26.1)	(24.6)
GWh	377	568	279	428	(26.0)	(24.6)
MW						

Source: Annex 12 (a-e).

8.8.2 A Low Case Investment Scenario

In the event that some combination of limited funding and implementation capacities were to persist for a number of years, the result would be a smaller investment program for the power sector. This Section outlines briefly such a low case scenario. The projection of demand has been scaled down on the assumption that there will be some combination of the following: (i) a reduced electrification

rate resulting from financial constraints and/or lack of implementation capacity and/or affordability of electricity prices; (ii) low business activities/slow economic growth resulting from unattractive investment climate. The electrification rate in the supply centres has been reduced from 60% to 30% in 2020 and from 80% to 50% in 2025. In addition, the average growth rate of the commercial sector has been reduced from 10% to 5% during 2016-2025, consistent with the projected growth in non-oil GDP for the low case. Table 8.18 above compares customers, demands and electrification rates of the high and low scenarios.

Table 8.19: Investments for Short-To-Medium-To and Long Term Programs (Low Scenario)
(In Million \$ at 2010 Constant Prices)

No.	Projects	2011-2015	2016-2020	2021-2025	Total
1	Generation				
1.1	New Diesel Generator	444.32	146.33		590.7
1.2	Fula Small Hydropower Plant	70.5			70.5
1.3	Lekki Hydropower Plant		480		480
	Subtotal	514.8	626.3		1141.1
2	Transmission Networks				
2.1	Renk-Malakal line	153.7			153.7
2.2	Fula-Juba line	53.3			53.3
2.3	Lekki-Juba line		53.8		53.8
2.4	Ethiopia -South Sudan Interconnector		101.7		101.7
2.5	Uganda-South Sudan Interconnector			53.04	53.0
	Subtotal	207.0	155.5	53.0	415.5
3	Distribution Networks	151.90	50.03	72.92	201.9
3.1	Distribution for new diesel plants	36.5	45.3	72.92	36.5
3.2	Juba, Malakal and Wau rehabilitation	188.4	95.34		118.2
3.3	Customer connections				356.7
	Subtotal				
4	Rural Energy	41.2	58.7	58.7	158.6
5	Soft Projects	12.3	15	15	42.3
5.1	Analytical Studies	15.7	15	15	45.7
5.2	Capacity Building	28.0	30	30	88.0
	Subtotal				
	Total	979.4	965.8	214.7	2160
Memo items					
Cost estimates for Ethiopia-South Sudan and Uganda-South Sudan include the South Sudan part only					
Average drop line (connection) Costs \$ 350/connection					

Source: Annex Table 13 (a & b).

Table 8.20: Routine Maintenance Expenditure (Low Scenario) (In Million \$ at 2010 Constant Prices)

Category	Cost of Routine Maintenance			Total	%
	2011-2015	2016-2020	2021-2025		
Private Developer	20.6	128.0	228.2	376.8	57.7
GoRSS	25.2	102.9	141.3	269.4	41.3
Rural Communities	1.7	2.3	2.3	6.3	1.0
Total	47.5	233.2	371.8	652.5	100.0
%	7.3	35.7	57.0	100.0	

Source: Annex Table 8.14.

The low case scenario will also result in the reduction of the routine maintenance of the power infrastructure. Accordingly, the routine maintenance will cost \$653 million in the period 2020-2025, which is about 17% less than the cost (\$763 million) in the high case scenario.

9 Water Supply and Sanitation

9.1 Current Status of Water Supply and Sanitation Services

9.1.1 The Setting

Despite the availability of abundant surface and ground water resources, millions of South Sudanese suffer from lack of access to improved water supply and sanitation services. Evidence suggests that two in three people don't have access to improved water supply services. Even worse, more than eight out of ten people don't have access to improved sanitation services. This situation implies that more than six million people are deprived of access to improved water supply services and about eight million people lack access to improved sanitation services. In addition to these, about 1,000 schools representing 50% of the total number of schools in the country don't have water supply and sanitation facilities.

The low levels of access to improved water supply and sanitation services coupled with poor hygiene awareness has been the principal cause of water related diseases such as diarrhea, cholera and guinea worm. The country is home to the largest incidence of guinea worm in the world that is transmitted through drinking contaminated and stagnant water. As discussed in subsequent chapters, the sectoral challenges are further exacerbated by weak institutional capacity and increase in number of returnees and internally displaced persons that continue to exert insurmountable pressure on the already feeble water supply and sanitation facilities. These drawbacks stem from decades of war and conflict that resulted in the destruction of several water infrastructure facilities and further impeded the flow of investment to the sector.

Notwithstanding these constraints, the Government has taken encouraging steps towards labeling the water supply and sanitation sector as an extreme high priority and a key entry point to its development objectives. This has been manifested by classifying the sector as one of the

top six expenditure priorities and enunciating it in all of its key strategic documents. In addition to articulating a comprehensive South Sudan Development Plan (SSDP) spanning 2011-2013, the Government has established key sectoral institutions and further taken commendable strides in formulating and adopting a water policy and a water, sanitation and hygiene strategic framework. These instruments generated a positive dynamic towards the sustainable development of the water sector, a necessary pre-requisite for alleviating poverty and spurring economic growth in the country.

9.1.2 Policy Framework and Institutional Arrangements

Policy framework: The principal document guiding the country's water and sanitation sector is the Water Policy.⁹⁹ Developed through an extensive consultation involving multitude stakeholders and adopted in 2007, the policy recognizes that access to improved water supply and sanitation services positively impacts the reduction of poverty and boosts economic growth. It underpins that provision of sufficient quantity and quality of water is considered a human right and shall be accorded highest priority. The policy highlights that investments in rural water supply and sanitation shall be targeted to those areas which are currently not served and/or experience acute water shortages. Underscoring the importance of separating regulatory and service delivery functions in rural water supply and sanitation services, it concurs with devolvement of these responsibilities to the lowest appropriate level. The policy highlights that planning and development of piped water supply and waste disposal infrastructure shall be carried out in an integrated manner. It proposes the establishment of semi-autonomous institutions to conduct operation and maintenance of urban water supply and sanitation services.

In 2011, the Government adopted the water, sanitation and hygiene strategic framework.¹⁰⁰ The strategy has been crafted to translate the water policy into action and aims at serving as a road map towards attaining the objectives of the policy. In addition to discussing water resources

⁹⁹ Harrison, M. N. and J. K. Jackson (1958), Ecological Classification of Vegetation of Sudan. Bulletin No.2.1-45 Forest Department, Khartoum.

¹⁰⁰ Ministry of Water Resources and Irrigation (2011), Water, sanitation and hygiene strategic framework.

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management, rural and urban water supply subsectors, the strategic framework explicitly addresses sanitation and hygiene issues. A key element of the framework dwells on speeding up rehabilitation and construction of water supply and sanitation schemes to ensure universal access of services to the people of South Sudan. It recognizes the low level of access to improved sanitation and hygiene services and proposes a reversal of the situation through techniques such as Community Led Total Sanitation (CLTS). It recognizes the challenges pertaining to institutional fragmentation in the water and sanitation sector and calls for streamlining responsibilities of all relevant institutions. The strategic framework recommends formulation of a Water Council to provide advisory services at the highest level as well as a Water Supply and Sanitation Regulatory Board to develop and enforce regulations for the water supply and sanitation services.

Whilst these initial steps are commendable, it is critical for the sector to formulate a Water Legislation (Act). The Act will assist in establishing a legal framework for the management of the water sector. Further, concerted efforts are necessary to improve the overall water governance in the country.

Institutional Arrangements: The lead ministry in the water sector is the Ministry of Water Resources and Irrigation (MWRI). The Ministry amongst other things

is mandated to (i) develop policies, guidelines and master plans (ii) oversee the operation of the South Sudan Urban Water Corporation (iii) set tariffs for the sale of water to be used for various purposes (iv) implement ground-water supplies of drinking water for the rural population until States and local governments assume such responsibilities and (v) advise, support and build the capacity of State and Local governments in charge of water services. As depicted in Figure 9.1, the MWRI contains six major directorates as well as other support providing units. Key directorates in the sector include the rural water supply and sanitation as well as the planning and programming directorates, the latter entrusted with overseeing the performance of urban water provision.

South Sudan has not designated a single lead Ministry responsible for sanitation. However, the provision of schemes for sewage disposal and treatment in urban areas is entrusted to the Ministry of Housing and Physical Planning (MHPP). The Ministry discharges these responsibilities through its directorate for urban sanitation. The Ministry of Health (MoH) is responsible for raising awareness on health problems that arise due to lack of adequate sanitation and hygiene services. MoH is also responsible for ensuring newly constructed as well as renovated health facilities have adequate sanitation and hygiene services. No institution has been designated to coordinate the provision of sanitation services in schools.

A Provisional Order (PO) passed in 2008 created the Southern Sudan Urban Water Corporation (SSUWC) as a semi-autonomous institution and made it responsible for operating urban water facilities. Given its limited capacity, the corporation so far manages the urban water supply systems of Juba, Wau, Malakal and Renk towns. It also partially manages Bor and Maridi towns. The Corporation has established stations in these towns to manage the day to day operation of the systems. Urban water supply systems outside of the SSUWC responsibilities are overseen by the respective state water and sanitation directorates or county water departments that are technically accountable to the MWRI. The PO stipulates the formation of a board of directors to provide operational guidance to the corporation, but positioning of the same has not yet taken place. This has weakened the corporation's decision making capacity and has slowed its operational activities. While limited revenue generated from sales of water is deposited into the central treasury, the government allocates annual budget to meet the operational expenses of the corporation. As the subsequent discussion indicates, coupled with strong government commitment, the corporation needs to reform its business practices, recruit professional staff to fill vacant positions, implement efficient financial management practices and reduce non-revenue water. Annex Table 9.2 depicts the current organizational structure of the SSUWC.

Institutional responsibilities at the State level: In seven out of ten states, water and sanitation activities are coordinated under the State Ministry of Physical Infrastructure. In Eastern Equatoria State, the State Ministry of Housing and Public Utilities; in Unity State, the State Ministry of Environment and Natural Resources and in Warrap State, the State Ministry of Cooperatives and Rural Development hold responsibilities for coordinating water and sanitation activities. There are water and sanitation directorates as well as departments operating under the state ministries. The directorates are responsible for the implementation of the MWRI policies and strategies. While the budget for the staffs working in the water departments of the states is channeled from the MWRI, the state ministries are in charge of administrative duties. It has been learned that this is a temporary arrangement pending the capacity building of the states to handle such responsibilities. As discussed later, inadequate numbers of staff, coupled with lack of office equipment and transportation facilities, are severe constraints central to all state water and sanitation directorates.

At the county level there are water and sanitation departments supervised by an Assistant Commissioner. The departments are mandated to plan and implement water supply, sanitation and hygiene promotion programs.

Staffs at county and Payam levels are working as unpaid volunteers in anticipation of being offered the permanent position when they become available¹⁰¹. In addition, where rural water supply programs are implemented, water management committee comprised of 6-10 members manage the facilities. While the committee is responsible for ensuring sustainable operation of the schemes, limited training coupled with no backstopping services from states and counties has hampered smooth performance of the systems. There are also a number of Private Service Providers (PSPs) that are active in transportation of water and sewage services in the urban towns.

In the absence of a Water Act, responsibilities of service delivery as well as regulatory functions are characterized by gaps and sometimes with overlaps.

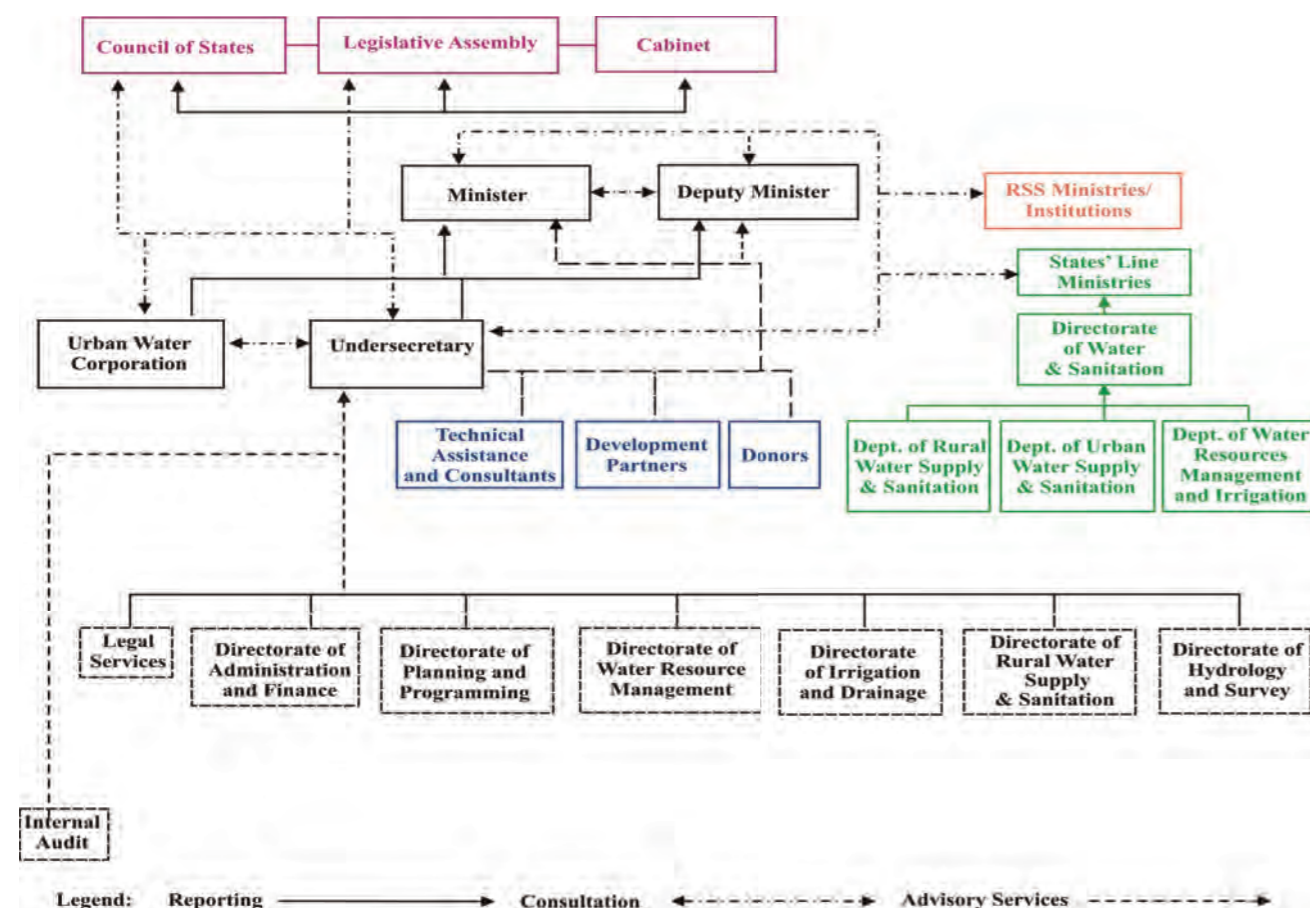
9.1.3 Pricing Policy for Water Supply Services

The water policy states that in rural areas, communities can be expected to contribute towards the cost of operation and maintenance (O&M) of water supply services. It also states that in urban areas, the costs of managing and supplying services shall be progressively introduced to promote financial sustainability. While these guiding principles are laid out in the policy, currently applied water tariffs in rural as well as urban areas have not been backed by any analytical studies and are generally set on ad-hoc basis.

In rural areas, where new water supply facilities are constructed, users generally contribute an estimated \$0.35 to \$1 per household per month. While in some areas users contribute \$2 per household when equipment needs to be repaired, payment in kind has also been reported in many cases. User fees collected from communities is generally kept with the treasurer and its usage is determined by community management members. Surveys carried out in rural areas indicate that in general, the Consumers' Willingness to Pay (CWP) as well as to charge is too low. A KAP survey conducted in South Sudan in 2009 indicated that only 20% of the population contributed towards O&M of their water supply system.¹⁰² Differences are also noted across states as in Warrap State, communities don't contribute any fees for water use. A major contributing factor has been the lack of sufficient community awareness training and mobilization while implementing rural water supply programs.

In urban areas various institutions are responsible for setting water tariffs, which complicates decision-making

Figure 9.1: Organizational Chart Of The MWRI 2011



101 Southern Sudan, Basic Services Fund-Interim arrangement, Mid-term review, 2011

102 Ministry of Water Resources and Irrigation (2011), Water, sanitation and hygiene strategic framework.

on this important issue. According to the Presidential decree 2011, where the SSUWC is responsible for operation of urban water supply systems, the general manager of the corporation, the board of directors of the corporation, the Minister of MWRI and the Ministry of

Finance and Economic Planning have all got stakes in setting and approval of water tariffs. This is in contrast to the practice in neighboring countries where tariff setting and approval usually rests with boards of directors and/or regulatory bodies.

Table 9.1: SSUWC water charges for treated water

Customer type	Juba (\$/month)	Wau (\$/month)	Malakal (\$/month)	Renk (\$/month)
Residential				
Class I - III	3 - 6	6.6	5	6.67
Stand pipes				
Ordinary - Large	33 - 333	6.6	–	6.67
Hotels				
Small - Large	260 - 480	6.6	5	6.67
Government units	100	6.6	20.3	16.67
Companies	233	6.6	5	6.67
Schools	83.3	6.6	5	6.67

Source: SSUWC, status reports prepared for AfDB, 2011 - 'Assessment of commercial and financial performance of SSUWC', GIZ 2010

In Juba, domestic users pay an average of \$8 per month (about \$1 per cubic meter) while government offices and business units pay monthly fees ranging from \$60 to \$300. A fixed connection fee of \$100 is also applied on new customers. Table 9.1 indicates average water tariffs currently applied in Juba, Wau Malakal and Renk towns. Having been in effect since October 10, 2010, most of the tariff rates set by the Juba water station saw increments ranging from 60% -700%. On the other hand, PSPs buy water from stand pipes at \$0.83 per cubic meters and sell it at about ten times the purchase costs resulting in about \$8.30 per cubic meters. Setting water tariff rates is a long process and takes approval of several government entities. In Malakal town, monthly flat rates ranging from \$5 to \$20 are applied on the basis of the size of connection pipes that range from 18.75 mm to 50mm. Contrary to the practices

of the corporation, consumers are not charged for water uses at public water points due to instructions laid by the state government. Currently, about 9,800 customers are officially connected to the Juba, Wau, Malakal and Renk water supply stations. Anecdotal evidence also shows that about 1,000 illegal customers obtain free services from the Juba water supply system. The average water tariff applied in the four major towns at \$1 per cubic meter is higher than the average for Sub-Saharan African countries at \$0.67 per cubic meter.¹⁰³ However, deteriorated distribution network leading to reduced number of new connections, high degree of unaccounted for water, weak revenue collection all contributed to the low performance of the water supply systems. In addition, water tariffs are not applied in Bor and Maridi towns.

As on-site sanitation dominates the technology type in both rural and urban areas, there are no fees applied for such services. However, in Juba, PSPs charge about \$120 per ten cubic meters (\$12/m³) to empty septic tanks and transport refuse to waste stabilization ponds.

9.1.4 Water Supply Situation Analysis

The country is endowed with abundant surface and ground water potential but access to water supply services is among the lowest in Africa. Surveys suggest that an estimated 10,000 water points are available in the rural areas of the country of which 30-50% are non-operational at any time in each state.¹⁰⁴ Over the last few years, a surge in the number of new water points mainly driven by NGOs as emergency measures has not been balanced with ensuring sustainability.

While comprehensive studies have not been undertaken to determine per capita water consumption levels, surveys carried out by PACT in Eastern Equatoria and Jonglei states indicate average consumption levels of 16.4 liters/capita/day following completion of new rural water supply projects.¹⁰⁵ The lack of proper design and supervision during implementation of rural water schemes has been a major concern. This coupled with lack of spare parts and essential maintenance tools, sustainability of rural water supply schemes will pose severe challenges in the country. Operation and maintenance is generally carried out by NGOs or volunteer technicians located in Counties and Payams. The private operators in the sector are non-existent and spare parts much needed for rural water supply equipment such as hand pumps are generally supplied at no cost to communities presenting a challenge of sustainability of maintaining rural water supply schemes.



103 Foster and Briceño-Garmendia (2010), Africa's Infrastructure: A Time for Transformation, World Bank, Washington DC, 2010.

104 Ministry of Water Resources and Irrigation (2011), Water, sanitation and hygiene strategic framework.

105 PACT (2010), Assessment of water & sanitation projects in Magwi and Akobo counties in Eastern Equatoria State.

Table 9.2: SSUWC water charges for treated water

Source	Share of water source (%)			Population (millions) 2010		
	Urban population	Rural population	Total population	Urban	Rural	Total
Piped water into						
house/compound	10.5	0.3	2.15	0.18	0.02	0.2
Public tap/stand pipe	10.8	5.8	6.77	0.19	0.45	0.64
Water yard/hand pump	34.3	50.9	47.85	0.6	3.95	4.55
Well	10.5	17.5	16.13	0.18	1.36	1.54
Surface and other sources	33.9	25.5	22.8	0.59	1.98	2.57
Total	100	100	100	1.74	7.76	9.5

Source: Southern Sudan Health and Household Survey, 2010. Population data for 2010, Annex Table 1.4.

Wells/boreholes are the most important source of water supply, accounting for 65% of the total supply. Other water supply sources include sub-surface dams, haffirs and ponds. As indicated in Table 9.2, only 2% of the country's population has access to piped water supply against an average of 33% for Sub-Saharan African countries. While the country's suitable hydrogeological formation will continue to favour wells/boreholes, alternative sources need to be explored as some areas have been found suitable for preferred sources such as springs and long range gravity schemes. The Ikotos gravity flow water system in Eastern Equatoria State is an example of such an alternative scheme where more than 28,000 people from four villages and Ikotos town are served from a single gravity fed system. Further, the country's low population density particularly in rural areas necessitates the use of other low cost systems such as improved dug wells which are complemented by locally manufactured pumps. It is also worth considering the country's predominant lifestyle of agro-pastoralism while planning for new water supply schemes, given the significant percentage of the rural population that moves seasonally in search of water and grazing for livestock.

Most of the urban water supply systems in the country are dilapidated and unreliable. The major urban towns that are also state capitals comprise of Juba, Wau, Malakal, Rumbek, Yambio, Torit, Bor, Aweil, Kuajok and Bentui. The SSUWC is currently managing the water supply systems of Juba, Wau, Malakal and Renk as well as in part the water supply systems of Bor and Maridi towns. However, long years of neglect coupled with poor maintenance practices have undermined the performance of these facilities.

To assist the country, in 2007 and 2009, USAID and MDTF supported the construction of treatment plants, booster stations and tanker truck refilling stations in Juba and Wau towns. With these interventions, capacity of the treatment plants in Juba and Wau increased from 3,500m³/day to 7,200m³/day and from 2,000m³/day to 6,000m³/day respectively. As indicated in Table 9.3, the three major towns currently produce an estimated 15,000m³/day to meet the demands of an estimated 678,700 people. This translates into an average of 15 liters/capita/day, alarmingly low compared to a minimum average of 50 liters/capita/day set for most urban towns in Africa.

Table 9.3: Capacity of major urban water supply systems (2011)

TOWN	Population	Production capacity (m ³ /day)	Estimated daily production (m ³ /day)
1. Juba	372 400	7 200	5 400
2. Wau	151 300	6 000	3 000
3. Malakal	155 000	5 000	1 875
Total	678 700	16. 080	10 275

Source: Southern Sudan Health and Household Survey, 2010. Population data for 2010, Annex Table 1.4.

While the rehabilitation works were instrumental in increasing the capacity of the treatment plants in the towns, less than 10% of investment costs were allocated to improving the distribution systems. About 49 km of the pipe network system comprised of old asbestos cement pipes and because of the health risks the asbestos materials pose there is an urgent need to replace them.

The lack of adequate system capacity led to a surge in the development of private wells. These wells have often been characterized by poor quality of water; however an estimated 400 of them supply water to an estimated 56% of the population in Juba, considerably higher than the average for African urban dwellers at 33%.

Going forward, it will be essential to collect well data and conduct routine water quality tests to safeguard the public against adverse health effects. Proper registration of these water sources will also serve as key input to ground water monitoring studies and analysis. Juba, Wau, Malakal and Renk water supply systems serve a total of 9,800 house connections, but services are not metered and the water stations apply monthly flat rates on all their customers. Mainly, Juba's aged distribution network has been the cause of water leakage and losses, estimated to reach 50%.

Further to this, the influx of IDPs to the town meant that the system couldn't cope with the increase in demand. Today, JICA is supporting capacity building activities for the town's water supply station and is also planning to carry out design and construction works for a new system with the intention of commissioning it after 2015.

The country's water sector could draw valuable lessons from the water supply system of Malakal town which has undertaken a series of major rehabilitation works but this system has experienced major setbacks. It was originally built in 1937 and rehabilitated in 1984, 2003 and recently in 2009. This system uses an intake structure, clarifiers and rapid sand filters as principal modes of water treatment mechanisms. However, the poor design and construction supervision works during its successive rehabilitation works led to crippling of the core components of the system. This clogged the intake structure and damaged the water tank, both of which forced consumers to revert back to untreated water sources. Additionally, the use of advanced membrane filtration system of treatment which is too sophisticated to be operated by the staff implies that careful planning in technology choice will be required in developing new water supply stems in the country.

Urban water supply systems in the remaining seven state capitals (Rumbek, Bor, Torit, Yambio, Aweil, Kuajok and

Bentui) and 70 small towns are mostly serviced by drilled wells fitted with hand pumps and water yards consisting of mechanized boreholes, storage tanks and stand pipes. Generally, the water supply is unreliable and it also of poor quality. Lack of capacity to operate and maintain the facilities and shortage of spare parts have contributed to mal-functioning of most of the facilities. To address these challenges, the MDTF is funding studies and detail design works for the seven towns and it is projected that the studies will be completed by late 2012.

9.1.5 Sanitation and Hygiene Services

Global studies reveal that improved sanitation and hygiene practices are key ingredients for sustaining human health and enhancing poverty alleviation. It has also been demonstrated that consistent use of latrines can reduce incidence of diarrhea by up to 40% and hand washing with soap at key junctures by up to 50%.¹⁰⁶

However, available statistics in South Sudan show that more than 50% of the schools don't have any sanitation facilities impacting school attendance and level of attained education. Some of the reasons attributing to the low levels of sanitation and hygiene practices are (i) low priority in the development agenda (ii) burden of carrying costs on households (iii) absence of a single lead ministry and (iv) resistance to behaviour changes. Apart from a few NGOs and development partners implementing sanitation projects, there is no dedicated budget towards improving sanitation and hygiene services.

Estimates suggest that diarrhea constituted as the second major reason for people's consultation in health facilities in South Sudan, superseded by only malaria.¹⁰⁷ The country's very high child mortality rate (102 per 1000) and frequency of deadly diseases such as cholera, acute respiratory infections, and typhoid is a manifestation of the low (15%) access levels to improved sanitation services. Compelling evidence-based analysis shows that hygiene and sanitation are among the most cost effective public health interventions to reduce childhood mortality.¹⁰⁸

Table 9.4 shows the types of sanitation facilities used in the country. While there is a very limited sewerage network in the ministerial complex and Hai Amarat areas of Juba and accompanying waste stabilization ponds, no other piped sewerage and/or waste treatment system exists in the country. The ponds in Juba have also reached their design capacity and the system needs to be upgraded. There are

106 Can Africa afford to miss the sanitation MDG targets? AMCOW, AfDB, World Bank, WSP, 2008
 107 Ministry of Health (2011), Health sector development program (Draft), South Sudan.
 108 UN-Water, 2008

also concerns on the quality of effluent from the ponds as proper regulation and monitoring is not carried out which endangers the environment and communities living in the area. The MHPP has been in charge of coordinating the design and construction works of the stabilization ponds. Privately owned and operated vacuum tankers collect and dispose waste water generated from septic tanks and

other holding structures. The MWRI and state water and sanitation directorates coordinate the construction of public latrines in market places, health centers, schools and other public gathering places. The Government's strategy places high priority towards construction of public (institutional) latrines as a means of reaching out to larger groups and alleviating problems in small towns and congested areas.

Table 9.4: Types of Sanitation Facilities

Facility	Access (%)			Population with access (millions)		
	Urban population	Rural population	Total population	Urban	Rural	Total
Flush toilet	9.3	2.9	4	0.16	0.22	0.38
VIP latrines	8.1	1.2	2.3	0.14	0.93	1.07
Pit latrine with slab	20.5	5	7.6	0.36	0.39	0.75
Composting toilet	0.7	0.2	0.3	0.01	0.02	0.03
Unimproved including open defecation	61.4	90.7	85.8	1.07	6.2	7.27
Total	100	100	100	1.74	7.76	9.5

Source: South Sudan Health and Household Survey, 2010

9.2 Major Challenges in the Water Supply and Sanitation Sector

9.2.1 Water Supply

The lack of improved water supply and sanitation services exacts a heavy toll on the health and economic productivity of South Sudan. The country's limited existing water facilities are also in danger of ceasing operation due to neglect and poor operation and maintenance practices. Hence, concerted efforts are necessary at national, state and county levels to properly maintain existing facilities and accelerate service delivery. It is also essential to demonstrate strong political commitment and address policy and regulatory issues. Key issues that need to be addressed include: (i) institutional capacity; (ii) supply

chains of goods and services in the water sector ; and (iii) reforms on urban water entities.

Institutional capacity: A central conundrum for accelerating the country's delivery of improved water supply services lies in how the sector builds its institutional capacity. While some efforts have been made to build water facilities in the rural and urban areas, very little has been done in availing adequate human resources and strengthening sectoral institutions. In particular, the states and counties institutions will require capacity building as well as upgrading the skills of the professionals. As depicted in Table 9.5, only 3-5 medium level professionals are available in each of the two state water and sanitation directorates. The staff have been entrusted to oversee the planning and management of an estimated 1200-2000 water supply schemes as well as to monitor sanitation and hygiene programs. However, the MWRI and SSUWC lack senior professionals such as engineers, geologists, financial analysts and treatment plant specialists.

Table 9.5: Staffing situation in water and sanitation directorates in selected states

State of Warrap		State of Western Bahr el Ghazal	
Water and sanitation Directorate		Water and sanitation Directorate	
Professionals (No.)	No. of water schemes	Professionals (No.)	No. of water schemes
1. Engineer (2)	1940	1. Engineer (1)	1258
2. Geologist (0)		2. Geologist (1)	
3. Economist (0)		3. Economist (0)	
4. P/ health spec. (1)		4. P/ health Spec.(3)	
TOTAL (3)		TOTAL (5)	

Source: Report by Warrap and Western Bahr el Ghazal states, 2011

As a result of this imbalance, implementers of water supply projects, mainly NGOs have been forced to "go it alone" posing serious challenges on the overall sustainable management of the water supply systems. The key to the success of program management and ensuring sustainability lies in building the capacities of state water and sanitation directorates.

Additionally, the current institutional arrangements in the water sector are also characterized by overlaps and often lack of clarity. Particularly, problems of duplication in service provision and regulatory responsibilities have been reported between the MWRI, SSUWC and local government councils. For example both Local Government councils as well as SSUWC are responsible for the provision of water supply services in urban areas. In addition to this, the current role played by these entities in asset ownership has not been clearly defined and again water tariff setting has been masked with overlaps between SSUWC and Local Governments. While a clear delineation of institutional responsibilities is crucial, this Report recommends that formal responsibility for water supply service provision and asset ownership in the State capitals be transferred to the SSUWC and formal responsibility for asset ownership and service provision in urban areas, outside of the State capitals be transferred to the respective State Governments. Further, it is recommended that rural water supply service provision as well as asset ownership also be transferred into State Governments. As the MWRI is heavily engaged in providing technical backstopping services to the states, crucial tasks such as regulatory activities have not been adequately undertaken. Hence a Water and Sewerage Authority entrusted with regulatory functions and positioned within the MWRI need to be established and made functional.

As discussed in subsequent chapters, the large number of water supply schemes that are going to be implemented will continue to pose significant strain on the already

weak institutional capacity. Further, lack of adequate office spaces, IT network, equipment and transportation facilities impact the working environment and disrupt much needed field works. M&E is almost non-existent and procurement and contract administration practices are generally weak. While the steps taken in establishing a data center, WIMS is commendable, much support is required to strengthen its capacity through training staffs and availing the necessary software and related equipment.

Supply chains of goods and services: Supply chains of goods and services in the water sector are major challenges in South Sudan. Central to the issues are; weak private sector, lack of clear guidelines and standards, poor infrastructure facilities, untargeted subsidies by some project implementers and low level of community awareness.

Local contractors and manufacturers specializing in water and sanitation activities are still few in the country meaning that the contract awarding is less competitive. Well drilling as well as civil construction costs in the country are among the highest in the region by any standards. Major reasons include i) infrastructure conditions and distances of mobilization and demobilization of rigs, equipment and manpower ii) number of boreholes in a package contract and the closeness between drill sites iii) security and risk conditions in operation areas and during inter-site movements; and iii) lack of maintenance capabilities and shortage of experienced hydro-geologists, drillers, and rig mechanics. In addition, there are serious concerns resulting from oversized drilling rigs currently used in South Sudan. Given the poor infrastructure conditions, smaller sized rigs should be encouraged for use due to their advantages in flexibility and cost effectiveness.

The limited numbers of drilling and civil construction contractors that are almost exclusively foreign based don't

have firm presence in the country constraining follow-up activities. The same holds true with consulting companies. As a result, design and construction supervision works particularly in rural areas is being undertaken by construction companies, compromising the quality of works and further affecting sustainability of schemes. As discussed in subsequent chapters, the large investment envisaged in the program ahead requires adequate number of drilling, civil construction and consulting companies. While every effort should be made and incentives designed to encourage the private sector to engage in these activities, this report recommends building local design and construction capacity to undertake major responsibilities. As demonstrated in neighboring countries, establishment of semi autonomous enterprises typically under a PPP arrangement has not only filled the gaps in securing large number of companies, but they also provide practical training to junior staffs coming out of academic centers. Given the prevailing situation in South Sudan, the country can benefit much from similar initiatives.

Most water supply schemes in the rural areas will continue to depend on wells/boreholes equipped with pumps as a major means of sources of water supply systems. Water lifting devices such as India mark II, Afridev, Duba and other makes have been installed in rural areas frequently encountering breakdowns due to lack of spare parts. Owing to the limitations in spare parts provision and lack of trained technicians, it is essential to limit the types of pumps to those that have been effective in the country.

Majority of spare parts provided by NGOs and UN agencies are delivered free of charge to Counties and Payams. Such arrangements often done with good intention to provide subsidies to communities managing rural water supply systems, these measures do not always meet the intended purpose. Evidence has shown that untargeted subsidies create a sense of dependency on external support and lead to the perception that water facilities provision is the responsibility of the government and donors¹⁰⁹. While

the private sector should be encouraged to play an active role in supply of spare parts through incentives and other mechanisms, this report suggests the establishment of Operation and Maintenance Support Units (OMSUs). These units will be positioned in strategic locations within states and avail spare parts; undertake major maintenance works and even supply pumps and other electro-mechanical items on cost recovery basis. The units will be fully managed by the private sector once such capacity is established in the states.

Improving the performance of urban water institutions: The major entity entrusted with operation of urban water systems is the SSUWC. Although the Corporation has been established to function as a semi-autonomous entity, it runs as a civil service institution. Staff are guided by civil service regulations and in most cases don't have clear job descriptions. Bills are manually prepared on a monthly basis and reflect a high volume of arrears. Revenue generated from sales of water is not ring-fenced and is reverted back to the central treasury. Contrary to good practices of a double entry accounting system as practiced in many countries, the corporation and its entities still use single entry system. Customer connections are not metered making it difficult to monitor consumption particularly among high end users. An average of 40 to 50% of the produced water is lost as unaccounted in Juba, Wau, Malakal and Renk towns. According to information obtained from the Corporation, there are close to 9,800 registered customer connections. Only 20% of the revenue is retained by the water stations and the balance 80% is transferred to the national treasury. Average collection ratios for piped and tanker supply at 85% is low compared to the average for Africa at 90%. Asset ownership still rests with the government. The corporations' four branch stations exhibit an average of sixty six (66) employees per 1000 connections, about thirteen times the average for African countries at five employees per 1000 connections. Table 9.6 highlights performance of the major urban water stations functioning under the SSUWC.

Table 9.6: Revenues and Operating Cost of SSUWC (2011)

Particulars	SSUWC
	Total
Operating Revenues	
Billed Revenues - Piped Supply	359 061
Billed Revenues - Water Tanker Supply	960 000
Total Billed Revenues	1 319 061
Collection Efficiency on Piped Supply	46%
Collected Water Revenues	1 123 814

¹⁰⁹ Ministry of Water Resources (2003), Supply chains for water supply and sanitation, Ethiopia, 2003

Particulars	SSUWC
	Total
Operating Revenues	
Billed Revenues - Piped Supply	359 061
Billed Revenues - Water Tanker Supply	960 000
Total Billed Revenues	1 319 061
Collection Efficiency on Piped Supply	46%
Collected Water Revenues	1 123 814
Operating Cost	
Energy - (SSEC Electricity)	898 673
Energy - (Generator Sets)	639 358
Chemicals	1 286 934
Operating Personnel	4 525 541
Operator of Treatment Plant Contracts	n/a
Maintenance & Repair	194 401
Oil & Lubricants	100 000
Transport Operating Vehicles	200 000
Others	0
Total Operating Cost	7 844 908
Overhead & Administration	
Admin Personnel	6 367 199
Transport Admin Vehicles	100 000
Telephones	128 300
Travels	200 000
Stationery	747 430
Office Consumables	75 000
Others	150 000
Total Overhead & Administration Cost	7 767 929
Total Operating/Overhead & Administration Cost	15 612 837
Deficit from Operation	-14 489 023

NB: Capital Cost Assumed Covered by GOSS, State and Local Government
Source: SSUWC + SSUWC Juba November 2010

There are no performance contracts entered into between the Government and the Corporation resulting in poor regulation of activities. While some investment has been made in rehabilitating treatment plants in the major towns, less than 10% of the investment made so far has been allocated towards expansion and improvement of distribution systems.

A key challenge for the SSUWC is to transform itself into an efficient and good financial standing entity.

This report recommends undertaking the following measures to enable it attain these goals in the next 3-4 years:

- Members of the Board of Directors have been designated but the board has not yet been made functional. It is urgent for it to assume its duties. Also, the list of nominated board members doesn't include representatives from the private sector which needs to be addressed.

- The Water, sanitation and hygiene strategic document proposes establishment of a 'Water Supply and Sanitation Regulatory Board.' As regulatory functions are essential, the Government needs to nominate staff to work and enable it operate accordingly.
- The SSUWC should recruit seasoned professionals to fill vacant positions. Also recommended in this report is recruitment of high caliber technical assistants much needed for supporting the activities of the Corporation.
- The distribution systems in Juba, Wau and Malakal seek urgent rehabilitation measures. In particular, Juba's old asbestos cement pipe needs to be replaced. Leakage and losses will be reduced and service delivery improved. In addition, metering systems should be introduced in the major towns. Illegal customer connections need to be identified and registered. Asset valuation study needs to be carried out.
- Introduction of performance targets and improvements in bill collection is critical. It is also recommended that double entry accounting systems be introduced.
- There is a need to agree and set deadline period for withdrawal of Government subsidies from the urban water stations. Indicators for Juba water station demonstrate that with improvement measures discussed above and ring fencing revenue, the station can sustain itself without any subsidy from the Government. Similar approaches can be used in other towns need to follow in other water stations.

9.2.2 Issues in Sanitation and Hygiene Practices

Some of the major issues that need to be addressed to accelerate the access to improved sanitation services include: (i) resistance to behavioral changes (ii) securing funding for sanitation facilities and (iii) fragmentation of institutional responsibilities

Behavioral changes. Construction of sanitation facilities by itself will not bring in anticipated changes unless awareness is created on the proper usage of such facilities. Evidence has shown that behavioral changes are instrumental in stimulating demand and serving as catalyst for improved usage of sanitation facilities. Similar with most other developing countries, the level of hygiene awareness in the country is low. Surveys conducted by PACT in two states of South Sudan demonstrate that while 50% of the population washed their hands before preparing a meal, only 15% did so after latrine usage. In South Sudan, a number of traditional beliefs impede the implementation of sanitation facilities. In some parts of the country, people see digging latrines as 'inviting death' and in others people

associate latrine usage to making a person infertile. In many areas, people also see digging a pit latrine as a degrading job. More studies are also required to understand what motivates behavioural changes as a number of factors attribute towards it. The MWRI, UNICEF along with a few NGOs has recently launched the Community Led Total Sanitation (CLTS) program in the country. According to reports by SNV, a capacity development organization active in South Sudan, encouraging results has been obtained in stimulating discussions among community members on the benefits of improved sanitation services in Northern Bahr el Ghazal State through application of CLTS. As more works are necessary in behavioral practices, this report recommends rolling out such techniques in other States too. In addition, targeting schools, market places and mass media services should all be utilized to generate demand for such essential services.

Cost of sanitation facilities. The water policy as well as the strategic framework document emphasize that households need to construct their own sanitation facilities. It is also stated that support provided by Government and development partners will focus on promotion of hygiene education and awareness program. However, these principles have not been put into practice in rural areas of South Sudan. In some of these areas, program implementers cover the full expenses for construction of household latrines and in others subsidies like slab panels, digging tools and construction materials are provided freely to communities. In some states, communities meet the full expenses of constructing sanitation facilities. The basic principles of CLTS don't encourage provision of subsidies towards construction of household latrines. While further studies are necessary to understand communities ability and willingness to pay for such facilities, this report suggests that consideration of targeted subsidies be made for the poor in rural areas. The current high construction cost in the country also hampers progress in construction of sanitation facilities. The costs of construction materials are too high as compared to other African countries. Surveys indicate that in urban areas of the country, construction costs for a simple household latrine ranges from \$1,500 to \$3,000 which is too high for many individual households. In neighboring countries, these costs are typically in the range of \$500 to \$800. Overall, technology selection is a key component for optimizing usage as well as for ensuring cost-effectiveness. It is thus critical to prepare alternative design of facilities which are cost effective and suited to the local conditions of South Sudan.

Institutional responsibilities. The country has not designated a lead ministry for sanitation. Formal responsibilities for sanitation service provision and regulatory functions are vested with MHPP and local governments. As discussed elsewhere in this report, the MHPP is entrusted with provision of sanitation services in urban areas. There is no institution mandated with provision of sanitation services and hygiene education

in schools. NGOs are key implementers in rural areas with almost no regulation and monitoring by the state water and sanitation directorates mainly due to lack of professional staffs in the States. Critics have long argued that responsibilities of water and sanitation are best discharged if managed under one organization. In addition, almost all major water supply projects incorporate sanitation components further justifying the need to merge responsibilities of these sectors under one umbrella entity. There is an urgent need to streamline responsibilities, avoid overlaps and bridge gaps. Experience from the region indicates that the National Water and Sewerage Corporation (Uganda), Nairobi Water and Sewerage Company (Kenya) and ONEA, National Office of Water and Sanitation (Burkina Faso) are exemplary entities that have transformed themselves from being weak debt ridden and inefficient service providers into efficient service providing entities. Key to these achievements is strong political commitment by their respective governments as well as support by development partners in building institutional capacity and provision of investment for service expansion. The position taken in this report and the approach best suited to South Sudan's needs is to assign formal responsibility for each of the State capitals to the Urban Water Corporation (transforming it into Urban Water and Sewerage Corporation) and assign formal responsibility to the state governments for provision of sanitation services to other

urban communities within each state. It is also suggested that regulatory functions be undertaken by the Water Supply and Sewerage Authority to be positioned within the MWRI.

9.3 Expanding Access to Water Supply Services

9.3.1 Current Access to Water Services

The country lacks reliable data on access to improved sources of water supply in rural as well as in urban areas. Key to the problem is the lack of strong capacity much needed to monitor the water and sanitation sector. As discussed in subsequent parts, reliable access data is a key parameter for robust planning and financing of the water sector. Whilst much work lies ahead, the South Sudan Health and Household Survey (SSHHS 2010) gathered information on household water and sanitation status across the ten states and the MWRI's Water Information Management System (WIMS) collects and maps out physical water source data. Table 9.7 indicates summary of access data obtained from different sources.

Table 9.7: South Sudan Access to Improved Sources of Water Supply

Category	Source					
	Water policy (2005)	Draft Country Status overview (2009)	South Sudan health and household survey (2010)		National Dev. Plan (2010)	Strategic framework (2010)
			*	**		
Rural water supply	-----	30%	67.9%	33.4%	34%	34%
Urban water supply	-----	14%	67.0%	48.9%	34%	-----
TOTAL water supply	27%	27%	67.7%	35.9%	-----	-----

*Without consideration of time to fetch water ** After consideration of 30 minutes to fetch water
Source: MWRI, 2011

As shown in Table 9.7, assuming a threshold round trip fetching time of 30 minutes, the household survey (2010) estimates access levels in rural areas to be 33.4%. Also, following a series of discussions held between development partners active in the water sector in South Sudan and the MWRI, consensus has been reached on the stated access level of 34%. With an estimated rural population of 7.56

million in 2010, the implication is that only 2.6 million people had access to improved water supply services. While further studies are necessary to determine reliable access levels, a baseline figure of 34% has been used in developing the rural water supply component of this action plan. Table 9.8 shows access levels of rural and urban water services in comparator countries.

Table 9.8: Water Supply Access Levels in Selected Comparator Countries
(As- percentage of total population)

Country	Year	Urban (%)	Rural (%)	Total (%)
Burkina Faso	2008	95	72	76
Burundi	2008	83	71	72
Eritrea	2008	74	57	61
Malawi	2008	95	77	80
Niger	2008	96	39	48
Rwanda	2008	77	62	65
South Sudan	2010	15	34	30

Source: WHO-UNICEF (2010), Progress on sanitation and drinking water, and estimate by authors.

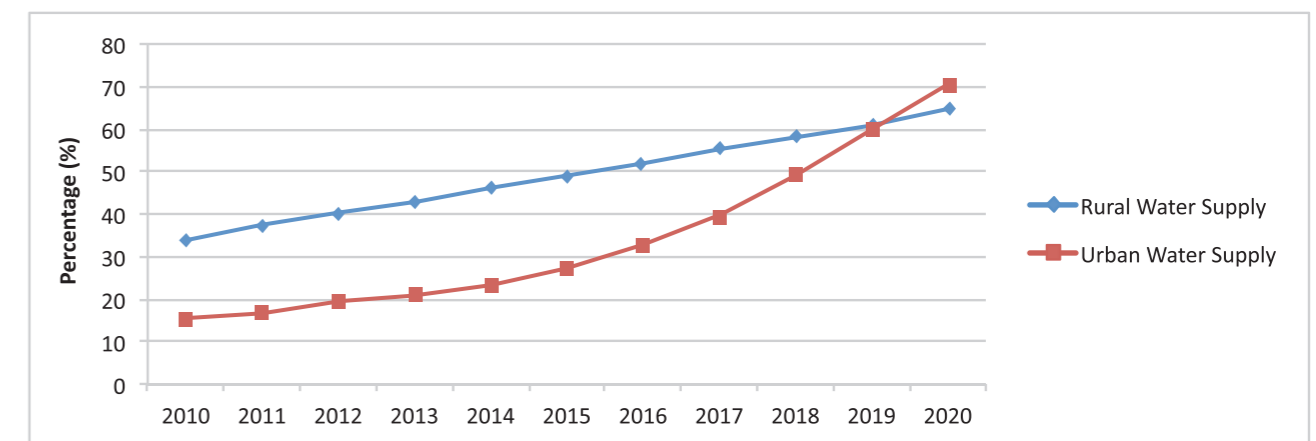
The South Sudan Local Government Act defines an urban area to be 'one where more than sixty percent of its economic activities are non-agricultural with considerable level of urban infrastructure and public utilities.'¹¹⁰ Estimates suggest that by 2010, about 1.74 million people lived in urban areas. For the purposes of this report, all state capitals, county headquarters and growing small towns are classified as urban areas. The 2010 Health and Household Survey (Table 9.2) estimated access levels to improved water sources in urban areas to be 67%. The stated level is widely disputed as almost all urban water systems are dysfunctional and majority of the population continue to rely on poor quality and often intermittent services. On the other hand, estimates made by MDTF suggest that in 2009, access levels in urban areas were limited to only 14%. Analysis undertaken for this report indicates that access levels in Juba, Wau and Malakal varied from 13% to 20% in 2010. In addition, anecdotal evidence suggests that the situation in most small/peri-urban towns at best is similar to the conditions in the major towns. While it is essential to conduct detailed studies to determine reliable access levels, it is assumed for the purposes of this report that by 2010, an estimated 15% of the urban population had access to improved water supply services.

9.3.2 Targets for Access to Improved Sources of Water

South Sudan does not have official target levels set for rural as well as urban water supply services. As indicated elsewhere in this report, the working assumption adheres to by 2010; access levels were 34% and 15% for improved sources of rural and urban water supply services respectively.

Preliminary data obtained from the MWRI as well as from states indicate that over the last three years, an average of 300-350 water supply schemes were annually constructed in the rural areas of the country. Assuming institutional capacity measures recommended in this report are put in place, it is projected that annually, an average of 500-600 rural water supply schemes will be newly constructed in the decade ahead. This translates into the construction of 50 to 60 rural water supply schemes per state per year until 2020. Figure 9.2 depicts estimated projection levels on access to improved sources of water supply in rural and urban areas. This program does not dwell on identifying specific technologies up-front as the selection of suitable systems will depend on water availability, site conditions, population density and other factors. It is also expected that communities will make informed decision about the types and levels of services they want and can afford during preparation stages. However, for the purposes of this report, hand dug wells (5%), boreholes with hand pumps (75%), water yards (10%) and surface sources such as ponds and rainwater harvesting structures (10%) have been assumed to form the major sources water supply in the rural areas by 2020.

Figure 9.2: Water Supply Access Levels in Selected Comparator Countries
(As- percentage of total population)

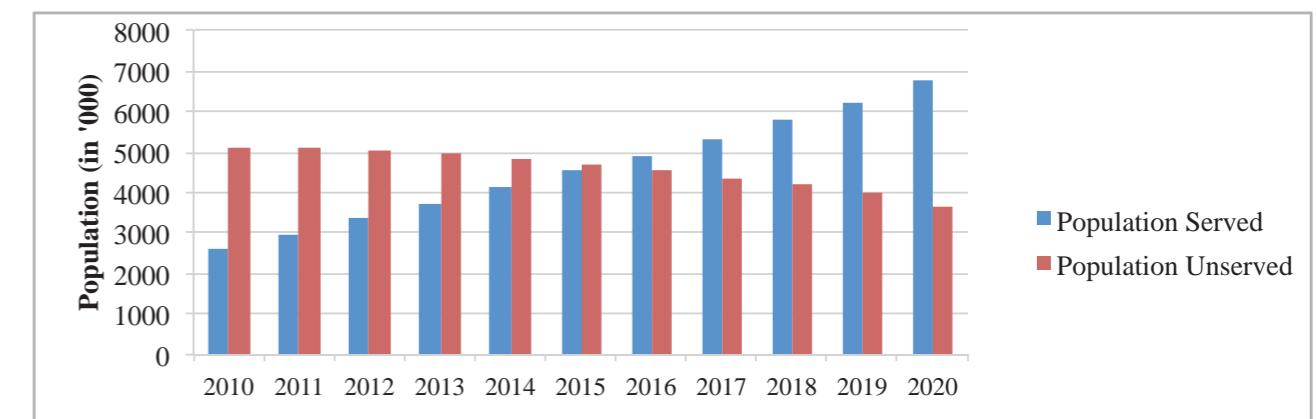


Source: Estimate by authors

Non-functionality of rural water supply schemes will also be reduced from the current level of 40% to 30% and 20% by 2015 and 2020. As shown in Figure 9.2, the planned intervention is expected to increase access levels in the rural areas to 49% and 65% by 2015 and 2020 respectively. In the

decade ahead, access to improved water supply services in rural areas will also grow at an average rate of 3% per year. As indicated in Figure 9.3, by the end of 2020, the total number of people with access to improved sources of water supply in the rural areas is estimated to reach 6.8 million.

Figure 9.3: Population with access to improved sources of water supply in rural areas



Source: Estimate by authors

9.3.3 Rehabilitation and New Construction for Rural and Urban Water Supply

Rural water supply schemes. As discussed elsewhere in this report, an estimated 4,000 water points are not functional in the rural areas. This coupled with a lack of the much needed periodic maintenance is expected to

shorten the economic life of most functioning facilities. In the absence of any meaningful asset valuation study and for the purposes of this report, rehabilitation and replacement requirements for rural water systems is put at \$90 million.

An estimated 600-800 rural water schemes will also be rehabilitated and/or replaced each year to decrease non functionality rates of rural water supply schemes from 40% to 20% by 2020. Therefore, there is an urgent need

110 The Local Government Act, South Sudan, 2009

to build local capacity as well as to mobilize the private sector. While technology selection will be a key factor in determination of optimum water sources, it is estimated

that about 11,000 new rural water supply schemes will be constructed to attain access levels of 65% by 2020. About \$253 million has been allocated for this component.

Table 9.9: Water consumption scenario in urban towns

Category/town	2020	2030
Juba, Wau and Malakal	90 l/c/d	120 l/c/d
Seven state capitals (excluding Juba, Wau & Malakal)	80 l/c/d	100 l/c/d
Other small towns (county HQs)	50 l/c/d	70 l/c/d

Source: Estimate by authors and Juba urban water supply and capacity building study, JICA 2009

Urban towns. While the broad definition of an urban town has been indicated in the Local Government Act of 2009, the Statistical Yearbook for Southern Sudan (2010) doesn't provide the list and population figures of all the urban towns. In the absence of such a data, this report assumes that urban water supply contains two sub divisions; i) 10 state capitals and ii) all county headquarters. South Sudan has not yet developed a national design criterion for urban water supply systems. Also, apart from Juba's water supply study project, no major urban water supply studies have been completed. In the absence of such data,

this report has established projections for water demand in urban towns based on best practices. Table 9.9 indicates estimated demand for urban water supply services in these categories.

For determination of the projected water demand in the ten State capitals, the base population of 2008 has been projected to 2020. Using the per capita factors adopted from Table 9.9, the total demand in 2020 is estimated to be 202,422 m³/day. Table 9.10 indicates projected demand for each of the ten towns in 2020.

Table 9.10: Demand projection for urban town water supply

Town	Estimated population (2010)	Projected population (2020)	Average water demand (l/c/day) 2020	Total water demand (m ³ /day) 2020
1. Juba	345 000	787 100	90	70 839
2. Wau	128 100	292 200	90	26 298
3. Malakal	139 500	318 100	90	28 629
4. Rumbek	29 000	90 100	80	7 208
5. Aweil	125 000	285 300	80	22 824
6. Bentui	35 000	108 700	80	8 696
7. Kuajok	60 000	136 900	80	10 952
8. Bor	77 400	176 600	80	14 128
9. Yambio	31 700	98 500	80	7 880
10 Torit	20 000	62 100	80	4 968
Total	990 700	2 355 600		202 422

Source: Estimate by authors

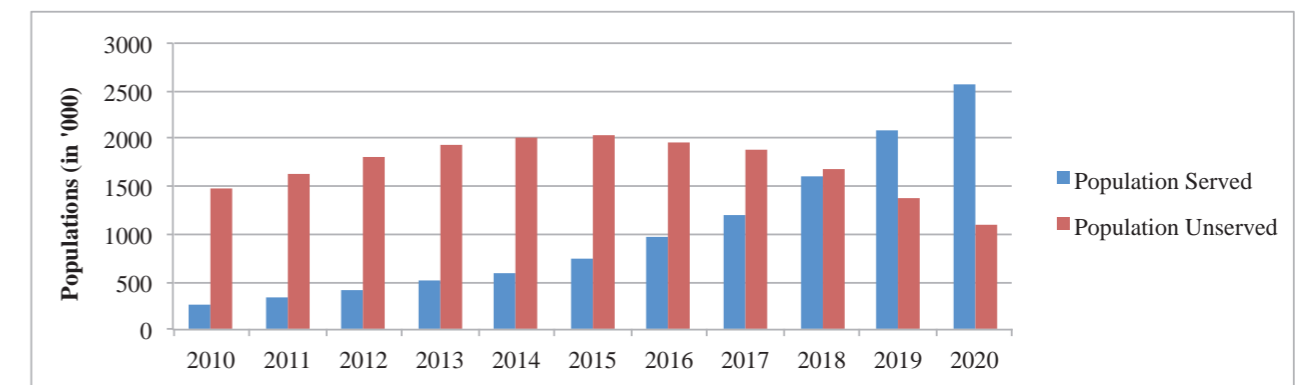
It is expected that Juba, Wau and Malakal towns will rely on surface sources. The proposed Sue multi-purpose dam project would become the primary source of the water for the town of Wau. Engineering studies and design works are underway for the remaining seven towns and it is estimated that at least four of the seven towns will depend on surface sources. The rest will depend on underground sources. The total demand for the ten towns will not cause major strain the available water sources. As the proposed construction works in the major urban towns will only be completed towards the end of the program period, the assumption used in this Report is an estimated 70% of a given towns' population will use services from the new system. As is the practice in many countries, it will take some time to attain 100% access levels even after completing the construction of new water supply schemes. These assumptions are also in line with the studies conducted for Juba water supply system.

This Report strongly recommends that concerted efforts are undertaken to enable all state capitals have access to improved water supply services prior to 2020. It is expected that JICA's support will enable the Juba water supply system to be commissioned before the end of the program period. Detailed studies and design works have been recommended under this program for Wau and Malakal towns planned to start in 2013. In addition, the

on-going MDTF supported seven towns water supply and sanitation study will be completed in 2012 making the towns' ready for construction in 2013.

In the remaining small towns, the assumption in this report is to construct water yards in majority of the towns. Other feasible sources such as long range gravity systems and cost effective technologies will be considered while planning new systems for these towns. This program recommends design and construction works in at least 50 small towns. Annex Table 9.3 shows the list of small towns and projected water demand until 2020. Overall, utilization of these interventions is expected to increase access to improved water sources in urban areas from the current level of 15% to 70% by 2020. Non-revenue water (NRW) will also be reduced from an estimated current level of 60% to 35% by 2020. It is projected that access to improved services in the urban areas will increase at an average rate of 2.4 percent until 2015 and at an average rate of 8.6 percent thereafter until 2020. As a result of these interventions, an estimated 244,000 households will benefit from improved services in the program period raising the total number of urban population with access to improved water to 2.6 million people by 2020. Figure 9.4 indicates estimated population expected to benefit from improved water supply services in the decade ahead.

Figure 9.4: Population projections to improved water supply in urban areas



Source: Estimate by authors

Rehabilitation and replacement of water supply schemes. In the urban areas, key rehabilitation programs include, replacement of an estimated 150 km of old asbestos and steel pipes in Juba, Wau and Malakal. A significant increase in the number of new customers as well as improved service delivery can be ensured through these high priority works. In addition, improvement/rehabilitation works are also proposed for the seven towns (state capitals) as envisaged long term solutions are not expected to be commissioned before 2018-2019.

New construction works. In the urban areas, construction of water supply projects in seven State's capitals is

recommended to start no later than 2014 and completed in 2018-2019 with on-going studies and tendering works due for completion in 2012-13. It is also assumed that the planned Juba water supply construction project supported by JICA will be completed by 2015. As recently completed rehabilitation works on Wau and Malakal towns will not be sufficient to meet the demands of the increasing population, studies and design works for long term solutions are proposed to start in 2015. Further, design and construction works for fifty small towns will be undertaken in the planning period. It is expected that these interventions will increase access levels in the urban areas to 70% by 2020.

As indicated in Table 9.11, rehabilitation costs for rural and urban areas are put at \$90 million and \$43 million respectively at 2010 constant prices. Inclusive of the on-going programs, the total cost of the proposed water supply investment program is estimated at \$1.1 billion at 2010 constant prices. Owing to the long rainy season in

the country, preparatory works such as procurement and contract negotiations should be undertaken in the rainy season with mobilization early in the dry season. It should be noted that successful implementation of the program strongly will depend on the implementation of institutional capacity recommendations suggested in this report.

Table 9.11: South Sudan Capital cost of water supply program (In \$ '000 at 2010 constant prices)

Indicator	Estimate 2010	2011	2012	2013	2014	2015	2020	Total 2011-20
Population with access ('000)								
Urban	260,6	337	423	512	602	750	2 559	2 559
Rural	2 637,4	2 986	3 348	3 731	4 127	4 525	6 774	6 774
Total	2 897,9	3 322	3 770	4 243	4 729	5 275	9 334	9 334
Access to improved water (%)								
Urban	15	17	19	21	23	27	70	70
Rural	34	37	40	43	46	49	65	65
Total	31	33	36	38	41	44	66	66
New systems								
Urban	-	-	25 845	26 832	26 985	44 214	144 060	666 780
Rural	-	-	18 104	19 176	19 778	19 925	27 981	189 439
Total	-	-	43 949	46 008	46 763	64 139	172 041	856 219
Rehabilitation (\$'000)								
Urban			4 000	4 000	5 000	5 000	5 000	43 000
Rural			5 000	5 000	5 000	7 000	16 000	90 000
Total			9 000	9 000	10 000	12 000	21 000	133 000
On-going (\$'000)								
Urban	4 789	20 202	6 001	1 680	1 680			29 563
Rural	19 041	36 760	20 502	6 772				64 034
Total	23 830	56 962	26 502	8 452	1 680			93 596
Total expenditure (\$'000)								
Urban	4 789	20 202	35 846	32 512	33 665	49 214	149 060	739 343
Rural	19 041	36 760	43 606	30 947	24 778	26 925	43 981	343 472
Total	23 830	56 962	79 451	63 459	58 443	76 139	193 041	1 082 815

Source: Estimate by authors

9.4 Expanding Access to Sanitation Services

9.4.1 Current Access to Sanitation Services

The 2010 Health and Household Survey estimates access levels to improved sanitation services to be 9.3% and 36.8% in rural and urban areas respectively. With a national access level of 14.6% in 2010, more than 8 million people were without improved sanitation facilities. Also, the same surveys indicate that an estimated 65%

of the total citizenry practiced open defecation causing serious concerns on the overall health conditions of the population.

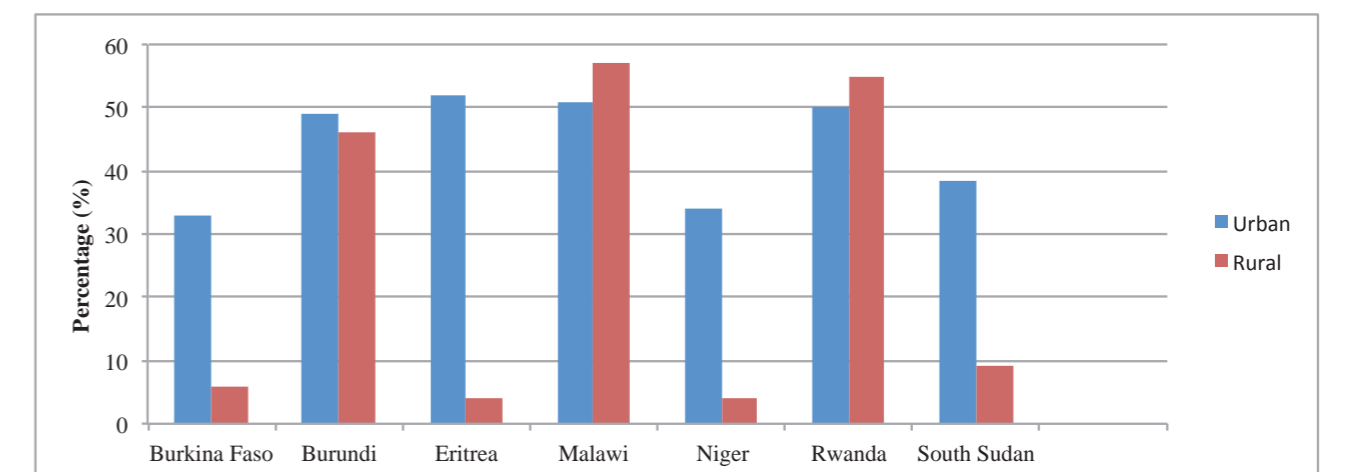
As shown in Table 9.12, with an estimated access level of 9.3% in the rural areas, about 1.2 million households lack access to improved sanitation services. In the urban areas, with an access level of 36.8%, about 165,000 households did not have access to improved sanitation services. Hygiene awareness is also low with an estimated 11.4% practicing hand washing after usage of toilet facilities. The country's challenges in improving sanitation and hygiene practices are enormous and seek concerted efforts. Figure 9.5 shows comparison of access levels on improved sanitation services in selected comparator countries.

Table 9.12: Access levels on improved sanitation services in South Sudan

	Water policy (2005)	MDTF (2009)	South Sudan Health and household Survey (2010)	National Development Plan (2010)	Strategic framework (2010)
Rural sanitation		2%	9.30%	9.30%	
Urban sanitation		19%	36.80%	36.80%	
Total sanitation	15%	5%	14.60%		14.60%

Source: MWRI, 2011

Figure 9.5: Access to improved sanitation services in comparator countries



Source: WHO-UNICEF (2010), Progress on sanitation and drinking water, and estimate by authors.

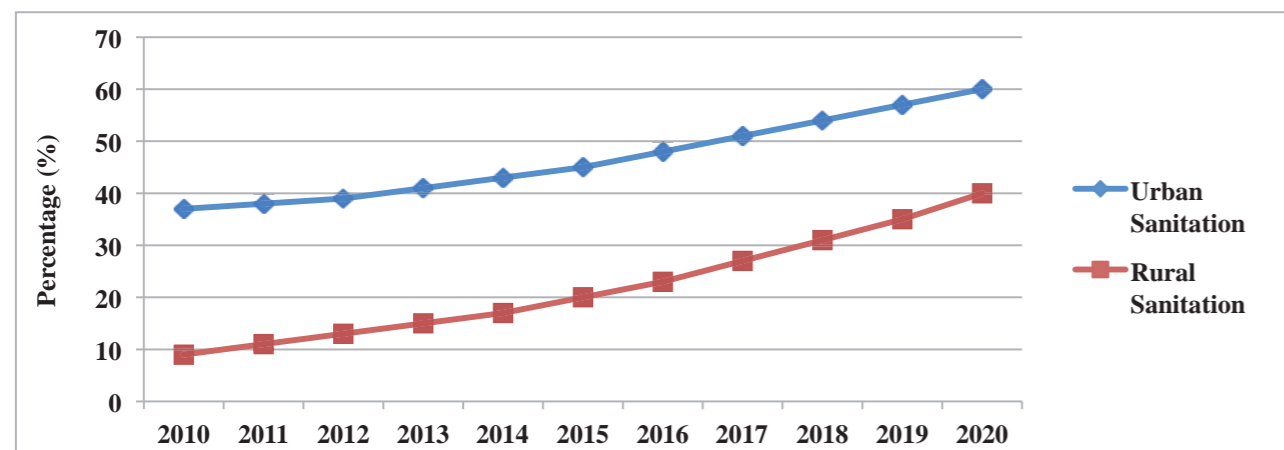
While further studies are deemed necessary, access to improved sanitation services of 9.3% and 36.8% have been assumed for the purposes of this report in rural and urban areas respectively.

9.4.2 Targets for Access to Improved Sanitation

In 2010, accesses to improved sanitation were 9.3% and 36.8% in rural and urban areas respectively. The Government has not yet set any official target levels on access to improved sanitation services. It is assumed that coupled with strong political commitment, newly introduced mechanisms such as the Community

Led Total Sanitation Program (CLTS) is expected to accelerate access to improved sanitation services. Over the last two years, the government along with the support of development partners launched CLTS to create an open defecation-free society. It is assumed this methodology will be rolled out in the decade ahead in most other states. This program recommends a bold initiative of implementing extensive hygiene awareness program targeting media outlets, schools and other public gathering places.

Figure 9.6: Projections on Access to Improved Sanitation Services



Source: Estimate by authors

As depicted in Figure 9.6, access to improved sanitation services in rural and urban areas is projected to grow at an average rate of 2.5% per annum in the decade ahead. As a result, access levels to improved sanitation services in rural areas will grow from 9.3% to 40% by 2020. Hence an estimated 720,000 households will have improved services in the rural areas by the end of the program period. In the urban areas, access will increase from 36.8% to 60% by 2020. This will enable an estimated 328,000 urban households to have access to improved sanitation services by 2020. Further, this program suggests construction of institutional latrines to be used in health posts and in urban areas. Construction of sanitation facilities in schools coupled with incorporating hygiene courses in school curriculum needs to be prioritized as young students can play a major role in changing household behaviour. Surveys indicate that about 1,570 schools are without any sanitation facilities.¹¹¹ An important initial step for the Government would be designating an institution to coordinate sanitation activities in schools.

9.4.3 Rehabilitation and New Construction of Sanitation Facilities

In the absence of detailed estimates on rehabilitation costs for sanitation services, this report assumes that a substantial part of the urban and rural sanitation facilities will require rehabilitation and/or replacement. In the absence of any asset valuation study, this program puts the cost of replacement at \$58 million in rural areas and at \$90 million in urban areas.

New construction in the rural and urban areas is estimated to cost about \$115 million and \$354 million respectively. In addition, an estimated \$15 million for institutional sanitation facilities to be constructed in urban towns as well as about \$55 million for low cost waste treatment facilities in the state capitals is allocated in the program period. Inclusive of on-going programs, Table 9.13 shows estimates on the total cost of the sanitation program and amounts to about \$703 million.

Table 9.13: Estimates on capital costs of sanitation program

Indicator	Estimate 2010	2011	2012	2013	2014	2015	2020	Total (2011-20)
Population with access (millions)								
Urban		752	870	1 000	1 127	1 251	2 196	2 200
Rural		888	1 088	1 302	1 525	1 848	4 168	4 170
Total		1 640	1 958	2 302	2 652	3 099	6 364	6 370
Access to improved sanitation (%)								
Urban		38	39	41	43	45	60	60
Rural		11	13	15	17	20	40	40
Total		16	18	21	23	26	45	45
Capital expenditure \$ ('000)								
New connections								
Urban		-	28 739	32 022	30 919	30 478	53 434	353 682
Rural		-	7 014	7 487	7 802	11 309	21 053	114 811
Total		-	35 753	39 508	38 721	41 787	74 487	468 493
Institutional sanitation facilities			1 000	1 000	1 000	2 000	2 000	15 000
Waste water treatment facilities				3 000	5 000		3 500	55 000
Rehabilitation								
Urban			10 000	10 000	10 000	10 000	10 000	90 000
Rural			4 000	4 000	6 000	6 000	8 000	58 000
Total			14 000	14 000	16 000	16 000	18 000	148 000
Ongoing projects								
Urban	1 105	2 783	1 608	539	120			5 051
Rural	4 421	6 495	3 751	1 259	280			11 785
Total	5 526	9 278	5 359	1 798	400			16 835
Grand Total								
Urban	1 105	2 783	40 346	42 561	41 039	40 478	63 434	448 734
Rural	4 421	6 495	14 765	12 745	14 082	17 309	29 053	184 599
Institutional sanitation facilities			1 000	1 000	1 000	2 000	2 000	15 000
Waste water facilities in 10 towns				3 000	5 000		3 500	55 000
Grand Total	5 526	9 278	56 112	59 306	61 121	59 787	97 987	703 333

Source: Estimate by authors

111 Statistical yearbook for Southern Sudan, 2010

9.5 Strengthening Capacity for Service Delivery and Implementation

As discussed in previous chapters, South Sudan's water sector faces chronic and severe capacity challenges in terms of human resources, technical skills, facilities and services. Institutional capacity building is also the single top priority intervention among all others to ensure sustainable delivery of water supply and sanitation services. Given the expected large investment estimated at US\$ 1.8 billion, several measures have been proposed to improve the policy environment and build capacity of the water sector institutions. The proposed program for strengthening capacity is in the range of \$150 million and a significant part of it is required early on in the implementation period. Key elements of the program include i) provision and strengthening of training institutions ii) conducting strategic and technical studies. iii) Improving the performance of urban water entities iv) training program; and v) construction of office buildings and related facilities.

9.5.1 Strengthening Training Institutions

Institutional capacities. Central to this component is strengthening mid level training centers that can generate adequate number of mid-level/intermediate professionals desperately needed at national, state and county levels. These professionals will provide support services to the MWRI, SSUWC and the state water and sanitation directorates. Thus, it is recommended to strengthen and upgrade the two training centers, Amadi Rural Development Institute and the Wau Vocational Center. Recently completed renovation works by USAID on Wau vocational center and on-going rehabilitation works on Amadi center by MDTF may not be sufficient to accommodate and train large number of mid-level professionals in high demand by the water entities. It is also envisaged to upgrade the levels of the centers into technology institutes and build essential links with major universities. In addition to several short and medium term training programs to be conducted in these institutes, it is recommended that 2 to 2.5 years of training program focusing on the following packages be urgently implemented.

- Operation and maintenance of water supply equipments
- Drilling technology
- Sanitation and Hygiene promotion and
- Water quality monitoring

There are compelling reasons to undertake these activities early on in the program to obtain first batch graduates by 2015. In addition, support will be provided to strengthen linkages between the MWRI and the two universities, University of Juba and the University of Western Bahr el Ghazal to train engineers, geologists and economists much needed for the sector.

Short and long term training. It is crucial to undertake carefully designed training program to improve the capacity of sector professionals. In addition, staffs from the MWRI, MHPP, MoH and SSUWC need to attend regional and international conferences to acquaint themselves with global developments in the sector. In order to maximize costs and train more staffs, regional training centers with significant experience will be used. Where a large number of trainees are targeted, organizing training program within the country will be also explored. Through the support of MDTF, the MWRI has undertaken a capacity building assessment geared towards the State water and sanitation directorates¹¹². On-going training program and capacity building measures are being undertaken using the recommendations set in the report. In the decade ahead, the following training courses are recommended to improve capacity of the staffs at all levels: planning and design of water supply and sanitation facilities; program monitoring and evaluation; tariff studies; operation and maintenance; water quality management; sanitation technology; project management and procurement; financial management; and ICT.

9.5.2 Advisory Services and Technical Studies

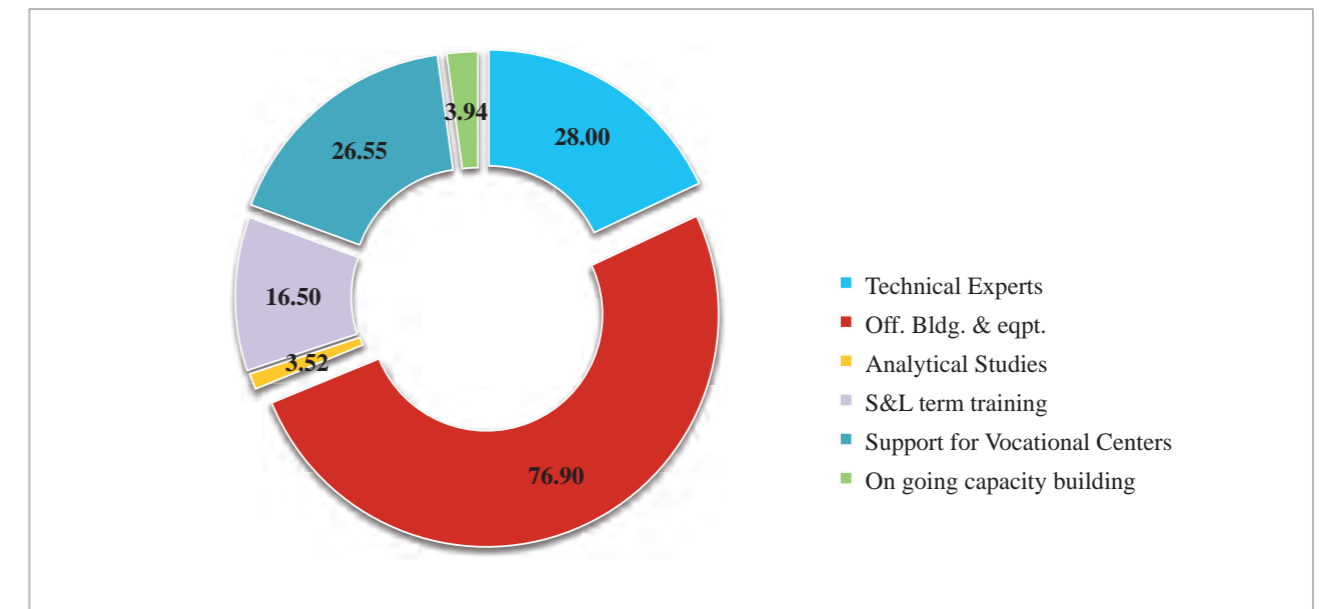
Given the current gap in the availability of skilled manpower and the time it requires to obtain adequate number of local graduates, it is essential to recruit technical assistants that will provide professional support to the states as well as to the MWRI, MHPP and SSUWC. The MWRI and SSUWC will require highly skilled experts in the areas such as hydrogeology, water treatment plant operations, financial management and program monitoring and evaluation. Experts in water and sanitation engineering as well as in geology will also be recruited to work in ten states. These experts will build capacities in the state water and sanitation directorates and provide technical support in program planning and management. All the recruited experts will provide technical support services and work under the existing government structure. Such services will be required until at least 2015.

Under the proposed action plan, important studies have been recommended which amongst other things are

expected to develop legal framework, clarify sectoral responsibilities, trigger investment into the sector and identify gaps and challenges to move the sector forward. Major proposed studies include: preparation of a sanitation master plan; supply chains of goods and services; determination/validation of access data on water

supply and sanitation; feasibility studies and design of Wau and Malakal water supply and sanitation systems; water tariff studies; private sector development to water and sanitation related activities; and organization and management structure/Institutional arrangements for the water and sanitation.

Figure 9.7: Capacity building program and technical Support



Source: Estimate by authors

9.5.3 Implementation of the Proposed Program

Inadequate offices and related equipment have continued to pose problems for the MWRI, SSUWC, states and counties. Office spaces of the MWRI being very limited, staffs are congested in small rooms and pertinent services like the rural water supply and sanitation directorate, water quality laboratory and the water information management services have been forced to be located further away from the main office. On a positive side, construction of office buildings

for the state water and sanitation directorates is underway through funds obtained from MDTF. However, county water and sanitation departments as well as the MWRI and SSUWC urgently need modest offices. Field vehicles and motorbikes, necessary for supervision and monitoring works will also be provided to the states and counties. Given the large number of IDPs and returnees as well as unexpected conflicts that are frequently encountered, it is recommended to construct emergency warehouse units at strategic locations. These units will help in storing water treatment package plants, chemicals and tools much needed during emergency periods such as floods and drought.

112 Report on MWRI/RWSSP Capacity Building Assessment, 2009

Table 9.14: Implementation Schedule for the proposed program

Category	Projected									
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Capacity building & technical studies										
Strengthen vocational centers										
Training program at all levels										
Technical experts for Ministries and States										
Technical support for Ministries and states										
Analytical & technical studies										
Rural water supply program										
Urban water supply										
Juba, Wau & Malakal distribution Rehabilitation										
Juba, Wau & Malakal water supply										
7 Towns (Kuajok, Rumbek, Torit, Yambio, Bentui, Aweil and Bor)										
50 small towns water supply project										
Urban towns rehabilitation program										
Rural sanitation program										
Urban sanitation										
Upgrading waste stabilization ponds in Juba										
Waste treatment systems for 9 state capitals										
Institutional sanitation facilities for towns										
Household sanitation program										

Source: Estimate by authors

Given the large investment requirement for implementing this program, sequencing the components of the plan is critical. As depicted in Table 9.14, the immediate priorities are fourfold: (i) undertaking reform studies and implementing recommended measures to bring urban water entities into healthy financial situation; (ii) strengthening training institutions and state water and sanitation directorates (iii) moving quickly to rehabilitate

the urban and small town water supply and sanitation systems and iv) rolling out community awareness programs on hygiene education and improved sanitation facilities. With a systematic implementation of these critical components of the program in the next three to four years, this program expects accelerated and sustainable delivery of water supply and sanitation services in the decade ahead.

9.6 Development Costs and Financing Arrangements

9.6.2 Development Expenditure Program

The proposed development program for the water supply and sanitation sector in the decade ahead amounts to \$1.94 billion at 2010 constant prices. As indicated in Table 9.15, it includes an estimated \$ 150 million for capacity building and advisory services, about \$280 million for rural water

supply, about \$ 710 million for urban water supply, about \$173 million for rural sanitation and about \$443 million for urban sanitation. In addition public sanitation facilities much needed in various towns and cost-effective waste treatment facilities for the state capitals will be constructed at an estimated \$70 million. A significant portion of the next four years will be dedicated towards building much needed capacity particularly at the state and county levels while remaining part of the program period will be dedicated to implementation of major water supply and sanitation projects. One of the recommendations of this report is making preparations early on in the program to ensure all state capitals will have adequate water supply and sanitation services before the end of 2020.

Table 9.15: Development expenditure for the water and sanitation sector (In \$ millions)

Category	Projected										Total 2011-20	
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020		
Ongoing												
Capacity building	3.15	0.79										3.94
Water supply	56.96	26.50	8.45	1.68								93.60
Sanitation	9.28	5.36	1.80	0.42								16.86
Sub Total	69.39	32.65	10.25	2.10								114.39
Proposed new programs												
Strengthen vocational centers		3.55	5.00	8.00	10.00							26.55
Training program at all levels		1.00	1.50	2.00	2.00	2.00	2.00	2.00	2.00	2.00		16.50
Technical advisors		7.00	7.00	7.00	7.00							28.00
Technical support		7.00	20.20	17.26	12.44		10.00	10.00				76.90
Analytical & technical studies		0.24	1.03	1.50	0.35	0.20	0.20	0.00				3.52
Sub Total		18.79	34.73	35.76	31.79	2.20	12.20	12.00	2.00	2.00		151.47
Rural water supply program		23.10	24.20	24.80	26.90	27.10	33.70	37.50	38.10	44.00		279.41

Category	Projected										Total
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Sub Total		23.10	24.20	24.80	26.90	27.10	33.70	37.50	38.10	44.00	279.41
Urban water supply											
Juba. Wau & Malakal distr. Rehab.		3.80	4.80								8.60
Juba. Wau & Malakal project		20.00	20.00	20.00	20.00	20.00	20.00	50.00	80.00	80.00	330.00
7 Towns (Kua-jok. Rumbek. Torit. Yambio. Bentui. Aweil and Bor)				5.00	22.00	40.00	50.00	60.00	60.00	60.00	297.00
50 small towns water supply		2.00	2.00	2.00	2.20	6.00	2.52	9.00	1.39	4.06	31.17
Urban towns rehabilitation		4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	43.00
Sub Total		29.80	30.80	32.00	49.20	71.00	77.52	124.00	146.39	149.06	709.77
Rural sanitation program											
Sub Total		11.01	11.48	13.82	17.27	17.65	23.51	24.18	24.82	29.11	172.84
Urban sanitation											
Waste stabilization ponds in Juba			3.00	5.00							8.00
Waste treatment (9 towns)						4.50	13.00	15.00	11.00	3.50	47.00
Instit. sanitation facilities for towns		1.00	1.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00	15.00
Household sanitation program		38.74	42.02	40.92	40.48	49.25	52.85	55.35	60.64	63.43	68682417.28
Sub Total		39.74	46.02	46.92	42.48	55.75	67.85	72.35	73.64	68.93	513.68
Grand Total	69.39	155.10	157.48	155.40	167.64	173.69	214.78	270.03	284.96	293.10	1 941.56

Source: Estimate by authors

9.6.3 Funding Arrangements for the Program

Since 2005, a number of water and sanitation programs and projects were implemented in South Sudan with the support of donors and NGOs. The government of South Sudan along with the support of donors and NGOs implemented a number of water and sanitation programs. UNICEF plays a key role in coordinating and supporting

a large rural water supply and sanitation program as well as in building the capacity of states and counties. An estimated 20 NGOs are actively engaged in rural and small town water supply and sanitation programs. Notable among them are PACT, SNV, MEDAIR and OXFAM. While a list of programs implemented by NGOs in various states couldn't be obtained during the preparation of this report, Table 9.16 shows a list of major development partners active in the water and sanitation sector in the country.

Table 9.16: List of major donors active in the water sector in South Sudan

Development Partner	Area of focus	Period	Estimated Amount (\$ millions)	National Development Plan (2010)	Strategic framework (2010)
MDTF	Rural and urban water supply and sanitation, capacity building etc.	2007-2012 (phases I & II)	\$60,0	9,30%	-----
BSF	Rural and urban water supply and sanitation, capacity building etc	2010-2011	\$14,3	36,80%	-----
USAID	Rehabilitation of urban water supply and capacity building	2009-2013	\$25,0	-----	14,60%
GIZ	Urban water supply and sanitation, capacity building	2009-2013	\$16,0		
JICA	Urban water supply and capacity building	2010-2014	\$50,0		
SDC (Switzerland)	Capacity building (Northern Bahr el Ghazal state)	2010-2013	\$4,8		
UNICEF	Capacity building & rural water supply & sanitation	2010-2013	\$34,2		
FRANCE	Urban Water Supply	2011-2014	\$8,4		
Govt. of Egypt	Small towns water supply	2007-2013	\$26.0*		

*includes water resources programs
Source: MWRI, 2011

Since 2005, most rural water supply and sanitation projects have been implemented by NGOs as emergency humanitarian assistance. The Multi Donor Trust Fund (MDTF) supports close to 50% of the total funding for water supply and sanitation sector and has so far committed \$60 million to the sector. The Basic Services Fund (BSF) committed \$15 million to rural water supply and sanitation activities. UNICEF, USAID, JICA, GIZ and the Egyptian Government also supported the water

supply and sanitation sector. A critical concern in the decade ahead is the two major donors in the water and sanitation sector i.e. MDTF and BSF are phasing out their intervention in 2012. This has been manifested by very little commitment for 2012-13. Hence, concerted efforts are necessary to engage all partners to support the sector.

As discussed earlier, the proposed water supply and sanitation program seeks estimated total expenditures

of \$1.94 billion. Table 9.17 sets out indicative financing strategy for the program period. About 70% of the \$150 million required for capacity building and analytical

studies will be financed by donors with the remaining 30% will be met by the Government.

Table 9.17: Indicative Funding of expenditure for the water & sanitation sector
(in \$ millions at 2010 constant prices)

Program	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2011-20
Ongoing											
Government	1.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.03
Donors	68.36	32.65	10.25	2.10	0.00	0.00	0.00	0.00	0.00	0.00	113.36
Sub Total	69.39	32.65	10.25	2.10	0.00	0.00	0.00	0.00	0.00	0.00	114.39
Proposed											
Capacity building											
Government		5.64	10.42	10.73	9.54	0.66	3.66	3.60	0.60	0.60	45.44
Donors		13.15	24.31	25.03	22.25	1.54	8.54	8.40	1.40	1.40	106.03
Sub Total		18.79	34.73	35.76	31.79	2.20	12.20	12.00	2.00	2.00	151.47
Water supply											
Government		21.16	22.00	22.72	30.44	39.24	44.48	64.60	73.80	77.22	395.68
Donors		31.75	33.00	34.08	45.66	58.86	66.72	96.90	110.69	115.84	593.52
Sub Total		52.91	55.00	56.80	76.10	98.10	111.20	161.50	184.49	193.06	989.20
Waste treatment in urban towns											
Government		0.10	0.40	0.60	0.20	0.65	1.50	1.70	1.30	0.55	7.00
Donors		0.90	3.60	5.40	1.80	5.85	13.50	15.30	11.70	4.95	63.00
Sub Total		1.00	4.00	6.00	2.00	6.50	15.00	17.00	13.00	5.50	70.00
Rural & urban house old sanitation											
Government		2.49	2.68	2.74	2.89	3.34	3.82	3.98	4.27	4.63	30.83
Donors		2.49	2.68	2.74	2.89	3.34	3.82	3.98	4.27	4.63	30.83
Private		44.78	48.15	49.27	51.98	60.20	68.72	71.58	76.92	83.29	554.87
Sub Total	0.00	49.75	53.50	54.74	57.75	66.89	76.36	79.53	85.47	92.54	616.52
Total											
Government	1.03	29.39	35.49	36.79	43.07	43.89	53.46	73.88	79.97	83.00	479.97
Donor	68.36	80.94	73.84	69.35	72.60	69.59	92.58	124.58	128.07	126.81	906.71
Private	0.00	44.78	48.15	49.27	51.98	60.20	68.72	71.58	76.92	83.29	554.88
Total	69.39	155.10	157.48	155.40	167.64	173.69	214.76	270.03	284.96	293.10	1 941.56

Source: Estimate by authors

The program recommends about \$990 million for the water program. About 40% or \$396 million estimated for the rural and urban water supply component of the program will be covered by the Government while the balance \$ 594 million is expected to be met by donors. The Government's policy on household sanitation services states that costs of household sanitation facilities will be borne by individual households. As discussed elsewhere in this report, on site sanitation facilities will continue to dominate the type of sanitation facilities during the program period. This report puts the costs of rural and urban sanitation facilities for households at \$616 million. For the purposes of this report, about 90 % of these costs amounting to \$554 million will be borne by individual households while the balance of \$62 will be equally shared between donors and government. In addition, low cost waste treatment facilities will be constructed in all the ten state capitals as well as public sanitation facilities in most towns for an estimated cost of \$70 million. While the Government will meet 10% of these costs amounting to \$7 million, the balance \$63 million will be covered by donors.

9.7 Maintenance Programs for Water Supply and Sanitation

Insufficient emphasis towards periodic maintenance of water and sanitation facilities has been the principal cause for the deterioration of more than 4,000 water points and an even greater number of sanitation facilities. Poor maintenance practices will also continue to shorten the life span of most functioning facilities. In particular the problem of sustainability is crucial in rural water supply services where quite often management and maintenance of rural water supply facilities is left for Water Management Committees. The assumption that villagers can maintain pumps having established a water committee and received some training has been widely discredited in recent years.¹¹³ While the principle of decentralizing such responsibilities is commendable, often these committee members are not equipped with the necessary training and tools and don't get any backstopping services from the water sector institutions. In addition, water fees collected from users in rural areas is not sufficient to meet operation and maintenance costs of water supply schemes. The willingness and affordability at the current stage is also too low. While more works will be necessary to aware the community on their responsibilities and allowing some time for improvement of resources, this report strongly recommends establishing a Rural Water Supply

Maintenance Trust Fund at the national level to provide the necessary support for operation and maintenance of facilities in the rural areas. It should also be noted that without adequate funds for Operation and Maintenance (O&M) of assets, the upcoming large scale program will simply result in a very high percentage of mal-functioning and inoperable schemes within only a few years. Thus, the Trust Fund will play a paramount role in the interim period of at least 4-5 years until the states and communities manage to fully cover the operation and maintenance costs of the systems. Initially, each State will be requested to prepare a business plan and indicate the financial gaps needed for O&M costs of facilities. It will also enter into a commitment to take over full responsibilities beyond the Trust Fund's operational period.

Detailed information on the current level of O&M expenses couldn't be obtained at the time of drafting this report. Rough estimates obtained from two states indicate that annual routine maintenance and rehabilitation costs average about \$350,000 per state per year. As the bulk of these costs will be expenditures for rehabilitation works, this report assumes that annual routine maintenance costs will not exceed \$50,000 per state per year indicating the severity of the problem. Where the SSUWC is responsible for operating urban towns (Juba, Wau, Malakal and Renk) reports indicate total expenditure on routine maintenance to be \$ 1.5 million per year. As revenue is not ring-fenced in the urban towns, the Government allocates budget to cover operation and maintenance costs.

In determining annual routine maintenance costs for the decade ahead, the value of the capital stock of urban and rural water and sanitation infrastructure has been calculated. For the purposes of this report, an estimated 4% of the capital stock has been considered in determining routine maintenance expenditure. Table 9.18 indicates the required maintenance outlays for the decade ahead. On the basis of the available information, actual expenditure for routine maintenance costs of urban water supply services is estimated at 30% of the required amount while in rural areas, less than 10% of the required amount has been allocated for the same year. For the purposes of this report, annual routine maintenance expenditure for urban and rural water supply services is put in the range of \$20 million a year. It is projected that expenditures for urban and rural water services will reach \$45 million by 2020. Also routine maintenance expenditures for sanitation facilities will rise from \$8 million to about \$27 million by 2020.

113 Southern Sudan Basic Services Fund, Midterm review, May 2011

Table 9.18: Routine maintenance expenditure for water & sanitation infrastructure
(\$'000 at 2010 constant prices)

Indicator	2011	2012	2013	2014	2015	2020	Total 2011-20
Water supply							
Urban	3.93	4.97	6.04	7.12	8.89	30.60	131.52
Rural	6.75	7.47	8.24	9.03	9.83	14.32	103.25
Sub-total	10.68	12.44	14.28	16.15	18.71	44.93	234.77
Sanitation							
Urban	6.38	7.53	9.01	10.49	11.79	23.33	137.49
Rural	1.28	1.56	1.86	2.17	2.62	5.87	31.52
Sub-total	7.66	9.09	10.87	12.66	14.41	29.20	169.01
Total							
Urban WSS	10.32	12.50	15.06	17.61	20.68	53.93	269.01
Rural WSS	8.02	9.03	10.09	11.20	12.45	20.19	134.77
Total	18.34	21.53	25.15	28.81	33.12	74.13	403.78
Memo items							
Maintenance as %							
Capital stock	4	4	4	4	4	4	4
Urban							
Water	98.37	124.21	151.04	177.94	222.15	765.06	3 288.01
Sanitation	159.58	188.32	225.34	262.26	294.74	583.26	3 437.35
Total	257.95	312.53	376.38	440.20	516.89	1348.32	6 725.36
Rural							
Water	168.67	186.77	205.95	225.73	245.65	358.11	2 581.33
Sanitation	31.90	38.92	46.41	54.21	65.52	146.72	787.91
Total	200.57	225.69	252.36	279.94	311.17	504.83	3 369.24

Source: Estimate by authors

9.8 Management of Risks and Uncertainties

Implementation of the proposed water and sanitation program is vulnerable to a number of risks which in turn calls for the design of appropriate mitigating measures. These risks mainly emanate from i) poor water governance ii) securing adequate financing resources iii) ensuring sustainability of water and sanitation schemes v) provision of construction materials and skilled manpower vi) security and political stability.

9.8.1 Water Governance

Water governance poses a major risk towards the successful implementation of the envisaged program. As proven in many African countries, where strong policy and regulatory frameworks are adopted and strong political commitment is demonstrated, accelerated and sustainable delivery of water supply and sanitation is ensured.

Management of such a large investment calls for the availability of adequate and qualified human resources with extensive experience in design, supervision and operation of water and sanitation schemes. It also requires setting up suitable policies and regulations. Essential guidelines on procurement, financial management and M&E are also critical for the successful implementation of the program. Weak institutional and human resources capacity is a major threat towards attaining the goals set in the program. Central to the success of urban water supply and sanitation service delivery is also the Government's readiness to implement the recommendations of the reform study on

the South Sudan Urban Water Corporation and delineation of service provision as well as regulatory responsibilities among line ministries and state Governments. To avert these risks, the program recommends a series of measures such as implementation of training program and provision of technical support mainly at the state water and sanitation directorate levels as a matter of high priority.

9.8.2 Mobilization of Investment

As discussed in this report, the proposed program for delivery of sustainable water and sanitation service calls for capital outlays of about \$ 2 billion. Given the large number of competing sectors such as education, health and other infrastructure services that are much needed for South Sudan, there is a risk of securing sufficient public funds for the water and sanitation component of the program. In addition, the global economic crisis is a major threat that could contribute to reduced flow of funds mainly by donors.

9.8.3 External and Internal Conflicts

One of the major risks of the proposed program is ensuring stability within the country and along its borders. In particular, the success of the rural water supply and sanitation component of the program entails a series of interactions with communities often located in remote areas. Conflicts hamper the smooth progress of the implementation plan and due care will be taken prior to implementation of specific projects. Accordingly cultural and traditional beliefs as well as potential sources of conflicts will be assessed and built into the design of the planning process.

Creation of a Communications Network

10 Creation of a Communications Network

10.1 Current Status of Communications Services and Infrastructure

Telecommunications has been recognized as the fastest growing sector in South Sudan with liberalization and competition leading to growth in the coverage area. While mobile network connectivity continues to grow, a key component to propel ICT growth in South Sudan – the national broadband backbone is lacking. On the other hand, for information dissemination, the mass media environment in the country is liberal with the right to expression enshrined in the Transitional Constitution of South Sudan 2011.

In order to further integrate as a sovereign nation, the country has already obtained its own international dialing code, +211, by the International Telecommunication Union (ITU)¹¹⁴ and its own internet domain, .ss, by the International Organization for Standardization (ISO).¹¹⁵ Attribution of an ISO country code is not only essential for Internet top level domain names (ccTLD), but without one, a country cannot have a currency code or issue machine-readable passports or facilitate international financial and banking transactions. The 211 dialing code and .ss domain are fully operational as this was a priority area of action by the Government. The Ministry of Telecommunication and Postal Services announced 15 December 2011 as the deadline for changeover from the Sudan 249 code to the 211 code.¹¹⁶ In addition, the Ministry has applied for membership to the Universal Postal Union (UPU) which will also enable the country to receive and send mail internationally.

10.1.1 Policy and Institutional Arrangements for the ICT Sector

There are two policies guiding operations in the ICT sector; namely, the Telecommunications and Postal Services Sector Policy, Framework and Work Plan 2008, and the Ministry of Information and Broadcasting Organization Bill of 2008. The ICT sector is governed by the Ministry of Telecommunications and Postal Service (MoTPS) as well as the Ministry of Information and Broadcasting (MoIB). Both ministries provide policy direction and perform regulatory functions. Annex 11 presents the detailed list of functions for each Ministry.

In the case of MoTPS, government will act as a facilitator, enabler and regulator of the ICT sector so as to allow the private sector and civil society organizations to operate effectively in ICT policy formation and implementation.¹¹⁷ For this purpose, the Ministry will encourage all the interested parties to fully be involved in the following:

- a) Participate in provision of universal service/access
- b) Attract more private sector resources and foster partnership between private and public sectors;
- c) Develop a sector with efficiency, credibility, commercial integrity and good corporate governance;
- d) Provide quality and sustainable service with choices to consumers;
- e) Keep abreast with and participate in developments in ICT within Africa and globally.

¹¹⁴ ITU. New country, new number: Country code 211 officially assigned to South Sudan, http://www.itu.int/net/pressoffice/press_releases/2011/25.aspx. Accessed 31 August 2011.

¹¹⁵ ISO. ISO country code for South Sudan, <http://www.iso.org/iso/pressrelease.htm?efid=Ref1456>. Accessed 31 August 2011.

¹¹⁶ South Sudan secures internet country domain, <http://www.sudantribune.com/South-Sudan-secures-internet.39798>. Accessed 31 August 2011.

¹¹⁷ GOSS. Telecommunications and Postal Services Sector Policy, Framework and Work Plan 2008.

Private sector is expected to play a key role in development of physical infrastructure, human resource capacity, and in ICT services and production sector of the economy. Development partners will be sought to provide the financial assistance for implementation of the policy as well as to build capacity for sustainability. Support will also be sought for SME ICT-based business incubators especially in area of software development.

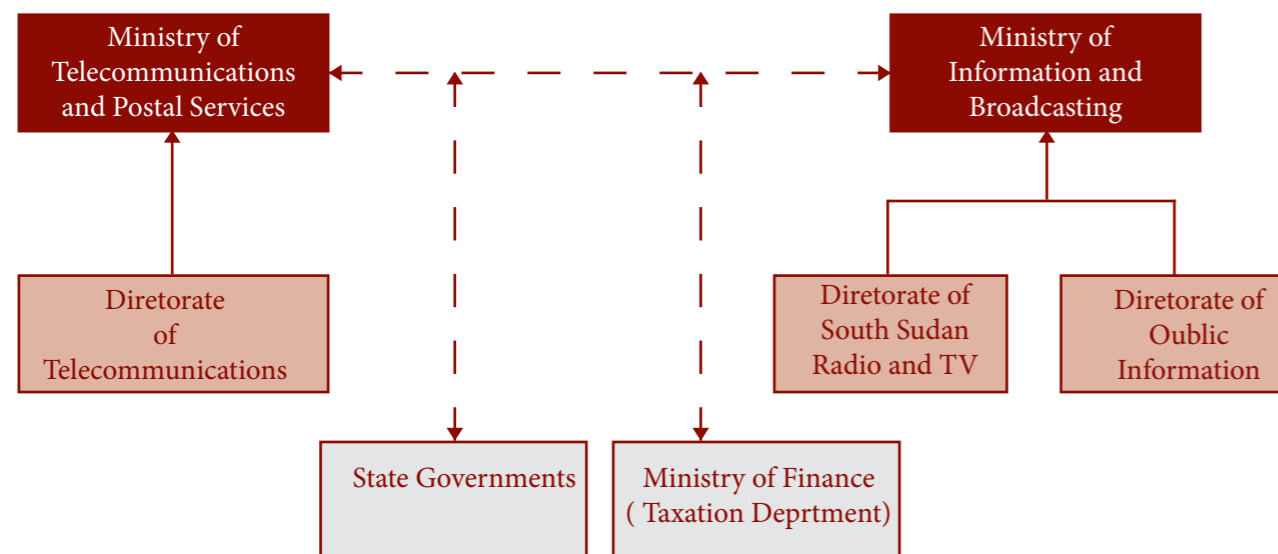
For a variety of reasons, the rules and regulations in place currently are not consistent across all the telecommunications operators in the country. The operators have different rules governing licenses and spectrum dues as well as investment incentives such as periods for tax breaks, etc. The prevailing situation does not provide a level playing field for all the operators and urgently needs to be redressed. This situation is partly due to the fact that some of the operators such as MTN Sudan and Zain have licences that were issued by the Sudan regulatory authority, National Telecommunications Corporation (NTC), while others such as Gemtel and Vivacell have 'regional' licences issued by the Government of South Sudan (GOSS) permitting them to operate only in what was then Southern Sudan. This arrangement came about because under the Comprehensive Peace Agreement (CPA), the Government of South Sudan shared responsibilities for the telecommunications sector with the Government of National Unity (GNU).

The two ministries are currently working on new bills to govern their respective subsectors. The MoTPS is drafting a new Communications Bill 2011 that will, among other functions, provide for the establishment of an independent regulator for the sector. The new regulator will focus on the telecommunications and postal sectors. The Bill will also provide new rules and the basis for licenses in the telecommunications sector.

The Ministry of Information and Broadcasting (MoIB) believes in facilitating freedom of expression and availing information to all South Sudanese whether within the country or in the diaspora. The ministry is finalizing three bills, namely: the South Sudan Broadcasting Corporation Bill, 2011; the Media Council Bill, 2011; and The Right of Access to Information Act, 2011. The South Sudan Broadcasting Corporation Bill is intended to set up the South Sudan TV and Radio Broadcasting Services as an independent corporation funded by government (in a model similar to the BBC). The proposed SSBC will operate alongside the over 30 private FM stations operating nationwide whose proliferation has been encouraged by GOSS so as to facilitate the dissemination of information. The new bills are also proposing an Independent Broadcasting Authority (IBA) or Media Council, a Board of Directors for Public Broadcasting Corporation (BDPB), and a Commission of Rights of Access to Information (CRAI).

Institutional arrangements for the ICT sector. Regulation for the ICT sector is presently provided by the MoTPS and the MoIB – although the new bills under preparation by the Ministries do call for independent regulators. There is presently limited drive for a converged regulator that would handle both telecommunications and broadcasting sectors. Currently, the regulation function by the MoTPS is handled under the Directorate of Telecommunications. Within the directorate, they have also designated a Liaison Officer who is the direct link between the operators and the ministry. In MoIB, there are two offices responsible for radio and TV. The public South Sudan radio and TV are under the Directorate of Southern Sudan Radio & TV while the private media stations are under the Director of Public Information. The two ministries do share responsibilities in the licensing of new media operators whereby the MOIB gives approvals, assesses and issues warrants of establishment, while the MoTPS controls the frequency allocations.

Figure 10.1: Institutional Arrangements for the ICT Sector in South Sudan



Source: Ministry of Telecommunications and Postal Services and Ministry of Information and Broadcasting

Figure 10.1 highlights the institutional arrangements for the ICT sector whereby regulation is currently provided by the Ministries. Regulatory functions at state levels are executed through the State Governments while matters related to taxation and revenue are handled by the Ministry of Finance. For example, the Ministry of Finance is responsible for assessment of custom duties and assessment and collection of taxes on equipment and services.

The regulatory situation in the comparator countries is presented in Table 10.1. Except for Eritrea, the other countries do have a regulator that is separate entity from the Ministry. Of note are factors that impact the independence of a regulator such as autonomy in decision making and self-financing of the regulator. Among the comparator countries, only Malawi makes information on its license agreements public. In addition, Malawi and Rwanda have a converged regulator handling both telecommunications and broadcasting sectors.

Table 10.1: Regulatory Situation in Comparator Countries

Country	Name of Authority	Year Created	Autonomy in Decision Making	Authority Reports to	Legal Document creating Authority	Authority Financed by	Collegial/ Board Status
Burkina Faso	L'Autorie de regulation des commu-nications electro-niques (ARCE)	1998	Yes	Prime Minister	Loi N° 061-2008/ AN of November 2008 Governs Communication networks and electronic communications services		Yes
Burundi ¹	Agence de Regula-tion et de Controle des Telecommu-nications	1997	No-Decision approved by Minister	Annual Report to the Sector Ministry	Decret Presidentiel N° 100/182		No
Eritrea ¹	Commu-nications Department	1998	No-Decision approved by Minister		The Communica-tions Proclama-tion N°. 102/1998	Government appropriation	No
Malawi	Malawi Commu-nications Regulatory Authority (MACRA)	1997	Yes	Annual Report to the Sector Ministry	Communications Act No 41 of 1998	Licence fees; Spectrum fees; Regulatory fees; Fines/penalties; Contribution from regulated teleco operators based on turnover. Financial income (e.g. Investment/Deposit)	Yes-7 members
Niger	L'Autorie de regulation Multisecto-rielle		No	Annual Report to the Sector Ministry			Yes-7 members
Rwanda	Rwanda Utilities Regula-tory Agency (RURA)	2001	Yes	Annual Report to the Sector Ministry	Law No 39/2001 of 13/09/2001 establishing an agency for the certain public utilities	Licence fees (1.5%); Numbering fees(8.2%); Spectrum fees (22.9%); Regulatory fees (55.3%); Donors (12.1%)	Yes-7 members

Source: ITU World Telecommunication Regulatory Database, 2010. Notes: ¹ – Pre-2009 Data.

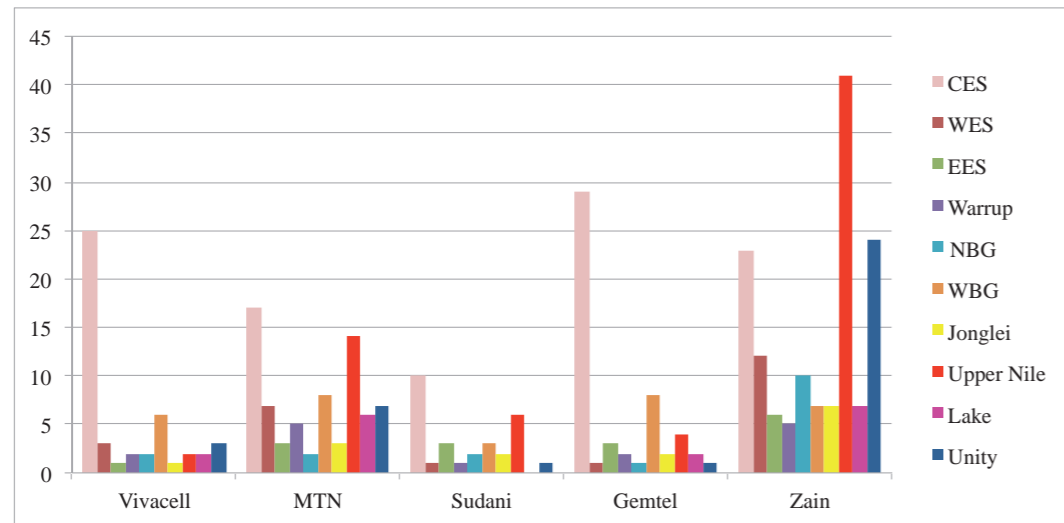
10.1.2 ICT Infrastructure and Access

National ICT infrastructure. Currently there are five telecommunication operators including MTN Sudan, Zain, Sudani, Vivacell and Gemtel. Of these, Vivacell and Gemtel have been operating under 'regional licenses' that restricted their operations to the territory of South Sudan, while the other three operators have licenses permitting

their operations over all parts of Sudan and South Sudan. A brief on the five operators is presented in Annex 11-A.

Figure 10.2 highlights the spread of the telecommunication operators via the number of points of presence they had in the ten states of South Sudan as of June 2011.¹¹⁸ MTN had added another 21 sites while Zain had added another 43 sites, as of August 2011. Together MTN and Zain have just over 60% of the currently available sites.

Figure 10.2: Spread of Telecommunication Operations across South Sudan

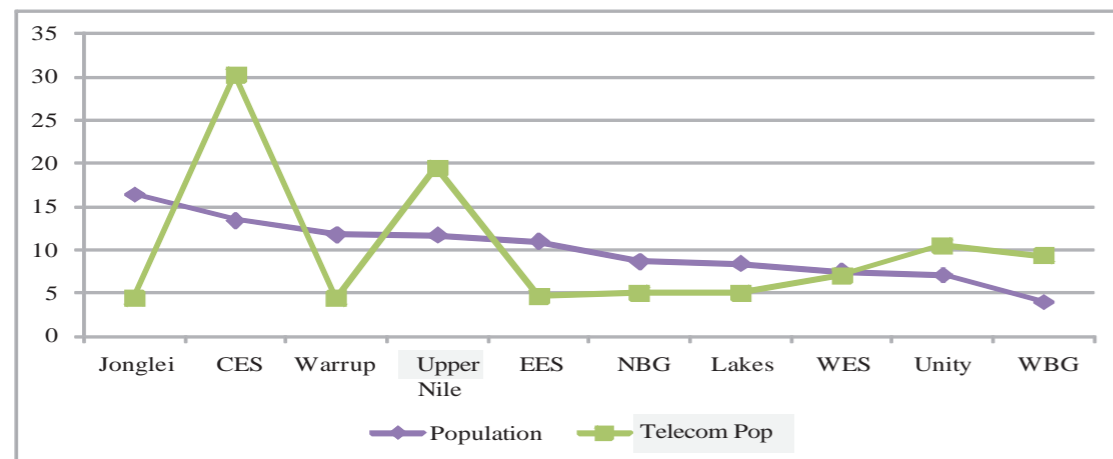


Source: Ministry of Telecommunications and Postal Services

As can be observed from Figure 10.2, there is an uneven spread of telecommunication services across South Sudan with the Central Equatorial State (CES) having the largest number of sites at 104 (30%) and on the other hand, Warrap and Jonglei having only 15 (4%) sites each. Even with the states, the distribution of sites

among the counties remains uneven with Juba and Yei having 67 (64%) and 21 (20%) of the 104 sites in the CES, respectively. The other counties with relatively high number of sites are Renk with 27 (40%) sites in Upper Nile and Wau with 22 (69%) sites in Western Bahr el Ghazal (WBG).

Figure 10.3: Trend of PoPs with Population Percentage in South Sudan States



Source: South Sudan National Bureau of Statistics

118 MoTPS Telecommunications Companies Outreach Data as of June 2011

There is also uneven distribution of access to telecommunication services with respect to the population of South Sudan. For example, the three states of CES, Warrap and Jonglei representing the states with the most and the least number of telecommunication sites respectively

have 13.4%, 11.8% and 16.4% of the population as of 5th Sudan Population and Housing Census, 2008. Clearly, the distribution of the presence of telecommunications points is generally under-matched with the population percentages in the various states as highlighted in Figure 10.3.

MAP 10.1: Existing Backbone Communications Network for South Sudan and Sudan



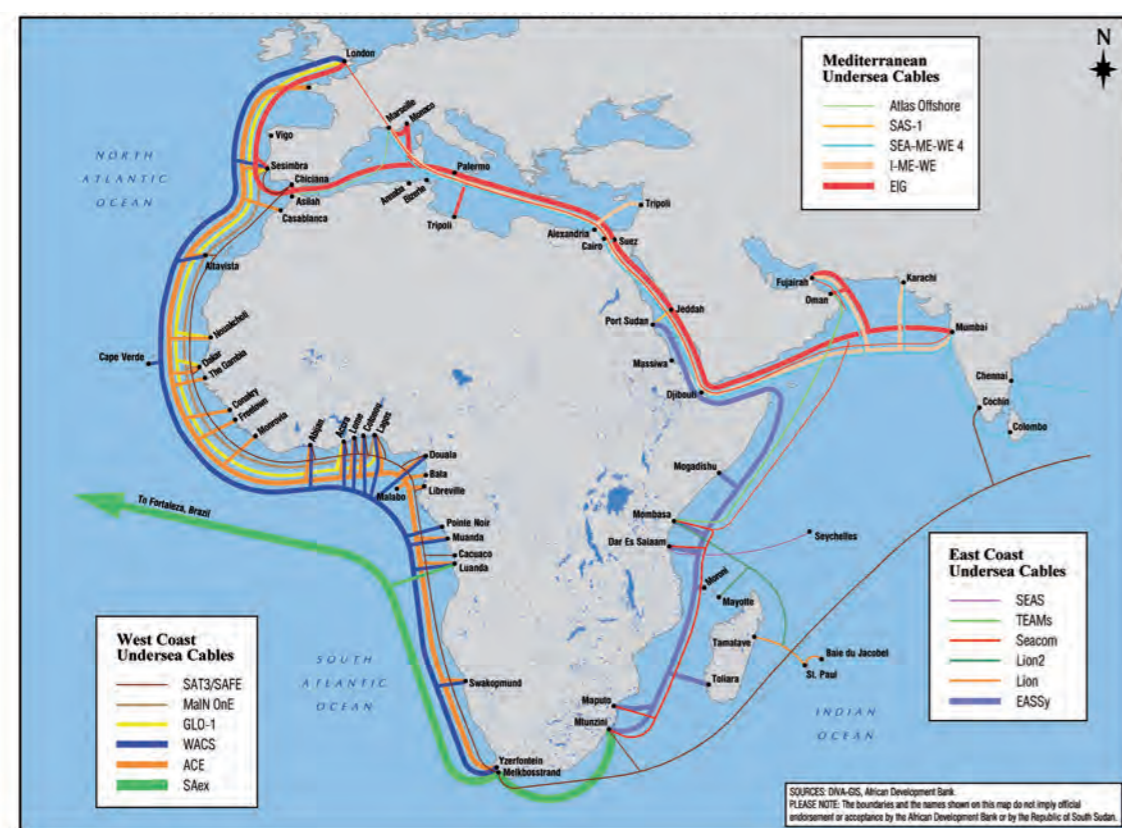
Source: WIMS, MWRI, 2011

Regional ICT infrastructure. Overall, an estimated 21,000 kilometers is needed to provide a reasonable degree of integration across Africa and plug the missing links¹¹⁹. At regional level, South Sudan currently does not have any intra-regional fiber optic backbone connectivity, as highlighted in Map 10.1. As a landlocked country, regional connectivity would enable South Sudan access to submarine cables which, in turn, would facilitate a reduced cost in ICT access as well as increased international bandwidth (compared to what is currently available via satellite). International and Internet charges for countries without access to submarine cables can easily be twice as high as those that do have access to submarine cables.

In the past decade or so, the African continent has benefited

from the arrival of a number of undersea fibre optic cables that facilitate the delivery of broadband access. Map 10.2 highlights the fibre optic cables currently available on the coastline, from which it can be observed that South Sudan has opportunities to link to the cable through Kenya, Ethiopia or Sudan. Currently, of the four options to obtain access to submarine cable, namely through Kenya, Uganda (and through Kenya), Ethiopia or Sudan, the preferred option for South Sudan in the short-term seems to be to connect via Lokichoggio in Kenya. One of the major operators has indicated preference via Ethiopia and onward to Djibouti. In the long-term, it is prudent to have multiple access points to the undersea cables as this will enhance the resilience of South Sudan's broadband network and promote competition among service providers.

MAP 10.2: Undersea Fiber Optic Cables Along Africa's Coastline



Source: African Undersea Cables (2013), manypossibilities.net

Selected indicators on ICT infrastructure and access. The national and regional infrastructure required to provide adequate ICT access consists of (i) strategic information systems necessary for sustainable economic development such as education, health, public financial management, and

transportation; and (ii) broadband telecommunications networks, and computer hardware and software.¹²⁰ The core ICT indicators used in this Report are developed by the Partnership on Measuring ICT for Development¹²¹, and can be broadly classified in two types:¹²²

- indicators where a higher value implies a better situation in terms of ICT infrastructure and access development
- tariff indicators where a lower value usually indicates a better situation

Table 10.2 highlights selected indicators on infrastructure and access. From the available statistics on South Sudan, it is clearly a case of very limited ICT infrastructure and access – even when South Sudan is assessed against the comparator countries.

Table 10.2: Selected Indicators on ICT Infrastructure and Access

Indicator	Year	Burkina Faso	Burundi	Eritrea	Malawi	Niger	Rwanda	Sub-saharan Africa ⁸	Developing Countries ⁸	South Sudan 2011
Fixed Telephone lines per 100 inhabitants	2010	0.9	0.4	1	1.1	0.5	0.4	1.4	11.6	0.11 ¹
Mobile cellular telephone subscriptions per 100 inhabitants	2010	34.7	13.7	3.5	20.4	24.5	33.4	53	78.8	12 ⁷
Mobile subscribers in 2010 (% of total telephone subscribers)	2010	97.6	97.2	77.4	95	97.8	98.9			
Mobile subscribers in 2006 (% of total telephone subscribers)	2006	90.1	86.5	62	81.8	93.8	94.2			
Fixed internet per 100 inhabitants	2009	0.1	0.1	0.1	0.75 ⁴	0.03 ¹	1.4			
Internet users per 100 inhabitants	2010	1.4	2.1	5.4	2.3	0.8	7.7	12.8	26.3	
Fixed broadband and Internet subscribers per 100 inhabitants	2010	0.08	0	0	0.03	0.02	0.02	0.2	4.8	
International Internet bandwidth (capacity that backbone operators provide to carry Internet traffic) per inhabitant (bits/second/inhabitant)	2005	16.39 ²	0.55	1.7 ²	2.38	2.33				3.03 ⁷
Percentage of the population covered by a mobile cellular telephone network	2006	60.3	60	50	93 ³	45	90 ³	60 ⁴		60 ⁷

Source: World Bank Data – Africa Infrastructure, ITU World Telecommunication/ICT Indicators Database, AICD 2011, South Sudan Ministry of Telecommunication and Postal Services. Notes: No data available; ¹ – 2005 Data; ² – 2006 Data; ³ – 2007 Data; ⁴ – 2008 Data; ⁵ – 2009 Data; ⁶ – 2010 Data; ⁷ – 2011 Data; ⁸ – 2011 Estimate.

Limited infrastructure in the country is compounded by the relatively high tariffs associated with ICT services.

Table 10.3 highlights selected indicators on tariffs and charges for fixed telephone, mobile telephone and internet

119 World Bank (2008), "Overhauling the Engine of Growth: Infrastructure in Africa." Africa Infrastructure country Diagnostic, World Bank, Washington DC, September, 2008.
 120 Oshikoya, T.W., and M.Nureldin Hussain (1998), "Information Technology and the Challenge of Economic Development in Africa." Economic Research Papers No. 36, African Development Bank, 1998.
 121 The core ICT indicators have been developed with the main purpose of producing high quality and internationally comparable data on information and communication technology. The tables have some missing data which further emphasizes the need to gather more information on the status of ICT in South Sudan as an on-going measure. In general, it has been a challenge to establish data pertaining to South Sudan as most of the ICT-related information is aggregated with that of Sudan.
 122 International Telecommunications Union (2010), Core ICT Indicators. Partnership for Measuring ICT for Development, 2010.

services. With 50.5% of the country's population living on less than US\$32 per month, ICT services are generally unaffordable (requiring more than 50% of the monthly income) – by similarity with costs in the six comparator countries. Indeed, for example, Zain charges about SDG 250 for the modem and SDG 50 per month¹²³ for a 2 GB connection.¹²⁴ These charges are about the same for Vivacell and MTN. Depending on specifications, the costs for internet access via satellite options such as Very Small Aperture Terminals (VSATs) range from \$500 and \$4,000 a month.

10.1.3 Access and Use of ICT by Households and Individuals

In assessing the ICT sector, it is important to consider both the supply and demand affecting the sector. Sustainable development of the ICT sector requires both an enabling environment for supply-side growth in terms of access to networks and services as well as demand for and adoption of ICT services by the users.

Table 10.3: Selected Indicators on ICT Tariffs in Comparator Countries

Indicator	Year	Burkina Faso	Burundi	Eritrea	Malawi	Niger	Rwanda	South Sudan
<i>3-minute call in \$</i>								
Local telephone call during peak time	2007	0.2	0.06 ¹		0.03	0.2	0.2	
International telephone call to the USA	2007	1.2	2.4		3	1.9	1.3	
<i>Fixed Charges in \$</i>								
Connection fee for residential telephone service	2007	50.71	9 ²		8.6 ²	48.35	45.09	
Monthly fee for residential telephone service	2007	5.07	0.4 ²		0.7 ²	7.28	1.77	
Fixed telephone monthly price basket	2007	12			1.67 ²	12.64	7.81	
<i>Mobile cellular telephone charges in \$</i>								
Mobile cellular telephone prepaid tariffs per month in \$	2007	15.48	11.51 ¹	16.78	10.52	14.96	11.48	4.75 ⁷
Mobile price basket as a percentage of per capita income	2007	38.65 ²	138.15 ¹	91.53	50.54	64.11	54.27 ²	
<i>Internet access charges in \$</i>								
Internet access tariffs per month in \$ (20 hour Internet basket)	2006	75	52 ¹	29.33 ¹	52.66	51.21	84.57	24.01 ⁷
Internet basket as a percentage of per capita income	2006	195.76	624 ¹	160 ¹	371.71	236.37	405.94	

Source: World Bank Data – Africa Infrastructure, ITU World Telecommunication/ICT Indicators Database
Notes: No data available; ¹ – 2005 Data; ² – 2006 Data; ³ – 2007 Data; ⁴ – 2008 Data.

123 Equivalent to US\$85 for the modem and US\$17 per month for the subscription

124 World Bank (2011), "South Sudan's Infrastructure – A Continental Perspective." World Bank, Washington DC, Policy Research Working Paper 5814, September 2011.

In addition to infrastructure, access by users is affected by factors such as high prices that prevent the public from accessing ICT services as well as quality of service of ICT services which affects users' willingness to pay for them.¹²⁵ Literacy and ICT skills are another key factor affecting demand in the ICT sector. Development of an information society requires an educated population at various levels including:¹²⁶

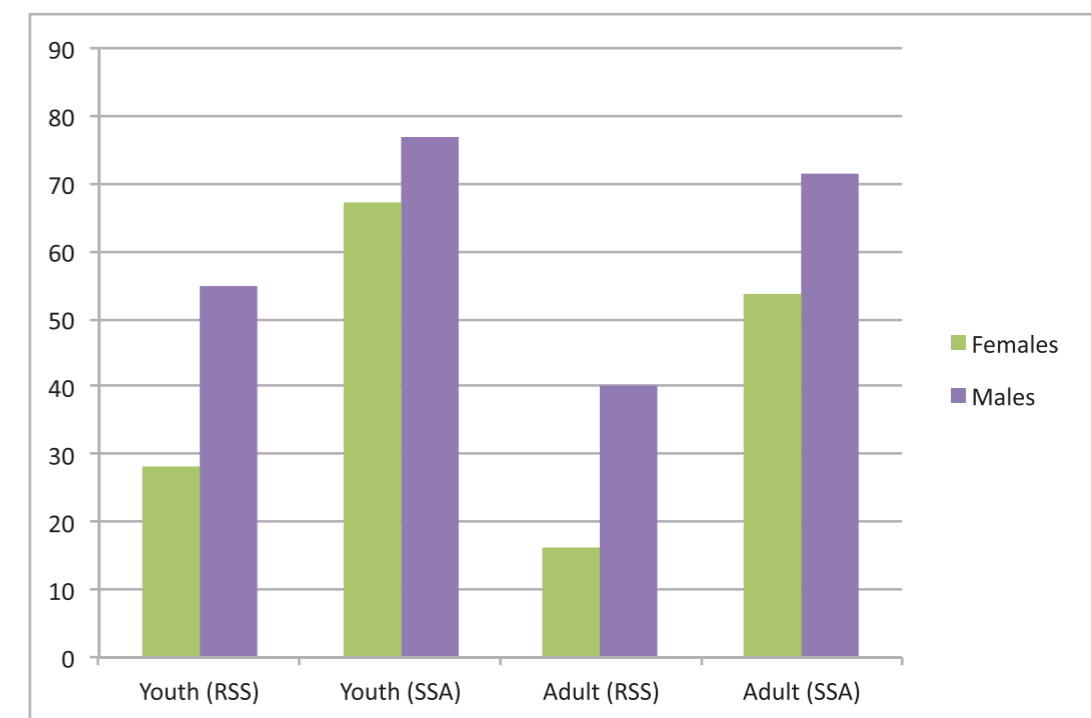
- The use of computers and the Internet requires at the least a minimal level of literacy and the ability to retrieve and process information
- Advanced educational attainment is a prerequisite for developing skills to manage ICT hardware and develop

ICT software and services.

- Language ability is important in order to participate in ICT-enabled service industries such as customer contact centers. Knowledge of widely spoken global languages is also important for understanding ICT systems given that much documentation is not widely translated.

Nationally, adult literacy rate is 27% and that for the youth is 40%.¹²⁷ Figure 10.4 compares the literacy rates among males and females for youth (ages 15-24) and adults (ages 15 and above). The literacy rates for youth and adults across Sub-Saharan Africa (SSA) are provided for comparison.¹²⁸

Figure 10.4: Literacy Rates among Males and Females in South Sudan and SSA (2008)



Source: UNESCO Institute of Statistics

In addition to literacy, there is the need for basic and advanced ICT skills so as to spur demand. Established in 2009, the College of Computer Science and IT at the University of Juba is currently offering degree and diploma programs in computer science, information technology, and computer networks. Short courses are also available to the public and to government institutions. In addition, the Ministry of Telecommunications and Postal Services has plans for an ICT Institute to provide ICT training particularly for government's human resources.

Selected indicators on access and use of ICT by households and individuals. There are twelve core indicators on access to, and use of, ICT by households and individuals. Of these, six are on household access to ICT and six are on the use of ICT by individuals (i.e. household members). There is also a reference indicator on access to electricity by households. ICT access refers to the availability of ICT within the home, while Use of ICT refers to use of ICT by one or more individuals of the household, whether at home or elsewhere.

125 Williams, Mark D.J., Mayer, Rebecca and Minges, Michael (2011), Africa's ICT Infrastructure: Building on the Mobile Revolution. World Bank, Washington DC, 2011.

126 Telecommunications Management Group (2007), Trade in Information and Communication Services: Opportunities for East and Southern Africa, 2007.

127 World Bank. South Sudan Statistics Database.

128 UNESCO (2010).UIS fact Sheet No. 3, UNESCO Institute for Statistics, September 2010.

Table 10.4: Status of Access to and Use of ICT by Households and Individuals in Comparator Countries

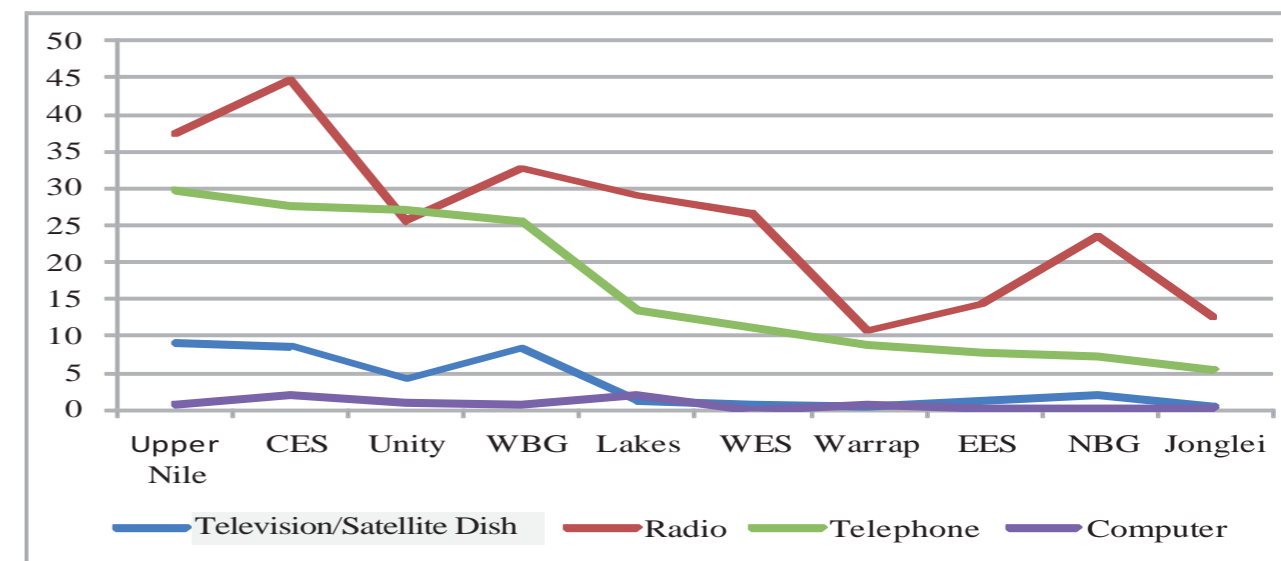
Indicator	Year	Burkina Faso	Burundi	Eritrea	Malawi	Niger	Rwanda	South Sudan
Proportion of households with a radio	2009	69.5			66	43	45.8	24.6
Proportion of households with a TV	2009	16.9			9	9.9	23	33
Proportion of households with a telephone	2009							15.1
Proportion of household with a fixed telephone	2008	2.7				1.4		
Proportion of household with a mobile cellular telephone	2008	21.6				31.9		
Proportion of households with a computer	2008	1.6				0.4		0.7
Proportion of individuals who used a computer in the last 12 months	2008					0.9		
Personal computers per 1 000 inhabitants	2005	3	3	5	6	2	4	
Proportion of households with Internet access	2008					0.1		
Proportion of individuals who used a Internet in the last 12 months	2008					0.7		

Source: World Bank Data – Africa Infrastructure, ITU World Telecommunication/ICT Indicators Database, SSCSE Statistics. Notes: .. No data available; 1 – 2006 Data; 2- 2007 Data; 3 – 2008 Data.

Figure 10.5 shows that variation among the states in terms of access to ICT by households. Except for Unity State, the dominant ICT tool available to households is the radio –

a typical finding in low income developing countries. By comparison, in 2009, 77% of households globally had a television set while 34% households had a computer.¹²⁹

Figure 10.5: Status of Access to ICT by Households by States in South Sudan



Source: South Sudan National Bureau of Statistics

10.1.4 Status of ICT-enabled Services in South Sudan

Increasingly in Africa, mobile phones and applications are becoming a key player in the arena of ICT-enabled services including such applications as mobile money, market information systems, weather forecasts/alerts. In the case of South Sudan, some services, such as mobile money are yet to be implemented – pending development of appropriate regulation according to informed sources. ICT-enabled services already available in South Sudan include:

- A videoconference facility via satellite has been piloted with an IDirect hub at the MoTPS and a link between Juba and one of the state capitals. The Ministry plans to make the same facility available at all state capitals. Already, a VSAT-based network links all the state capitals and Juba.
- The Ministry of Internal Affairs is developing a National Identification System.
- An Electronic Record Management system has been piloted in the Ministry of Cabinet Affairs.
- The Sudan Vote Monitor website enabled the public to monitor and report on the April 2011 national elections via SMS, email or the web

ICTs in education. ICTs have also been used in the field of education – where a mix of old and new ICTs have been deployed, i.e. radio, MP3 players, computers, etc. ICTs are known to have a positive impact on increasing opportunities for education and for lifelong learning. In November 2005, the Multi-Donor Trust Fund (MDTF) gave the first disbursement of \$20 million to the GOSS for the rebuilding of health and education services.¹³⁰ A significant investment is required for the education system in South Sudan- only 1,600 schools exist for the 1.6 million children of school age, only 10% of the classrooms are in permanent buildings, 80% of the children have no bench to sit on and only one-third of the schools have access to latrines and half have access to safe clean water.¹³¹

In spite of the seemingly dire situation, there are still initiatives that seek to take advantage of the use of ICTs in education. These include the use of radio and the use of computers. The Southern Sudan Interactive Radio Instruction (SSIRI) is program of the Ministry of Education, Science and Technology¹³² that focuses on the effective use of radio for delivering high-quality education programs to children, youth and adults.¹³³ Administered by the Education Development Centre (EDC), it is funded by the United States Agency for International Development (USAID). SSIRI broadcasts three major programs on FM radio stations throughout Southern Sudan, namely:

- *Primary Education* – The Learning Village that consists of half-hour programs in English, local language

129 International Telecommunications Union (2009), The World in 2009: ICT Facts and Figures.

130 infoDev.ICT in Education in Sudan, Amr Hamdy, 2007. (Online version available at www.infodev.org/ict4edu-Africa).

131 GOSS Ministry of Labour, Public Service and Human Resource Development. CIDA/PALAMA Regional Capacity Building Project – Baseline Study Report, November 2009.

132 Now split into the Ministry of General Education and Instruction, and the Ministry of Higher Education, Science and Technology, as announced in Presidential Decree No. 26/2011 for the Establishment of the National Ministries of the Republic of South Sudan, 2011.

133 Southern Sudan Interactive Radio Instruction, <http://www.ssiri.org/index.html>. Accessed September 5, 2011.

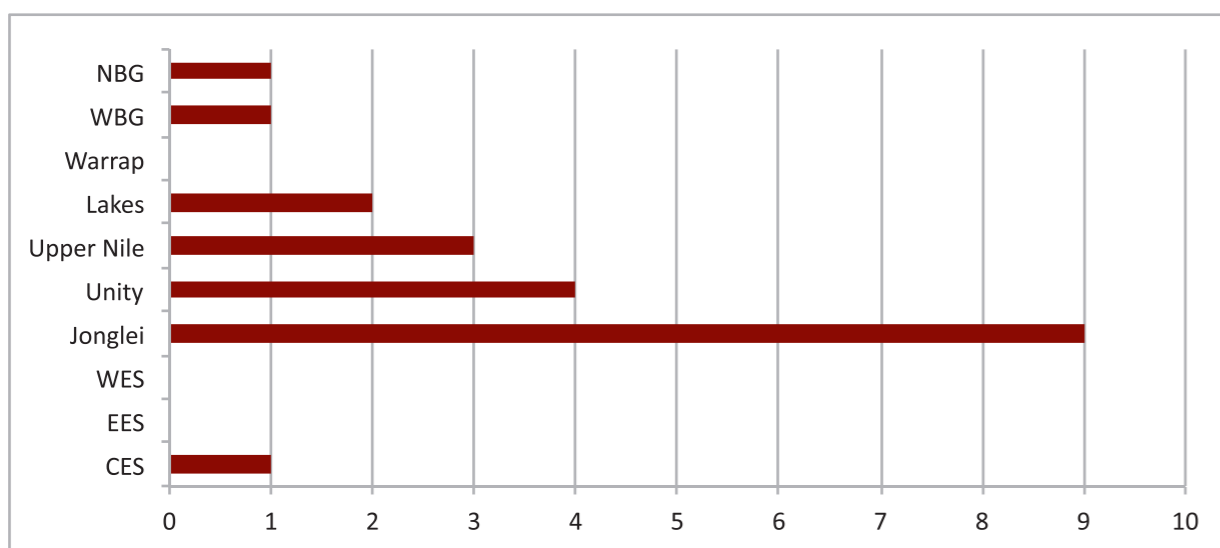
literacy, mathematics, and life skills for Grades 1 to 4.

- *English – The Terbia* (Teaching English through Radio-Based Instruction for All) that consists of half-hour radio programs to provide English language instruction to youth and adults.
- *Professional Studies for Teachers* that is a radio-based, distance-learning course to improve teaching and classroom management.

In recognition of the energy challenges, SSIRI provides

participating schools and adult learning centres with solar-powered and wind-up radios.¹³⁴ SSIRI outreach coordinators train teachers on how best to use and care for the radios and how to integrate the radio programs into the school day. For areas that are out of the coverage range of the FM stations, SSIRI makes the programs available via digital devices such as MP3 players and boom boxes – whereby solar panels or wind-up devices are used to recharge the batteries. In addition, to further strengthen teacher education programs, SSIRI is implementing computer centres that have Internet access and video production equipment.

Figure 10.6: Alternative Education Centres in South Sudan States



Source: GOSS Ministry of Education, Science and Technology

In terms of outreach, SSIRI is available in seven states as highlighted in Figure 10.6.¹³⁵ By June 2010, it was reported that over 90,000 children received SSIRI programs and over 300,000 youth and adults received English and primary school programs in their homes.

In addition, there is need to have skilled human resource in ICTs. As of 2009, only Sunshine Learning College was offering a Computer Science program at university/college level and had 12 (0.2%) male students then.¹³⁶ In terms of numbers, vocational institutes fared better in the same time frame with 314 (11%) students receiving computer training in five vocational institutes across South Sudan.¹³⁷ In April 2009, the College of Computer Science and Information Technology (CCSIT) was established at the University of Juba offering two Bachelor of Science degree programs (5 years) in either Computer Science or Information Technology. The same courses are available at diploma level (3 years) as well as a diploma program in Computer Systems & Networks. Currently, there are 157 students enrolled in diploma programs and 104 enrolled in

degree programs. CCSIT has two computer labs installed with office management software tools for training purposes and student work:

- A State-of-the Art ICT Lab with 20 standalone computers. The facility was donated by the government of Norway.
- A State-of-the Art ICT Lab with 60 networked computers. The facility, including the building, was donated by CNPC International (Nile) Ltd (Chinese Company).

10.2 Expanding Access to Communications

It is widely accepted that the ICT sector, including ICT infrastructure and ICT-enabled services, has a key role to play as a driver of economic and social development. A

2009 World Bank econometrics analysis of 120 developed and developing countries showed, for example, that there is an increase in economic growth of 1.3 percentage points for every 10-percentage-point increase in the penetration of broadband services.¹³⁸ Because a broadband network has the potential to contribute so much to economic development in South Sudan, it should be widely available at affordable prices and should become an integral part of national development strategies. The regional and national infrastructure required to provide adequate access in the information age consists of:¹³⁹

- Strategic information systems necessary for sustainable economic development such as education, health, public financial management, and transportation
- Broadband telecommunications networks, and computer hardware and software

10.2.1 Key Challenges Facing the ICT Sector in South Sudan

South Sudan faces a number of well known challenges for the development of its ICT sector and expanding access to communications, including:

- Lack of access to infrastructure
- Lack of energy sources for users and for powering up the ICT infrastructure
- Expensive communication infrastructure
- High tariffs associated with ICT services and applications

In addition, as a newly formed country, South Sudan has unique challenges to address including the launch of its own country code and its own domain name. While preparations for management of the new .ss domain are still underway, a plan to migrate to its own country code is underway. All the telecommunications operators have noted that they were on course with the necessary hardware and software configurations required to start offering services under the South Sudan code of +211. On top of the equipment requirements, this exercise is expected to include procurement and delivery of new SIM cards, training of agents to support users swap cards and mobilisation of users to swap cards. All operators indicated that they would meet the costs for this exercise, which was estimated to range from half a million to about US\$2 million.

Furthermore, the telecommunications operators identified a number of challenges for their operations in South Sudan. Key challenges identified by the operators can be classified broadly as infrastructure, regulatory and financial.

Infrastructure. The key concerns about infrastructure are as follows:

- Need for a fibre optic national backbone as the country currently relies on a combination of microwave and expensive satellite links to provide nationwide coverage. This challenge affects both telecommunications and broadcasting.
- The broadcasting sector currently relies primarily on satellite communications to transmit radio and TV signals to the Diaspora and the local audience as well. Via satellite, South Sudan TV is available to the local audience and the Diaspora in Africa, Middle East, Western Europe, North America and Australia. However, not all the local audience has access to satellite receivers and yet the terrestrial radio and TV transmissions do not cover the entire South Sudan territory. If the national backbone were in place, this would also serve the purpose of transmitting radio and TV. The terrestrial infrastructure would also facilitate expansion of coverage of public TV and radio service nationally
- A number of companies (over 20) have offered solutions to the South Sudan National Backbone. GOSS requires technical assistance in order to evaluate the options being offered.
- Poor quality of service and unreliability of phone service (a development worker noted that they still maintain a satellite phone as backup)
- Lack of other basic infrastructure, in particular, roads that are necessary in order to reduce the currently very high operational costs, and energy to run their equipment and services.

Regulation. Key concerns about the regulatory environment are as follows:

- Revision of license may have a significant adverse impact on existing investments – and so existing operators would like minimal change from the status-quo
- Need for fair and level-playing ground for the enabling environment and for actions by the regulator.

134 Soul Beat Africa. Southern Sudan Interactive Radio Instruction. <http://www.comminit.com/?q=africa/node/134510>. Accessed August 2, 2011.

135 GOSS Ministry of Education, Science and Technology. Alternative Education Centers by State and Program, 2009.

136 GOSS Ministry of Education, Science and Technology. Students in Higher Education by Institution, and Gender, 2009.

137 GOSS Ministry of Education, Science and Technology. Students in Vocational Institutions by Institution and Type of Study, 2009.

138 World Bank. Information and Communications for Development 2009: Extending Reach and Increasing Impact.

139 Oshikoya et al (1998). op cit.

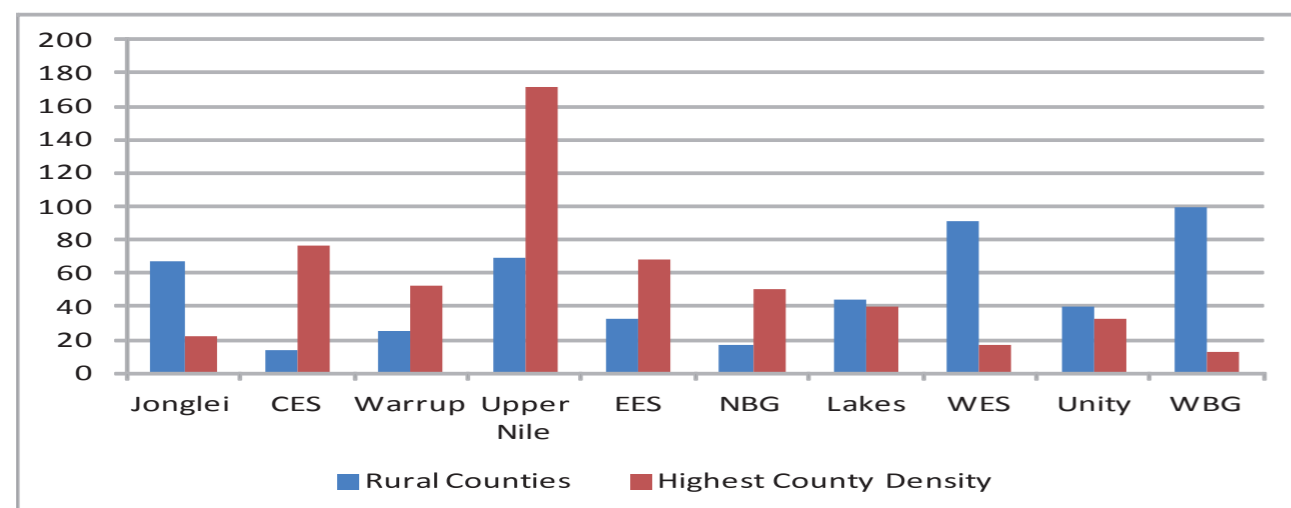
- Comprehensive development of ICT-enabled services including mobile banking – for which regulation is required – and which would drive access and usage of their networks.
- Clear quality of service parameters against which ICT services can be measured. Currently all operators noted that they do meet internationally accepted key performance indicators; however, MoTPS does not have the capacity to make independent assessments.
- The regulator/MoTPS lacks spectrum management capacity and hence cannot adequately address complaints related to signal interference.
- Multiple taxation in a variety of areas, including when bringing equipment into the country and when searching for mast sites in the states/counties. It was also noted by one operator that in effect, tax incentives are on paper, but not in practice. Prior to 9th July, telecommunications operators were classified as big companies and hence their national taxes and levels were handled by the Government of Sudan.

From the perspective of the Government of South Sudan a key challenge is to formulate and implement policies and programs that promote universal access to ICT services. The ICT infrastructure situation in South Sudan indicates the need for universal access programs to facilitate the provision of basic communications services to all in the short to medium term. Universal access programs are also needed due to the high costs associated with delivery of communications services to rural/undeveloped areas – typically comprised of dispersed settlements with population densities of less than 15 people per square kilometer.

Financial. The key financial concerns are as follows:

- Provision of services and equipment is done in USD and yet operators collect revenue in local currency. The exchange rate has been fluctuating rapidly posing a challenge for operators.

Figure 10.7: Proportion of Counties in with Population Densities Less than 15



Source: South Sudan National Bureau of Statistics

The unit cost of providing a basic infrastructure package in rural areas is US\$400 per capita, compared with US\$200 per capita in densely populated cities, even when the options for cheaper decentralized technologies for rural areas are considered. At 40% of the gross national income per capita, the unit cost for rural connectivity is not affordable. The large share of population in rural areas will affect the uptake of ICT services and growth of the ICT sector if no universal access programs are implemented. Figure 10.7 shows the proportion of counties in each state with population densities less than 15 people per square kilometer.¹⁴⁰

In comparing Figure 10.3 and Figure 10.7, one can observe that CES and Upper Nile which have a much higher proportion of telecommunication PoPs relative to the population, also have within them counties that have population densities above 50 people per square kilometer. However, population density is not the only determining factor as high-yielding economic activities (in case of low density population, but with high incomes) can also be a factor to incentivize operators to move into low-density areas. As indicated in Chapter 1, South Sudan has a population density of 13 people per square kilometer (see Map 1.3).

¹⁴⁰ South Sudan Centre for Census, Statistics and Evaluation (2010), South Sudan Statistics Yearbook 2010. Indicator 18-28: Population, Area and Population Density by County.

10.2.2 Strategy for the Decade Ahead, 2011 - 2020

The Southern Sudan Development Plan 2011-2013 (SSDP) envisions a key role for the ICT sector in the economic growth of the country.¹⁴¹ It also envisions economic benefits accruing to all South Sudanese from the use of ICTs in a variety of ways. These include Agricultural and Business Development Services that utilize ICT for enhanced market information and farmer/pastoralist association price negotiations; improved agricultural advisory services, and use of ICT for market and product information. As Table 1.8 in Chapter 1 indicates, in 2010 there were 97 businesses registered as providers of information and communication services in south Sudan (equal to 1.3% of total businesses registrations).

In its development plan, and as is typical for the ICT sector in other countries, the Government indicates its intention to limit intervention to those activities that the private sector is not able, or currently not willing, to engage in but which are of benefit to society. This calls for identifying the coverage gap within the ICT sector for which government will have the legitimate role in leading the supply and maintenance of public goods. As stated in the plan, GOSS plans to ensure that the provision and maintenance of public goods and services is done cost-effectively, sustainably, is based on value for money, and where appropriate will move towards cost-recovery for the services provided. The SSDP further recognizes that maintenance of public goods is a high priority as it is typically more cost effective to maintain existing infrastructure and services than it is to build new ones.

Development targets for South Sudan's ICT infrastructure. The SSDP outlines a number of targets for the Ministry of Telecommunications and Postal Services (MoTPS) as well as the Ministry of Information and Broadcasting (MoIB).

In the short- term, over the period 2011–2013, the SSDP expects MoTPS, in collaboration with telecommunication operators and courier service providers, to increase coverage, access, usage and literacy of ICT and postal services across the country. The target number of counties with at least one base telecom station would rise from 61 to 79 (i.e., all counties to have at least one base station), and telecommunication exchange offices as well as opening of states offices from 4 to 12. The MoIB is expected to increase access to public media and improve the broadcasting quality of the South Sudan Radio and TV. The number of licenses is targeted to increase from 32 FM radio stations to 38, and newspapers to increase from 8 to 12. The number of states with radio relay stations is to increase from 0 to 10, and the average South Sudan TV broadcast time from 6 hours per day to 18. Fundamental to the successful deployment and utilization of ICT nationwide is reliable and affordable access to energy – a matter that is the subject of Chapter 8 of this Report.

For the purposes of this Report a series of objectives are set for the ICT sector for 2020. Achievement of these targets would bring South Sudan into line with many other Sub-Saharan countries and improve its regional and international competitiveness. These development targets take into account the Connect Africa Summit goals - which need to be achieved by 2015. The projections made here therefore are for the mid-term up to 2015 and for the long-term to be achieved by 2020. The projections take into account the following: (i) with peace, security and government commitment for the ICT, South Sudan has good potential to attract ICT investments; (ii) wireless access deployments will dominate the ICT infrastructure, even while it is expected that the infrastructure will include a combination of wireless, satellite and fibre optic networks; and (iii) demand initiatives including the use of e-government and m-government services will spur interest in use of the internet. Mobile computing devices including smart phones will encourage more use of the internet.

Table 10.5: Development Targets for South Sudan's ICT

Indicator	Present Situation (2010-2011)	Med-term (by 2015)	Long-term (by 2020)
Selected indicators on ICT infrastructure and Access			
Percentage of population covered by a mobile cellular	60	90	100
Mobile telephone subscriptions per 100 inhabitants	12	18	40

¹⁴¹ Government of South Sudan (2011), South Sudan Development Plan 2011-2013: Realising Freedom, Equality, Justice, Peace and Prosperity for All. Council of Ministers Draft. Juba, July 5, 2011.

Indicator	Present Situation (2010-2011)	Med-term (by 2015)	Long-term (by 2020)
Internet users per 100 inhabitants		3	10
Percentage of localities/counties with public internet access		30	50
Access and use of ICT by households, individuals and selection institutions			
Proportion of households with a radio	25	50	80
Proportion of households with telephone	15		
Proportion of educational institutions with ICTs		30	60
Proportion of health institutions with ICTs		30	60
Proportion of government institutions with ICTs		40	70

Source: Estimates by authors (.. Data not available)

A combination of government interventions (e.g. a competitive enabling legal and regulatory environment, and universal access programs) and private sector initiative will lead to an increasing number of institutions making use of ICTs. This will include health/educational institutions being able to acquire internet access on their own with reducing costs of internet access as the South Sudan national backbone is rolled out.

In charting the way forward for the decade ahead, the country would do well to align its framework with those of other African countries for the development of ICT in the region. This will not only enable national development, but enable such development in a manner that is consistent with regional objectives hence facilitating South Sudan's path towards regional integration.

Efficient infrastructure and related services have been recognized as important in pursuit of Africa's development goals, including regional integration. Conversely, inadequate ICT infrastructure and services result in increased production and transaction costs, which reduce

competitiveness and make it more difficult to achieve Africa's development goals.¹⁴² Regional integration is also at the core of African Development Bank (AfDB)'s mandate and it has attached priority towards this since its establishment.¹⁴³

Guiding frameworks for development of the ICT Sector in South Sudan are the Connect Africa Summit Goals and the 2010 Addis Ababa Declaration of the African Union on Information and Communication Technologies in Africa – Challenges and Prospects for Development. The need to strengthen ICT infrastructure was a key issue for the Connect Africa Kigali 2007 Summit whose primary aim was to mobilize the human, financial and technical resources required to bridge major gaps in ICT infrastructure across the continent. Improved ICT infrastructure is expected to support affordable connectivity and applications and services to stimulate economic growth, employment and development throughout Africa. The Kigali Summit endorsed five goals as highlighted in Box 10.1.

Box 10.1: Connect Africa Summit Goals: Addressing Broadband ICT Infrastructure

Goal 1: Interconnect all African capitals and major cities with ICT broadband infrastructure and strengthen connectivity to the rest of the world by 2012.

Goal 2: Connect African villages to broadband ICT services by 2015 and implement shared access initiatives such as community tele-centres and village phones.

Goal 3: Adopt key regulatory measures that promote affordable, widespread access to a full range of broadband ICT services, including technology and service neutral licensing/authorization practices, allocating spectrum for multiple, competitive broadband wireless service providers, creating national Internet Exchange Points (IXPs) and implementing competition in the provision of international Internet connectivity.

Goal 4: Support the development of a critical mass of ICT skills required by the knowledge economy, notably through the establishment of a network of ICT Centres of Excellence in each sub-region of Africa and ICT capacity-building and training centres in each country, with the aim of achieving a broad network of inter-linked physical and virtual centres, while ensuring coordination between academia and industry by 2015.

Goal 5: Adopt a national e-strategy, including a cyber-security framework, and deploy at least one flagship e-government service as well as e-education, ecommerce and e-health services using accessible technologies in each country in Africa by 2012, with the aim of making multiple e-government and other eservices widely available by 2015.

In line with the Connect Africa Goals, the strategies proposed to enhance South Sudan's ICT sector are consistent with general trends for developing countries as highlighted in Box 10.2.¹⁴⁴

10.2.3 Regulatory reform

Given its professed strategy of a private-sector led development of the ICT sector, it is imperative that the country offers an enabling environment that serves to

promote private investment in the sector, while at the same time ensuring that these services are provided within an operating environment that promotes competition among providers. A clear regulatory regime would minimize uncertainty for current and potential investors in South Sudan as to its ICT investment climate and it would lower the perceived risks of investing in South Sudan. This is particularly important given the numerous other challenges facing development of the ICT sector including low population densities, a largely rural population, and very limited infrastructure such as roads and electricity supply.

Box 10.2: Key Tools and Measures for Enhancing ICT Markets

Regulatory reform	In particular, promotion of a level playing field, open access and fair competition for ICT investments and service provision, policies that entice new entrepreneurial investment in under-served areas
Universal Access and Service Funds (UASFs)	UASFs and other public finance mechanisms such as loan guarantees and public private partnerships (PPPs) to enhance and target investments into priority areas in need of special finance
Fiscal measures	Enabling tax, tariff, import, and business regulation policies designed to reduce risks and financial burdens and provide incentives to ICT investors and financiers
Demand support and capacity building	Initiatives in e-governance, education and training, budget allocations within the public sector for ICT networking and service applications, as well as government pre-purchase of capacity through open tenders (i.e., the government commits to a medium-term contract with one or more providers to purchase capacity in bulk and hence becomes an anchor tenant, which lowers the risk to the private operator in building the infrastructure). Another measure of demand support and capacity building is open procurement plans that leverage ICT industry competition and private sector development
Regional investment	Support and promotion of domestic, regional and other South-South investments (e.g., mobile communications, software and systems houses emanating from emerging markets), and increased sub-regional and regional cooperation to address infrastructure and last mile gaps

Following consultations with stakeholders in government, private sector and civil society, and based on observations, one of the key areas for regulatory intervention is the lack of an independent regulator and lack of a level-playing field for the current telecommunications operators.

Development of independent regulator. The position taken in this Report is that South Sudan can benefit from the creation of an independent regulatory authority for ICT services. International experience has indicated that introduction and strengthening of independent,

142 United Nations Economic Commission for Africa (2010), Assessing Regional Integration in Africa IV: Enhancing Intra-Africa Trade, pg. 295.

143 African Development Bank. Terms of Reference. Regional Integration in Eastern Africa Flagship Report (2010-2014).

144 infoDev. General Trends in ICT Development and UAS Finance. <http://www.ictregulationtoolkit.org/en/Section.3273.html>. Accessed November 1, 2011.

neutral sector regulation has helped to reinforce investor confidence and market performance, while enhancing consumer benefits, as noted by the UN Task Force on Financing ICT.¹⁴⁵ An independent regulator should be free from political interference in its day-to-day or decision-to-decision operations, but the regulator should clearly understand that its role is to implement the policy of the government and only make decisions that are within its legal authority.

The regulatory functions required in South Sudan are typical of the most important duties of regulators, including:¹⁴⁶

- Implementing the authorization framework that provides opportunities for new companies and investors to establish ICT businesses. Simple authorization procedures tend to maximize new entry.
- Regulating competition (including tariffs) involving the effective enforcement of fair and equitable competitive market principles, restraining the power of dominant suppliers and levelling the playing field for new entrants.
- Interconnecting networks and facilities. Normally transparent rules are established for interconnecting all types of traditional and new communications networks and associated cost-based payments.
- Implementing universal service/access mechanisms to ensure the widespread (and affordable) diffusion of ICT.
- Managing the radio spectrum effectively to facilitate new entrants and new technologies, which is particularly relevant to new broadband wireless opportunities and next generation networks.
- Establishing sufficient safeguards to ensure that consumers, particularly children, are protected against bad business practices, cyber crimes and violations of data privacy.
- Minimizing the burden and costs of regulation and contract enforcement.

Given that the process to have a bill that creates an independent regulator is already underway, it is important to cross-check that the key elements are in place for the regulator. Even with that process, there remains need for capacity building through technical assistance to ensure the presence of a strong, fair and independent regulator. In addition, with telecommunication operators already in place, there is need for resolution on a number of key

areas for which technical assistance will also be required. The technical assistance will include studies, provision of consultancies, etc., in the areas of:

- *Regulatory strategy and related policy recommendations:* Analyze the current telecommunications market situation, including support for rollout of services in rural and underserved areas
- *Licensing of services:* Define the terms and conditions for different types of telecommunication/broadcasting licenses and give simplified license formats with regulations on quality of service and other pertinent areas. The licensing regime should be so as to harmonize and level the playing field in South Sudan where operators seem to have significantly different terms of engagement in the country.
- *Spectrum regulation and management:* Identify options and develop regulatory recommendations so as to simplify the spectrum regulation and management regime in South Sudan, based on international best practices; identify the mechanism to make the spectrum also technology and service neutral; identify spectrum related issues and challenges for high speed data services such as 3G, 4G and other broadband Sectors. In addition, there is need to establish a digital migration plan for South Sudan to comply with the international cut-off date of 2015 for analogue transmission.
- *Quality of service (QoS):* Conduct an analysis of QoS in the telecommunications sector; undertake a consultation with stakeholders to identify reasons for below-standard QoS as well as to identify mechanisms to improve QoS; identify ways to harmonize, clarify, and simplify the regulation of QoS in South Sudan.
- *Tariff and competition regulation:* Undertake an analysis of the existing competitive scenario, comparing especially market performance and indicators such as QoS and tariffs with regional peers and global benchmarks. Provide guidance on the optimal number of operators in different service markets, voice, data, broadband, etc.
- *Numbering management:* Numbers are a valuable resource in the ICT sector and hence the need to develop a numbering plan for the +211 code; and guidelines on how best to allocate for the number resources – taking regional experiences and international best practices into account. There is also need to consider option of charging for number resources as one of the mechanisms for financing the regulator.

- *SIM card registration:* Need to ensure SIM card registration is part of the +211 rollout

An estimate of US\$20 million is provided for such studies and assessments over the decade at an average of \$2 million per year.

Another issue that could be considered is the case for a converged regulator handling both telecommunications and broadcasting. This becomes a key issue given the global trends where a single platform is capable of delivering all forms of electronic communications ranging from voice, data, internet access, and broadcasting. However, preliminary indications are that South Sudan would prefer a separate regulator for telecommunications and for broadcasting.

Management of the .ss domain. While South Sudan is now in possession of its own domain, there is need to map out how best to deploy and manage .ss. This will involve significant stakeholder consultation and review of best practices in mapping the way forward. There are a number of benefits arising from equitable management of a country's domain including: (i) managing and operating the domain name; (ii) promote the utilization of the .ss name space; and (iii) facilitate articulation of the views of South Sudan relating to internet use, at both local and international fora.

There is a broad range of models for management of the .ss domain, including management by the regulatory authority, government, private sector, academic institution and telecommunication operators. In any case, it is important that management of the .ss domain will cater for issues including:

- Need to involve stakeholders so as to cater for the needs and interests of the entire local Internet community
- Priority as well as the perceived value attached to the Internet, or more specifically, to the .ss domain, by government in national development plans
- Funding and sustainability of the registry (ccTLD activities) – including whether provision of domain names will be operated as a government activity or as a monopoly service or as a competitively offered service by a number of private sector companies and other institutions
- Oversight of the activities of the registry – including whether this would be done by the regulatory authority, government or by a non-profit or commercial entity that are able to get on board a broad range of stakeholder

views from government, the technical community, and the end users.

- Security of internet networks in general and the domain names related business.

Technical assistance to enable South Sudan plan and map out the management of the .ss domain is a key component in promoting development of the ICT sector.

Establishment of an Internet Exchange Point. There is need to establish an Internet Exchange Point (IXP) to keep local traffic local within South Sudan and hence reduce on costs for international bandwidth as well as increasing the available data speeds to local users. From a public policy perspective, an IXP ensures online services are equally accessible to all local users, enhances competitive opportunities, and improves the quality and affordability of Internet services.¹⁴⁷ Furthermore, the presence of an IXP helps to encourage more local content development and creates an incentive for local hosting of services – due to the lower cost and the larger pool of local users, who are able to access online services faster and more cost effectively. Existing telecommunications and ISP operators should all be encouraged to join the IXP which should also eventually have a connection to the national backbone.

Given the existing development of the South Sudan Gateway and the need for all the operators to have linkage with this, the functionality of an IXP could be considered as an additional function focused on interchange of data.

Open access policy in support of a sustainable ICT sector. At the Fourteenth Ordinary Session of the Africa Union Assembly in 2010, Heads of State and Government emphasized the need to develop a sustainable ICT sector based on the principles of technological neutrality, non discrimination and open access. Principles of open access are important to ensure that all networks – particularly subsidized or public/private partnership networks, and networks in rural or remote areas – offer capacity or access to all market participants in a non-discriminatory way. This helps promote the delivery of ICT services in a competitive and affordable way for end users.

Open access entails facilitating competition at every layer within the communications network. This means that there is competition in access to the undersea cables, in the national backbone, and in the last mile. There is also competition in the provision of services over the ICT infrastructure. Given the huge need for ICT infrastructure across South Sudan, the principle of open access will be a major consideration. In support of its infrastructure rollout, South Sudan will need policies to:¹⁴⁸

145 Report of the Task Force of Financial Mechanisms for ICT for Development: A Review of Trends and an Analysis of Gaps and Promising Practices. December 22, 2004.

146 infoDev. The Role of Regulators, <http://www.ictregulationtoolkit.org/en/Section.1309.html>. Accessed November 1, 2011.

147 Internet Society Reports. Promoting the Use of Internet Exchange Points: A Guide to Policy, Management, and Technical Issues, Mike Jensen. 2009.

148 World Bank (2011). Broadband Strategies Handbook. Washington, DC. 2011.

- *Promote effective competition and encourage investment:* Encourage wireline and wireless infrastructure sharing by multiple providers – which can be more efficient, especially in low population density areas (which represent much of South Sudan)
- *Facilitate access to rights of way:* (i) facilitate access to public rights-of-way available for building ICT networks which can help ease construction of both long distance (backbone) and local connections; and (ii) develop policies that provide open access to government-sponsored and dominant operator networks so as to enable greater competition in downstream markets
- *Facilitate open access to critical infrastructure:* (i) develop policies that provide open access to government-sponsored and dominant operator networks enable greater competition in downstream markets; and (ii) consider implementation of local loop unbundling if necessary to facilitate competition

A concern that has so far been raised by one of the current telecommunication operators is that the requirement for operators to build out their networks in an open access manner should be coupled with a requirement that all interested to make use of their networks will need to declare the traffic/service to be deployed (i.e. no “dark sharing” permitted). Some of the existing operators have also expressed reservation with infrastructure sharing as they consider it as a means for introducing cut-throat competition in areas where they have borne the full cost of making infrastructure available. It is thus important that open access principles are deployed in such a way so as not to serve as a dis-incentive for potential investors in South Sudan’s ICT infrastructure.

10.2.4 ICT Infrastructure and the Case for Universal Access Programs

The Connect Africa Summit called for the following with respect to ICT infrastructure:

- Interconnect all African capitals and major cities with ICT broadband infrastructure and strengthen connectivity to the rest of the world by 2012.
- Connect African villages to broadband ICT services by 2015 and implement shared access initiatives such as community tele-centres and village phones.

Given the limited ICT infrastructure currently available as well as the low population densities that are largely rural-based, programs for ICT infrastructure development will necessarily need to address the question of universal access.

Development of a national backbone network. The Ministry of Telecommunication and Postal Services (MoTPS) has already put forward a proposal for a national backbone infrastructure. The plan involves backbone infrastructure linking various parts of the country along with a series of metropolitan fibre rings in the state capitals. In the immediate term, it is opportune to consider quick access to the undersea cables to provide an alternative to expensive satellite access. In this regard, it is proposed that the following section of backbone network be developed:

- Fiber-optic link to submarine cable through Kenya to deliver broadband connectivity to South Sudan Internet Exchange Point (Connection via Lokichoggio in Kenya)
- Metropolitan fibre rings in two state capitals along the backbone link to provide broadband networking among government/state institutions and for the private sector and public

In addition, there is need for studies to develop a phased approach to rolling out backbone and last mile connections in support of South Sudan’s ICT infrastructure.

In estimating the costs per kilometer of turnkey ICT infrastructure, this Report uses two data benchmarks applied in the World Bank 2009 paper on “Costing the Needs for Investment in ICT Infrastructure in Africa”:¹⁴⁹ (i) a rate of \$27,000 for links that are 400 km or shorter; and (ii) a rate of \$19,000 for links longer than 400 km. While the World Bank used a threshold of 300 km, given the higher cost of construction in South Sudan, for the purposes of this Report a threshold of 400 km is used instead of 300 km. For comparison purposes, in October 2008, Rwanda contracted Korea Telecom for a 2,300 km project at \$17,391 per km, and in November 2007, Malawi contracted Huawei Technologies for a 1,500 km project at \$15,267 per km.

Map 10.3 presents the MoTPS proposal for a phased approach to the national broadband backbone.¹⁵⁰ The plan is to establish three corridors:

- Eastern Corridor (green line): Renk-Malakal-Bor-Juba-Torit-Kapoeta through to Lokichoggio, with a spur line from Malakal to Bentiu

- Central Corridor (orange line): El-Mujlad-As Sumayh-Aweil-Wau-Rumbek-Juba-Nimule-Gulu, Uganda, with a spur line from Wau to Raja and another to Kwacjok
- Western Corridor (pink line): Wau-Tambura-Yambio-Yei-Kaya (to Uganda), with spur lines Maridi-Mundri and Yei-Juba

An estimation of the turnkey costs for the South Sudan backbone is developed using Map 10.3 and yields a total cost of about US\$ 113 million for a total of 5,720 km. It is proposed to build out the Eastern Corridor in the short-term, the Central Corridor in the medium term, and finally the Western Corridor.

MAP 10.3: Proposed Expansion of National Broadband Network



Source: Ministry of Telecommunications and Postal Services

In addition to the Corridors, it is proposed to build metropolitan rings around the state capitals and major towns of South Sudan. These fibre rings will serve to provide broadband connectivity between government ministries, commissions, chambers and other strategic offices. The rings should also be extended to provide broadband connectivity to key institutions in the education and health sectors. It is proposed to build 2-3 metropolitan rings per Corridor depending on the towns most likely to benefit from the factors such as presence of the corridor as well as economic and social development opportunities. Assuming 100 km of connection per ring, an average cost of \$3 million per city is estimated, making it a total of \$9 million per Corridor and a total of \$27 million.

Altogether, over the decade, a total of \$140 million is required for the country backbone and metropolitan rings around 9 key state capitals/major towns. This estimate

assumes an all fibre network; however, the final design would need to integrate wireless options as appropriate for particular links or sections of the networks. The estimate also caters for the metropolitan rings independent of the backbone – even when there would be instances of overlap between the two networks. This all would serve to lower the cost estimates determined for the decade.

Development of a universal access program. In rolling out communication services across South Sudan, it is important that the rollout plan is guided by anticipated demand from the various rural areas in order to prioritize the network deployment. Such demand can be estimated from data including the percentage telecommunication expenditure of GDP, percentage of GDP accounting for household income, typical rural income compared to average income, regional variation of income, percentage of telecommunication revenue from business users,

149 World Bank (2009), Connecting the Continent: Costing the Needs for Spending on ICT Infrastructure in Africa. Washington DC, 2009.

150 Ministry of Telecommunication & Postal Services, Government of Southern Sudan. Concept Proposal for Southern Sudan Optical Fibre Backbone Network. June 2009.

telecommunication expenditure by households, as well as household number and size¹⁵¹. The universal access demand studies would be part of the regulatory strategy and related policy recommendations that need to be made for regulation of the ICT sector in South Sudan.

In addition to demand, in deploying universal access funds, it is important to address a number of important elements to consider, namely, connectivity, competition, innovation/growth and social benefit.¹⁵² Projects which focus on one and exclude the others will likely not be optimal for taxpayers. For example, money invested which creates or strengthens a monopoly provider in a given state or region may expand connectivity, but will likely stifle competition, innovation and possibly social welfare. On the other hand, simply focusing on projects which ensure economic growth based on the demand studies may leave further unserved/underserved areas without sufficient connectivity and lead to social inequality.

In developing the universal access program, recommendations from the Tenth Forum on Telecommunication/ICT Regulation and Partnership in Africa (FTRA-2009) can serve as a guide for the program development. As presented in Annex 11-C, FTRA 2009 with its theme “Universal Access and Service Fund (UASF)” provided the opportunity to analyze in depth the mechanisms for the allocation and use of UASFs, and adopted ten recommendations in order to promote the roll out of networks and services to rural areas.¹⁵³

As already noted in the discussion of an independent regulator (Sec. 10.2.1.1), there is need for a technical study to analyze the current telecommunications market situation in the country – including support for rollout of services in rural and underserved areas. The study would among other issues determine the size of the underserved/uneconomic areas for direct private sector intervention, the model(s) to be applied for universal access support and subsidies (e.g. competitive subsidy model, reverse action model, incentive-based private sector model), and the social development priorities. Initially funded by government, it is expected as the regulator develops and is able to generate its own income through licences and fees; the regulator would take on the costs for implementing the universal access strategy.

10.2.5 Business Environment for the ICT Sector

An important measure for promotion of the ICT sector is enabling tax, tariff, import, and business regulation policies designed to make South Sudan an ICT investment destination. In addition, if ICT uptake is to be significantly increased across the country, a major barrier that will need to be addressed is the cost of ICT services. Efforts to reduce ICT price baskets could include infrastructure development and policy as highlighted below.¹⁵⁴

As the discussion in Chapter 2 indicates, South Sudan’s Investment Promotion Act does provide that after registration, companies enjoy tax exemptions and concessions in machinery and equipment, capital and net profits for a pre-determined period.¹⁵⁵ For example, computers attract a deductible annual allowance of 25%, and the Government of South Sudan and the Local Authorities shall provide land for investment. However, there is need for additional attention to other ICT-related costs.

Indeed two key issues raised by telecommunication operators in the country were:

- Promotion of infrastructure sharing and joint planning, e.g., ducts for communication lines and other utilities should be laid out during road construction projects. While telecommunication operators are reserved about their support for infrastructure sharing with fellow operators, this seems to stem from concern about ‘free riding’ to later compete for an existing market share through price warfare that would disadvantage the infrastructure owner.
- Operators are faced with multiple taxation points at national and state levels as they import equipment, procure land for telecommunication sites, etc. There is thus need for review of the taxation policies post-Independence to curb multiple (and sometimes illegal) taxation of goods in transit and to streamline taxation of service provision at national/state/county levels.

The issue of ICT-related costs such as taxes on ICT equipment and services, interconnection rates and regulatory fees is one that has generated a lot of debate across Africa from both the private sector and civil society. Taxes include import duties on ICT equipment, VAT on ICT products and services and excise taxes on ICT services. The variety of taxes and, in some cases, the high rates imposed, are an impediment to the development of ICT infrastructure and services, reducing country competitiveness.¹⁵⁶

Other taxes on ICT services are VAT and excise tax which together considerably raise the cost of telephone use. Studies by the GSM Association have indicated that reducing or eliminating the excise tax would not only increase mobile penetration but also result in greater tax receipts to governments due to higher use of mobile phones and the multiplier effects throughout the economy. As a new country, South Sudan should balance its need to increase its non-oil revenues through a potentially lucrative telecommunication sector with the need for

fiscal measures that favour investment and uptake in the ICT sector.

10.2.6 Demand Support and Capacity Building

Demand support refers to efforts to boost the use of ICT services by raising awareness of its possible benefits, as well as making it affordable and more attractive to users. Such support is necessary to promote uptake of ICT services and applications that ride over the ICT technologies and infrastructure put in place by “supply-side” strategies to enhance ICT network coverage. The supply-side strategies assume that there is unsatisfied demand or that demand will grow to justify the ICT investments – especially in the case of South Sudan which is a post conflict country. Demand support is also necessary as it is expected that with more visible demand, the private sector is more likely to make the necessary investments to expand the ICT infrastructure. One of the key factors driving uptake of ICT services and applications is having the necessary confidence and ICT skills. Hence, capacity building is a core element of any demand support program.

There are three key pillars of demand support programs, namely, awareness, affordability, and attractiveness. It is anticipated that US\$500,000 will be required annually to cater for demand support programs including mechanisms to spur innovations and to reward excellence in deployment and use of ICTs. A number of the activities proposed in this Report have also been highlighted on the World Bank Report on strategies to accelerate broadband.¹⁵⁷

Awareness. Essential first steps in building demand are awareness and sensitisation about the benefits of ICT as well as the capacity to use ICTs. The ICT skills competency can range from a basic understanding, which enables users to access information using ICTs, to deeper technical knowledge, which enables them to create and disseminate their own information, including new applications and services. Activities to address awareness should include:

- Use of ICTs and inclusion of ICTs in schools’ curricular so as to build and promote ICT skills
- Encourage and training small and medium enterprises on the benefits of incorporating ICTs into their businesses
- Provide training on security and privacy to allay public fears on the use of ICTs and well as to curb cybercrimes

Box 10.3: Strategies to Reduce the Cost of ICT Services

- Regulatory policies to enhance liberalization and privatization as well as to strengthen national and regional agencies.
- Regulatory policies to promote infrastructure sharing and hence lower the costs of investment in ICT infrastructure in a bid to encourage more investment.
- Reduce and/or lower various ICT-related costs such as taxes on ICT equipment and services, interconnection rates and regulatory fees,
- Incorporate mobile cellular into universal access policies, for example, by allowing mobile operators to receive money from universal funds to expand coverage.

Source: International Telecommunication Union

151 infoDev. ICT Sector Analysis and Assessing Demand, <http://www.ictregulationtoolkit.org/en/Section.3337.html>. Accessed 1 November 2011.

152 OECD (2009), Working Party on Communication Infrastructure and Services Policy. The Role of Communication Infrastructure Investment in Economic Recovery. May 19, 2009.

153 International Telecommunications Union. 10th Forum on Telecom/ICT Regulation and Partnership in Africa, FTRA 2009, Lusaka, Zambia, <http://www.int/ITU-D/afr/events/FTRA/2009/index.html>.

154 International Telecommunication Union. Information Society Statistical Profiles 2009 – Africa.

155 Government of South Sudan. Laws of Southern Sudan. The Investment Promotion Act, 2009.

156 Telecommunications Management Group. Trade in Information and Communication Services: Opportunities for East and Southern Africa. A Study Commissioned by the Global Information and Communications Department, World Bank.

157 World Bank (2011). Broadband Strategies Handbook. op cit.

- Support secure e-transactions so as to build confidence in the use of electronic systems and mechanisms of transacting business

Affordability. A major barrier to the uptake of ICT services is the affordability of the services and/or the equipment, installation charges, and service fees necessary to access the ICT services. Government subsidies may be required to encourage uptake through addressing issues of affordability. In turn, such subsidies would promote greater deployment and use of ICT services as well as increase the value of ICT network services in general due to the increasing number of people using ICTs. In addition to the fiscal measures highlighted in section 10.2.3, there are a variety of ways by which government subsidies could be implemented, including the following:

- Subsidize the purchase of devices or computers, by means of government financing or bulk procurements, vouchers, or distribution of devices. This process could be managed by a Department or an Authority for Information Technology in South Sudan.
- Introduce tax credits for the purchase of devices or computers, or by reducing import duties and other taxes.
- Establish locations for shared or community access to computers and other devices to facilitate the use of ICT services, in addition to providing ICT equipment to educational institutions at cost or via subsidies. The community access points can also serve as Public Information Centres for distribution of government information.
- Introduce measures that reduce or eliminate taxes on ICT service so as to reduce the final price paid by consumers.

Currently, the Ministry of Information and Broadcasting proposes a rollout of Public Information Centres to all states at a rate of three centres established per year. This rollout is considered essential for internal and external communications to be facilitated through adequate and timely information to the public; systematic information flow and management; and the development and use of official government websites, email, video and audio communication. Such internal and external communications would form part of the South Sudan e-Government program using ICT-enabled services to reach out to citizens. This type of initiative not only addresses affordability, but is also likely to generate further interest of the public to make use of ICT services as they interact with government via ICTs. However, it is important to consider the rollout of the Public Information Centres

as being of multipurpose functionality such as serving as a library, internet access point, community meeting area, etc., in order to maximize the utility of these centres.

At this point, it is also important to acknowledge the key role that the postal sector can have in stimulating demand for ICT services. MoTPS has already indicated a need to renovate the existing postal buildings. This is a good move given the wide geographical spread of post offices, and the trust that people tend to have in the network of post offices. In proceeding with this plan, however, it is imperative that consideration be given to the re-development of the postal sector in the current e-environment. Properly integrated with the use of ICTs, the postal services can continue to be a relevant and affordable link with communities providing both traditional and electronic services including public information services, financial services, public internet services, in addition to the delivery of letters and packages.

Attractiveness. In order for consumers to take up ICT services, they need to perceive such services as adding value. The attractiveness of ICT services is therefore key in generating demand. Attractiveness and relevance is facilitated by ensuring that the market provides sufficient choice and diversity of services, applications and content to appeal to all consumers and businesses. One way of making ICTs attractive is by supporting generation and dissemination of local, relevant content in local languages. Another is through creating e-government and ICT applications in areas such as health, education and agriculture.

Governments are able to enhance ICT demand by promoting e-government services and ICT-related standards, distributing content through electronic means, and supporting the development and distribution of electronic content by other players. Government services and applications can be categorised as follows:

- Making government information available (e.g. online, via mobile applications, or through radio and TV, or through the Public Information Centres being established through the Ministry of Information and Broadcasting).
- Conducting transactions with the government.
- Participating in the political process.
- Improving efficiency and effectiveness of the public sector.

As a new country, South Sudan can draw on lessons from the eTransform Africa initiative by the African Development Bank and the World Bank. With the support of the African

Union, eTransform Africa – www.etransformafrica.org - seeks to identify how information and communication technologies have the potential to transform the education and other sectors in Africa. Annex 11.C highlights recommendations for policy makers and regulators in the areas of e-education, e-health and e-financial services.

In order for e-government services and applications to flourish in South Sudan, there will be need for cyber laws to define and recognize electronic signatures, electronic filings and certification of electronic documents as well as laws to address cyber security and to address cases of cyber fraud and other crimes. There will also be need to create awareness and sensitize the public about the various cyber laws so as to help users gain further knowledge of e-government services/applications.

10.2.7 Development of Regional Backbone Network Links

As previously noted in Section 10.1.2, the country currently does not have any intra-regional fiber optic backbone connectivity. Furthermore, as a landlocked country, South Sudan does not have direct access to submarine cables and hence is currently not able to tap into lower costs submarine broadband capacity as compared to access via satellite. As such, it is in the country's best interest to engage in initiatives to address infrastructure and last mile gaps on the continent – as in turn, the country will benefit from submarine broadband access through transiting neighboring countries with submarine access. Not only, infrastructure, but there is need for regional participation in initiatives to address regional concerns such frequency planning, cyber security, regional trade information, etc.

Currently, there are four options for South Sudan to connect to the submarine cables:

- Access via Lokichoggio in Kenya (with potential access to EASSy, TEAMS, and Seacom)
- Access via Uganda with onward access via Malaba in Kenya or via the virtual landing station at Mutukla on the Uganda/Tanzania border (with potential access to EASSy, TEAMS, and Seacom)
- Access via Ethiopia with onward access via Djibouti (with potential access to EASSy, Seacom as well as Mediterranean undersea cables EIG and I-ME-WE)

- Access to Port Sudan in Sudan (with potential access to EASSy)

Already Kenya and South Sudan have announced the 'Four In One' project (also known as the Lamu-Southern Sudan-Ethiopia Transport (LAPSSET) Corridor Project), which is comprised of construction of a railway line, the rehabilitation of roads from Lodwar – Lokichoggio – Juba, construction of a fibre optic link, and an oil pipeline from Lamu (Kenya) to Kapoeta Port (South Sudan)¹⁵⁸. While Kenya's national backbone has been completed up to Lokichoggio, the fibre is reportedly yet to be lit. Currently, South Sudan is already connected to Uganda via microwave, and Uganda's national backbone includes a fibre optic link up to Nimule on the border with South Sudan.

In order to enhance reliability of the country's international bandwidth capacity, and to avoid monopolistic access to the submarine cables, it is recommended to establish at least two virtual landing stations under open access principles such that all ICT operators can gain access on transparent and fair terms. A virtual landing station enables a landlocked country such as South Sudan to have an equivalent physical landing point of the undersea cables.

With in-country connectivity to the relevant borders catered for under the South Sudan national backbone costs, the cost of each virtual landing station is estimated at \$3 million. It may also be necessary to budget for \$ 2 million per virtual landing station to connect to the closest fibre/broadband link in the country of transit to the cable. Such connections could be established as high-speed terrestrial wireless links in the interim, given the drive within the region for broadband national networks largely based on fibre networks. This wireless links could later serve to provide redundancy or can be redeployed when the fibre links are eventually established. Feasibility studies are required to the establish the actual link routes given the multiple options to connect to the submarine cables, and to identify the amount of resources required to connect South Sudan to the submarine cable and to other African capitals – as called for by the Connect Africa Summit.

In enhancing the country's regional connectivity, it is also important to follow up on existing regional connectivity projects, particularly those in Eastern Africa, to which South Sudan has proximity. Table 10.6 presents details for two regional backhaul connectivity projects in Eastern Africa.

158 Africa Bandwidth Maps. Kenya Plans Direct Fibre Link to Southern Sudan, 2011.

Table 10.6: Regional Backhaul Connectivity Projects in Eastern Africa

Indicator	Description	
Project	East African Regional Backhaul Network	East Africa Community Infrastructure Network (EAC-BIN)
Country links	Burundi, Kenya, Rwanda, Tanzania and links to Gjibouti, Eritrea, Ethiopia and Sudan	Burundi, Kenya, Rwanda, Tanzania and Uganda
Route (km)	4 367	
Supporting institutions	World Bank Regional Communications Infrastructure Programme	NEPAH IPPF
Status	Feasibility study addressing missing links is being fi by the AfDB and World Bank	The AfDB is financing the project through NEPAD IPPF. The detailed pre-investment analysis/study is aimed at implementingan integrated East African Broadband ICT Infrastructure Network that would provide cross-border connectivity among EAC partner states and link up with global gateways through sumbmarine fibre cable systems

Source: African Development Bank.

10.3 Building Institutional Capacities

As noted earlier in this Chapter, the ICT sector is governed by the Ministry of Telecommunications and Postal Service (MoTPS) as well as the Ministry of Information and Broadcasting (MoIB). Both ministries provide policy direction and perform regulatory functions. However, there remains need for institutional and human capacity development. For example, as the current regulator, the MoTPS does not have the capacity to monitor spectrum utilization even though it does have a frequency allocation

plan in place. One of the ongoing concerns within the MoIB is the lack of maintenance/repair technicians to handle any problems with their expensive transmission and broadcasting equipment. Such equipment is currently shipped to Nairobi or Dubai for repair.

The proposed Action Plan for the ICT sector includes a total of \$38.1 million for a range of capacity building initiatives (\$32.2 million) and technical studies that will support policy making and program design and implementation (\$5.9 million). Table 10.7 below provides details for the capacity building and technical support program.

Table 10.7: Regional Backhaul Connectivity Projects in Eastern Africa

Category	Estimate	Projected						Total 2011-20
	2010	2011	2012	2013	2014	2015	2020	
Capacity building and technical support								
Ongoing programs								
Donor-funded capacity building for the media	3 945	2 914	2 641	-	-	-	-	5 555
Proposed programs								
Strengthen Samuel Yunis Institute	-	-	750	1 000	1 000	300	300	4 550
Support for government printing press	-	-	30	-	-	-	-	
Develop communications regulatory authority	-	-	2 000	2 000	2 000	2 000	2 000	18 000
Improve business operating environment	-	-	300	300	300	-	-	900
Support for University of Juba	-	-	375	525	300	-	-	1 200
Capacity building for e-applications	-	-	500	500	-	-	-	1 000
Strengthen procurement capacities	-	-	500	500	-	-	-	1 000
Total	3 945	2 914	7 096	4 825	3 600	2 300	2 300	32 235
Technical studies								
Proposed programs								
Master plan for national fibre optic grid	-	-	500	500				1 000
Design of universal access program for ICT	-	-	500	500	-	-	-	1 000
ICT skills audit & training needs assessment	-	-	300	300	-	-	-	600
Develop & popularize cyberlaws	-	-	100	100	50	50	-	300
E-Readiness study to assess requirements for e-applications	-	-	300	-	-	-	-	300
Development & support for e-applications	-	-	500	500	500	200	200	2 700
Total	-	-	2 200	1 900	550	250	200	5 900
Grand total	3 945	2 914	9 296	6 725	4 150	2 550	2 500	38 135

Source: Annex Table 11.1.

10.3.1 Ongoing Initiatives in Support of Institutional Capacity Building

In general, the full potential of ICT in South Sudan is significantly hindered due to minimal uptake and utilization of ICT services. Even where available, communities generally lack the capacity to make the best use of the services. Measures to address this situation include initiatives by UNDP to assist GOSS through its ICT institutions and its volunteers to promote ICT for human development. The UNDP has provided communication facilities to the President's office and to all State Governor officers. In addition, UN volunteers have been posted to all Governors' offices to provide technical support and basic capacity building.

To-date there have been a number of initiatives to build institutional and human capacity, including for example:

- Under MoIB, the Capacity Building, Institutional and Human Resource Development (CABIHRD) project supported the establishment of a Public Information Centre. Achievements to-date include:
 - o Construction of the Public Information Centre in Juba
 - o Procurement of furniture, computers, a web server, generators, photocopiers, printers and scanner for the Centre
 - o Official GOSS website was developed and launched in December 2009
- In 2008/9, 46 staff under MoIB received training from the Government of Kenya in a variety of areas including news reporting, news editing, and TV production. In the same period, 53 staff under MoTPS were identified for management and leadership training.
- The MoTPS has proposed the Samuel Yunis ICT Institute to build requisite expertise and capacity to design, develop, operate, manage, maintain and use emerging information systems and ICTs.¹⁵⁹ An Acting Principal is already in place and the short term plans are to outsource trainers from the African Advanced Level Telecommunications Institute (AFRALTI) – an ICT capability building inter-governmental organization headquartered in Nairobi, Kenya.

Nevertheless, there is need for significant institutional and human capacity building if South Sudan is to harness the opportunities of the ICT sector.

10.3.2 Proposed Institutional Capacity Building Program for ICT

The institutional capacity for South Sudan can be met in a variety of ways, including training and the use of technical assistance – with a requirement to build local capacity. In the area of training, there is need for a comprehensive ICT Skills Audit and Training Needs Assessment to determine the skills gap in ICT sector ministries and further on with various levels and entities of government and key users such as health and educational institutions. Government entities include, for example, the Government Printing Press that has recently procured modern printing equipment, but is in need of recruiting and training appropriate technical and administrative staff.

The assessment would address both needs in terms of management and regulation of the sector as well as needs in terms of effective uptake and usage of ICT services and applications. There is currently opportunity to have the ICT Skills Audit and Training Needs Assessment conducted as one of the activities under the Africa Development Bank's Korea-Africa Economic Cooperation (KOAPEC) ICT Training program. In addition, South Sudan can also benefit from ongoing KOAPEC ICT Training as well as KOAPEC consultancy services in ICT policy, infrastructure and applications. For example, support will be required for the development of ICT applications such as e-government and applications in education and health as outlined in Sec. 10.2.4.3.

The proposed training initiatives also need to support institutions such as the Samuel Yunis ICT Institute and tertiary institutions such as the University of Juba with the objective to build local human resource capacity for the ICT sector. The Samuel Yunis ICT Institute already had temporary space and has been awarded temporary accreditation by the Ministry responsible for Education. The first batch of 60 trainees, all employees from various ministries, were brought onboard in 2011 and trained by MoTPS part-time staff. To be fully functional, the Institute requires full-time staff, equipment and office/classroom furnishings. There is also need to upgrade the Institute's trainers on industry specific certifications. In the case of University of Juba, there is need to set up a secure,

reliable and scalable network and email system to promote teaching, research and collaboration. The university will also need access to broadband internet as well as establish specialized computer labs in fields such as computer engineering, mobile computing and applications, geographical information systems, computer networks, and software development.

The country is also in need of institution capacity building in support of the broadcasting sector. In terms of infrastructure, broadcasting would benefit from the proposed national backbone and other ICT infrastructure rollout. However, the public broadcasting sector in particular has specific needs as well. As a post conflict country, GOSS recognizes that timely dissemination of information is critical for stability. There is therefore need to expand on the studio and production facilities for South Sudan Radio and TV. Currently, South Sudan has only one radio studio and one TV studio – each of which is used for both transmission and recordings of programs. This limits the time available for airing of programs as part of the time must be used for production of programs. Although the immediate needs are for the establishment of studios in Juba, MoIB also has plans to establish regional studios in Wau and Malakal. In addition to the studios, there is need for outdoor broadcasting vans and associated equipment in support of live broadcasts.

The country's ICT sector needs to lay a proper foundation for growth of the sector in a way that avails the benefits and opportunities for all her citizens. As such, there is urgent need for short-term technical assistance to work alongside the ICT ministries in getting the sector up and running effectively and efficiently. For example, as discussed in Section 10.2.1, there is need for technical assistance for establishment of a regulator and identification of key regulatory issues including regulatory strategy and related policy recommendations, licensing of services, spectrum regulation and management, quality of service (QoS), tariff and competition regulation, numbering

management, and domain name management for .ss. In addition, there is need for technical assistance to develop a digital migration plan for South Sudan so as to prepare the country to comply with the international cut-off date of 2015 for analogue transmission.

10.4 Proposed Capital Development Program for ICT

10.4.1 Overview of the Proposed Development Expenditure Program

As Table 10.8 indicates, total capital expenditures for the communications program are expected to increase from about \$60 million a year in 2010 to about \$100 million a year by 2020 (at 2010 constant prices). The total cost for the decade as a whole is estimated at \$814 million, of which provision of universal voice and data coverage is \$635 million, and development of the national backbone network is about \$150 million. These estimates do not include the cost of building a link from South Sudan to one or more of the existing regional links to the submarine cables. These cost of the national backbone network could be lowered if the design takes into account complementarities of the networks; for example, rather than build out a projected link on the backbone, existing broadband links of the telecommunications operators could be integrated into the national backbone – under open access principles. The bulk of funding for the capital cost of the ICT Infrastructure Plan will be met through private sector participation. Annex 11-F presents details of the ongoing and proposed development expenditures for the Communication Program.

Table 10.8: Ongoing and Proposed Capital Expenditures for ICT Program (\$ '000 at 2010 constant prices)

Category	Estimate 2010	Projected						Total 2011-20
		2011	2012	2013	2014	2015	2020	
Ongoing Government capital works programs								
Telecommunication & postal services	2 170	1 390	-	-	-	-	-	1 390
Information and broadcasting	6 990	5 490	-	-	-	-	-	5 490
Proposed public programs								

¹⁵⁹ Ministry of Telecommunication & Postal Services, Government of Southern Sudan. Samuel Yunis ICT Institute, Juba. May 2009.

Category	Estimate 2010	Projected						Total 2011-20
		2011	2012	2013	2014	2015	2020	
Expand postal network and capacities	-	-	-	250	500	500	100	2 150
Expand radio and TV network	-	-	1 500	1 500	2 000	2 000	1 000	13 000
Establish South Sudan internet exchange point	-	-	50	50	50	-	-	150
Ongoing and proposed private sector programs								
Construct landing platforms and region fibre optic links	-	-	1 000	3 000	3 000	3 000	-	10 000
Construct backbone network	-	-	12 213	12 213	12 213	16 150	9 197	112 680
Construct metropolitan rings for state capitals	-	-	3 000	3 000	3 000	3 000	3 000	27 000
Expand provision of universal voice and data services	51 200	52 130	48 900	51 800	56 000	67 000	153 000	850 830
Total	60 360	59 010	66 663	73 363	79 263	94 150	166 297	1 029 240

Source: Annex Table 11.1.

10.4.3 Private sector investment in the ICT sector

As is common with other developing countries, the focus in the ICT sector is on private-sector-led development; hence the proposed program outlined earlier in this Chapter for liberalization of the sector. Like South Sudan, one notable development in some post-conflict countries such as Afghanistan, Iraq, East Timor and Sri Lanka, has been the level of private sector investment in ICTs. Such countries can leapfrog (or “cheetah jump”) to state-of-the-art next generation networks given the often poor state of ICT infrastructure.

Capital costs for voice and data services. Private sector expenditures in ICT in South Sudan to-date include about \$500 million by Zain as well as \$50 million this year alone by MTN. These outlays have been made in the face of substantial operating costs for ICT provision in South Sudan. Both operators report that they spend in the range of SDG500,000-700,000 (equivalent to \$169,000-238,000) to establish a base station in South Sudan compared to about SDG100,000 (equivalent to \$34,000) for a base station in Sudan. They have indicated that in 2011 spending was in the range of \$150 million on further expansion of their networks, on independent switching stations to separate

their South Sudan operations from those of Sudan, as well as the costs associated with the shift to a+211 country code.

Experience from Sub-Saharan countries suggests that outlays for voice and data service provision are the equivalent of about 0.83% of GDP, 99% of which have been by the private sector. Applying these averages to the non-oil component of South Sudan’s GDP suggests that capital outlays by the private sector have risen steadily from about \$37 million in 2008 to about \$44 million in 2010. (See Annex Table 11.3 for details of these estimates.)

For the purposes of this Report, it is assumed that, as in other post-conflict countries, facilitated by an enabling legal and regulatory environment, the share of ICT investment rises to at least 1% of the non-oil component of GDP. Table 10.9 provides projections of private sector investment based on a high growth scenario for non-oil GDP. The figures include the capital expenditures to roll out universal access voice and public broadband coverage to at least 98% of the population by 2020. Operations and maintenance outlays, which are about 20% of total costs, are projected to rise from \$13 million in 2011 to about \$22 million by 2020. These are conservative estimates of capital and operating costs; they may increase more rapidly as South Sudan becomes an increasingly attractive investment opportunity.

Table 10.9: Projection of Private Sector Capital and Operating Expenses for the ICT Sector
(In \$ millions at 2010 constant prices and exchange rate)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Capital Expenditure	52.13	48.06	51.06	54.5	58.32	62.76	67.9	73.6	79.87	86.78
Operations and Maintenance	13.03	12.02	12.77	13.62	14.58	15.69	16.98	18.4	19.97	21.69
Total Investment	65.16	60.08	63.83	68.12	72.9	78.45	84.88	92	99.84	108.47

Source: Annex Table 11.3 and estimates by authors.

One of the key cost drivers for telecommunication operations is the energy costs due to rising costs of fuel. This is due to the limited coverage and reliability of grid electricity power supply. Table 10.10 shows the projection of South Sudan’s energy requirement for the communications network for the decade ahead. These projections for South

Sudan are based on the number of cell sites for the period 2008-2011, as reported by MoTPS, and an annual growth rate of 30% year for the decade as a whole. This would result in about 4,000 base stations by 2020. As shown in Annex Table 11.8, such a growth rate is comparable to that of Burundi, another post-conflict country.

Table 10.10: Projection of Energy Consumption from Market-driven ICT Investment

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Electric Power Consumption (gWH)	55	7.1	9.2	12	15.6	20.3	26.4	34.3	44.5	57.9

Source: Annex Table 11.8.

Chapter 8 provides detailed information about the current and projected demand for electricity. At the present time electricity consumption for ICT services accounts for about 1.3% of total demand; by 2020, it would account for about 1.6% of total demand under the high economic growth scenario used in this Report. Moreover, the reliability of the electricity supply would improve substantially if the capital investment of \$2.2 billion for additional generation capacity and a national transmission grid proposed in this Report was implemented.

services to rural/underserved areas, providing broadband connectivity to educational and health institutions, and implementing demand support programs. As indicated in the SSDP, government does intend to intervene in those activities that the private sector is not able, or currently not willing, to engage in but which are of benefit to society. This calls for identifying the coverage gap within the ICT sector for which government will have the legitimate role in leading the supply and maintenance of public goods. Universal coverage focuses on the supply-side of the ICT sector while universal access considers both supply and demand side issues.

10.4.4 National Government Funding for the ICT Sector

While it is expected that the ICT sector will be largely private sector led, there will be need for government intervention particularly in addressing the social targets for the sector. Social targets include expanding voice and data

In assessing the coverage gap, there are two main areas to be considered – basic communications services defined as voice/SMS coverage and broadband services which includes internet coverage. For the purposes of this Report, universal coverage of voice/SMS services will be attained when at least 98% of the population lives within range of a mobile telephone signal. Furthermore, universal

coverage of broadband service would be attained when a land connection for a public broadband facility (such as an Internet café or telecentre) is available within close proximity of more than 98% of the population.

The cost estimates provided draw upon the gap analysis conducted by the AICD (2009) study on 'Costing the Needs

for Spending on ICT infrastructure in Africa' for the period 2006-2015. The study estimated that if African countries promote effective competition and mobilize private sector resources, they will be in position to have more than 92% of their population covered by voice infrastructure by 2015. In the case of South Sudan, this Report sets the development target at 100% coverage by 2020.

Box 10.4: Universal Coverage

Universal coverage is a prerequisite to universal access and may fulfill the requirements of certain countries without further investment. Once coverage is achieved, fulfilling universal access to ICT services becomes a matter of achieving a social consensus on what level of services constitutes a basic right, what skills the population needs to benefit from those services, and whether the political will exists to invest public funds to bring people and services together.

Source: AICD (2009) Connecting the Continent: Costing the Needs for Spending on ICT Infrastructure in Africa.

To identify the coverage gap that would not be served by the private sector, the AICD analysis was conducted with the following key parameters – population density, income distribution, steepness of terrain, and size of the wireless cell site. The estimates for investment requirements to close the market and coverage gaps are the minimum investments required to achieve corresponding levels of population coverage, rather than to satisfy all demand for individual subscriber connections within those areas. In the discussion to follow, there are two primary types of investment gaps:

- *Efficient market gap*: Difference between existing coverage and the extent of commercially viable coverage under perfect competition whereby there are no economic or regulatory barriers to impede market development. Such gaps can arise because, for example, civil war can prevent network construction and rollout.
- *Coverage gap*: A geographic concept associated with delivery of universal coverage and it is of two forms:
 - *Sustainable coverage*: Areas in which revenue potential is high enough to cater for ongoing operating costs (including a reasonable rate of return), but is not sufficient to cater for initial capital investments over a reasonable depreciation period.
 - *Universal coverage*: Areas beyond the existing coverage, efficient market gap and sustainable coverage areas for

which the revenue potential is not sufficient to fully cater for capital or operating costs of the infrastructure.

While the AICD report did not examine the case of South Sudan, the findings of the comparator countries, as well as the gap analysis for Sudan prior to the independence of South Sudan, were used to make estimates for South Sudan. In making the projection for the funding gap to be covered by the Government of South Sudan, the Report assumes an increase in private sector investment consistent with that given in Table 10.9. The Report also assumes that in anticipation of increased investment to address the development targets identified in Table 10.5 above, the Government will maintain its contribution at 0.01% of non-oil GDP as private sector will contribute to closing the efficient market gap and to at least 30% of the coverage gap. The operating and maintenance costs are assumed to be the equivalent of 0.2% of non oil GDP as in Table 10.9. This is because the population in the coverage gap is mostly rural and is the most sparsely populated; as a result, equipment is widely distributed in often hard to reach areas. This, in turn, drives up the operating and maintenance costs per individual. Based on these assumptions, Tables 10.11 and 10.12 present the public funding gap for universal voice and broadband coverage respectively. In the case of the voice coverage gap, the Government subsidy would amount to an average of \$39.7 million a year to achieve 100% by 2020. In the case of broadband coverage, the annual subsidy would be \$31.5 million a year.

Table 10.11: Funding Required from Government to Bridge the Voice Coverage Gap

Sustainable coverage gap (\$ million per year)	Universal coverage gap (\$ million per year)	Private sector contribution (\$ million per year)	Public funding gap (\$ million per year)	Public funding gap as % of GDP
13.2	43.6	17.03	39.7	0.01

Source: Annex 11-E

Table 10.12: Funding Required to Bridge the Broadband Coverage Gap

Efficient market (% of population)	Coverage gap (% of population)	Efficient (\$ million per year)	Coverage gap (\$ million per year)	Total Investment required for Universal Coverage (\$ million per year)	Total Investment required for Universal Coverage as % of GDP
28.5	71.5	13.9	17.6	31.5	0.01

Source: Annex 11-E

10.4.5 Donor Support for ICT Initiatives

The international donor community has shown interest in supporting development of the ICT sector in South Sudan. According to the Aid Information Management System (AIMS) of the Ministry of Finance and Economic Planning, in 2010 ongoing donor support for the ICT sector amounted to \$12.3 million. Donor support has included the following:

- Support from CTO to develop a three-year strategic plan as well as a plan for digital migration by the global deadline of 2015.
- World Bank mission in March-May 2011 to conduct an ICT infrastructure needs assessment.
- A September 2011 visit by ITU to assess ICT status in South Sudan and support that could be availed by ITU.
- UNDP has employed and deployed ICT specialists to State Governors' offices to provide technical support and assistance.
- Preliminary proposal by MoTPS for establishment of a broadband backbone as highlighted in Map 10.3.

- Review of the taxation policies post-Independence to curb multiple (and sometimes illegal) taxation of goods in transit and to streamline taxation of service provision at national/state/county levels.

In November 2011, the World Bank convened a roundtable to initiate a dialogue among donor agencies, international organizations, and ICT-focused NGOs to discuss existing and planned activities in support of the ICT sector in South Sudan. Annex 11-F provides a detailed description of existing and planned donor activities in support of South Sudan's ICT sector. From informal conversations with donor representatives, it is clear that donors are ready to play an expanded role in capacity building, technical studies and demand support programs such as initiatives in e- applications. In that connection, it will be important for the donor community build on the November 2011 dialogue so as to avoid overlap and to maximize synergies in support for the ICT sector.

10.4.2 Implementation of the ICT Infrastructure Action Plan

This Report presents an ambitious ICT program both in terms of funding and in the timeline for implementation. A number of activities, studies and capacity building initiatives have been identified – all requiring urgent

action. However, this is because of the key role ICTs can play in supporting the overall economic and social goals of South Sudan. It is also because in order to realize the expectation of private sector led ICT infrastructure

growth then key factors such as an enabling environment, a broadband national backbone, and perceived or actual demand need to be addressed. The indicative schedule for the Action Plan is set out in Table 10.13.

Table 10.13: Indicative Schedule for ICT Infrastructure Action Plan

Program Activity	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Institutional Development and Policy Framework										
Revise ICT sectoral bills										
Migrate to .ss domain and country code										
Create regulatory authorities for ICT										
Conduct studies to strengthen regulation										
Capacity building programs related institutional development										
Development of National Backbone										
Develop Master Plan for National funding										
Mobilize private sector funding										
Implement investment program for backbone										
Establish virtual landing points										
Rollout of universal access program										
Conduct studies to establish universal access targets										
Decide mechanism for private access program										
Implement universal access program										
Conduct demand support programs to promote uptake										
ICT applications										
Develop e-Government applications										
Promote electronic financial services/										

Source: Prepared by authors.

Assessing the costs and benefits of support for the ICT infrastructure. In planning to support South Sudan's ICT infrastructure and institutional capacity building, it is important that such support is assessed in terms of its costs and benefits. In assessing the benefits of the ICT infrastructure, one must forecast uptake of the infrastructure following policy implementation since the economic benefits arise from lower prices and greater consumption of the national connectivity and regional links – particularly to the undersea cable. For purposes of this Report, the development targets outlined in Table 10.5 represent the expected access and use of ICT infrastructure and services. As a post-conflict country with petroleum resources, South Sudan is presently an attractive investment destination. Furthermore, telecommunications has already been recognized as the fastest growing sector in South Sudan with liberalization and competition leading to growth in the coverage area. A 2009 World Bank study of 120 countries showed that there is an increase in economic growth of 1.3 percentage points for every 10-percentage-point increase in the penetration of broadband services.¹⁶⁰ In all, it is therefore imperative that prompt implementation of the infrastructure action plan is undertaken to expand access to communications and to manage the risks and uncertainties in the ICT sector which in turn will facilitate

greater access to communications.

The country's ICT sector policies drive the expected private and public cost contributions for the ICT infrastructure. Annex 11-D summarizes some of the basic principles involved in costing of initiatives to develop the ICT sector. For instance, revision of the licensing framework shall entail expenditure on technical assistance, changes to the licenses of existing operators may also involve additional expenses, and some form of government investment will be required to stimulate rollout in rural and underserved areas.

10.5 Financing Arrangements for the ICT Program

The proposed program of development expenditures for the ICT sector amounts to \$851.5 million for the period 2011-2020 (Table 10.14). This total does not include the projected operating cost of ICT service providers that is given in Table 10.9 above. Nor does it include the estimates for the government subsidy that is required to achieve universal coverage for voice, data and broadband services by 2020.

Table 10.14: Ongoing and Proposed Funding for the Communications Development Program (\$ '000 at 2010 constant prices)

Category	Estimate	Projected						Total
	2010	2011	2012	2013	2014	2015	2020	2011-20
Ongoing								
Government	9 160	6 880	-	-	-	-	-	6 880
Donors	3 945	2 914	2 641	-	-	-	-	5 555
Private	51 200	52 130	-	-	-	-	-	52 130
Total	64 305	61 924	2 641	-	-	-	-	64 565
Proposed								
Government	-	-	8 205	5 031	6 088	5 638	1 725	34 986
Donors	-	-	-	5 044	3 113	1 913	1 875	19 444
Private	-	-	65 113	70 013	74 213	89 150	165 197	948 380
Total	-	-	73 318	80 088	83 413	96 700	168 797	1 002 810
Total								
Government	9 160	6 880	8 205	5 031	6 088	5 638	1 725	41 866
Donors	3 945	2 914	2 641	5 044	3 113	1 913	1 875	24 998
Private	51 200	52 130	65 113	70 013	74 213	89 150	165 197	1 000 510
Total	64 305	61 924	75 959	80 088	83 413	96 700	168 797	1 067 375

Source: Annex Table 11.2.

¹⁶⁰ Ministry of Telecommunication & Postal Services, Government of Southern Sudan. Samuel Yunis ICT Institute, Juba. May 2009.

As Table 10.14 indicates, the private sector investments of \$785 million would account for a little more than 90% of total development expenditures. Detailed information about the balance sheets of the existing service providers is not available; a prudent assumption about the funding arrangements for the \$785 million of additional assets held by these companies, and new entrants into the sector, would be that it would include \$235 million of equity and \$550 million of debt financing. A more stringent set of reporting requirements to a regulatory authority would typically include information about the balance sheets of the service providers. Such information would allow the regulatory body to satisfy itself as to the financial soundness of the ICT service providers. Elsewhere in Sub-Saharan countries, there have been examples of private sector service providers operating with balance sheets in which the ratio of debt to total assets exceeded 95%. In some of these cases, the excessive levels of indebtedness have resulted in financial collapse of the service provider, disruption in services, and requests for governments to step in and provide debt relief.

The proposed program includes a modest amount of funding by the international community. For the decade as a whole, the proposal is for donors to provide about \$25 million of support for the program. These donor resources would all be directed at the program of capacity building, technical support and studies needed to ensure effective implementation of the ICT program and outlined in some detail in Table 10.7 above. The important point here is that a high priority should be given to the early mobilization of this support which will be critical for effective implementation of the ICT program in subsequent years.

Under the proposed program the government would fund a total of about \$40 million of these development expenditures in the decade ahead. A significant portion of these outlays would be for support for the development of e-applications by South Sudanese institutions and the proposed regulatory authority. However, not included

here would be the government subsidies required to ensure universal coverage of ICT services by 2020. As the earlier discussion indicates, achieving full coverage by 2020 would require total outlays by the government in the range of \$700 million in the decade ahead. A portion of these expenditure requirements could be met from the imposition of a tax on ICT service providers that was then specifically earmarked for the universal coverage program.

10.6 Management of Risks and Uncertainties

Recent SWOT analysis has highlighted a number of concerns for Sudan from which risks and uncertainties pertinent to South Sudan can be drawn. These are highlighted in Box 10.5. From the SWOT and the sector analysis already presented in this Report, the key risks and uncertainties that the country needs to contend with are as follows:

- Lack of an independent regulator with the necessary institutional and human resource capacity to develop and promote a fair and level enabling environment for development of the ICT sector
- Lack of skilled human resources to develop and manage the ICT sector as well as to facilitate uptake of voice and internet services and applications
- Degree and pace that ICT operators can rollout their networks and services due to the lack of basic infrastructure such as roads and electricity
- Weak institutional arrangements and capacity for promotion of the ICT sector
- Threats to political stability and peace due to unresolved post-conflict issues

Box 10.5: SWOT Analysis of ICT Sector in South Sudan

Strengths	As a post-conflict country with petroleum resources, South Sudan is an attractive investment destination. The country's investment policies and intent for a private-sector led ICT sector do encourage foreign and local investment. There is a competitive environment with a number of international and local operators already in the ICT sector, including telecommunication operators, Internet Service Providers, and radio stations.
Weaknesses	Penetration rates for voice are very low, with the majority of subscribers being prepaid users who generate much less revenue compared to postpaid users. There are very low internet usages, with most internet access being via public points as opposed to individual use. The current high costs for internet access start-up equipment and monthly subscription coupled with low income users also drives down the potential number of internet users. High operational costs for operators due to lack of basic infrastructure including roads and electricity. Institutional framework and capacity to manage the sector is weak, and there is lack of skilled human resources.
Opportunities	As a post-conflict country, similar to experiences in other similar countries, there is opportunity for expansion into underserved areas that were previously inaccessible due to security concerns. With a good legal and regulatory environment, and an already competitive market, there is an opportunity for the sector to flourish with minimal public funding. Use of new technologies and the lack of legacy technologies can allow South Sudan to 'cheetah jump' in provision of a variety of ICT services and applications at lower service costs. Multiple broadband infrastructure options via Uganda/Kenya, Ethiopia/Djibouti, and Sudan can be considered for access to undersea fiber optic cables which should result in improved broadband access.
Threats	Unresolved areas of conflict with Sudan and other regions could threaten the peace needed to encourage operators to rollout and expand their networks. A poorly regulated competitive market could drive down ARPUs to a point that the operators are no longer sustainable and the South Sudan is no longer an attractive investment destination.

Part C

Annexes

Please see website

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