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USAID/SENEGAL ENVIRONMENTAL THREATS AND OPPORTUNITIES ASSESSMENT (ETOA)




November 2015

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Cover Photos: [*clockwise from top left]* Farmers meeting in a field outside of Tambacounda, photo taken by Charles Hernick *[top left]*; Fishermen in Missirah, photo taken by Patrick Hall *[top right]*; Woman farmer in Toubacouta, photo taken by Ashley Fox *[bottom right]*; Panther at Parc National du Niokolo-Koba, photo taken by Charles Hernick *[bottom left]*.

USAID/Senegal Environmental Threats and Opportunities Assessment (ETOA)

November 2015

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ACRONYMS

ADB	African Development Bank
ADF	African Development Fund
ADS	Automated Directives System
ARCC	African and Latin American Resilience to Climate Change
ASER	Agence Senegalaise d'Electrification Rurale (Senegalese Agency for Rural Electrification)
BCC	behavior change communication
BMZ	Federal Ministry for Economic Cooperation and Development (Germany)
CBD	Convention on Biological Diversity
CDCS	Country Development Cooperation Strategy
CFDT	French Company for Textile Development
CLPA	Conseil Local de la Pêche Artisanale
CIDA	Canadian International Development Agency
CITES	Convention on International Trade in Endangered Species
COMFISH	Collaborative Management for a Sustainable Fisheries Future
CSA	Climate Smart Agriculture
CSE	Centre de Suivi Ecologique (Center for Ecological Monitoring)
D&G	Democracy and Governance
DGIS	Netherlands Ministry of Foreign Affairs
DO	Development Objective
DPN	Direction des Parcs Nationaux
EEZ	Exclusive Economic Zone
EITI	Extractive Industries Transparency Initiative
EMP	Environmental Management Plan
EO	Executive Order
ESIA	Environmental and Social Impact Assessment
ETOA	Environmental Threats and Opportunities Assessment
EU	European Union
FAA	Foreign Assistance Act
FAO	Food and Agriculture Organization
FNPC	National Federation of Cotton Producers
FtF	Feed the Future
GCC	Global Climate Change
GDP	Gross Domestic Product
GEF	Global Environmental Fund
GHG	Greenhouse Gas
GHI	Global Health Initiative
GoS	Government of Senegal
GTZ	German Technical Cooperation Agency
HDI	Human Development Index
IEE	Initial Environmental Examination

IFAD	International Fund for Agricultural Development
IMF	International Monetary Fund
IR	Intermediate Result
IUCN	International Union for Conservation of Nature
IUU	Illegal, Unreported and Unregulated
JICA	Japan International Cooperation Agency
LPG	liquefied petroleum gas
LPS	Lettre de Politique Sectorielle [des Peches et de l'Aquaculture] (Sectoral Policy Letter on Fisheries and Aquaculture)
MDG	Millenium Development Goal
MPA	Marine Protected Area
NAIP	National Agricultural Investment Programme
NGO	Non-Governmental Organization
NRM	Natural Resource Management
PA	Protected Area
PATRP	Power Africa Transactions and Reforms Program
POPs	Persistent Organic Pollutants
PMI	President's Malaria Initiative
PSE	Plan Sénégal Emergent
RDCS	Regional Development Cooperation Strategy
SDG	Sustainable Development Goals
SEP	Senegal Emergent Plan
SENELEC	Société Nationale d'Electricité du Sénégal (National Power Utility of Senegal)
SODEFITEX	Société de Développement et des Fibres Textiles (Textile Fibers Development Company)
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
WADB	West African Development Bank
WASH	Water, Sanitation, and Hygiene
WB	World Bank
WWF	World Wildlife Fund

EXECUTIVE SUMMARY

PURPOSE AND SCOPE

The purpose of this assessment is to analyze environmental threats and their drivers, and then identify opportunities for environmental conservation, protection, and improved natural resource management—specifically as it relates to USAID programming. By incorporating biodiversity and tropical forestry conservation needs and related issues, this assessment complies with Sections 117, 118, and 119 of the Foreign Assistance Act of 1961, as amended. It will be used to inform the USAID/Senegal Mission in strategic planning, under Automated Directives System (ADS) 201.3.4.11 and ADS 204.5.

To support these objectives, this assessment identifies important linkages across sectors and new initiatives with respect to environmental conditions and threats that USAID/Senegal must be aware of as it drafts its next Country Development Cooperation Strategy (CDCS). This assessment will also provide recommendations for how best to address these conditions to protect the natural resource base, conserve biodiversity and tropical forests, and promote sustainable resource use, thereby enabling ecosystems to continue to provide the goods and services needed for healthy communities and economic growth. This assessment supersedes the 118/119 Biodiversity and Tropical Forests Assessment completed in 2008.

This assessment summarizes the current state of development in Senegal (see Section 2)—including its economic dependency on ecosystems and ecosystem services—then describes USAID Programming (Section 3) and the state of the environment and natural resource management (see Section 4). This includes a description of biodiversity, forests, and natural resource-based industries (e.g., agriculture, fisheries, and mining). Environmental threats (Section 5) are described in terms of direct threats (i.e., direct human actions that harm biodiversity, tropical forests, and the environment) and their drivers (root causes).

The actions necessary to conserve and sustainable manage biodiversity and tropical forests, and otherwise safeguard the environment (Section 6) are described in general terms and then linked to USAID strategy (Section 7) and discussed in terms of opportunities for USAID to work with the Government of Senegal (GoS), other donors, non-governmental organizations (NGOs), and stakeholders (Section 8). This assessment concludes with a brief discussion of the key recommendations in terms of USAID's results framework (Section 9).

METHODOLOGY

The Assessment Team conducted the ETOA through three partially overlapping phases, including desk research, stakeholder consultations, and analysis. The Assessment Team started with a one-week desk review of available information on socioeconomic issues, ecology and conservation, environmental management, and USAID programming in Senegal. This information was used to draft a pre-field draft report—to identify key resources and gaps in knowledge—and inform in-country stakeholder consolations. Key literature reviewed is included in Annex B. This desk review was completed concurrent with preparations for the two-week field missions.

Stakeholder consultations started in Washington D.C. and included USAID environment staff (e.g., Agency Environmental Coordinator, Office of Forestry and Biodiversity staff) and staff representing other U.S. Government agencies (e.g., USAID) and non-governmental organizations. Follow-up consultations were conducted before the in-country field visit.

A two-week in-country segment started on August 24, 2015, and focused on interviews and stakeholder consultations in order to "ground- truth" the preliminary findings and expand the scope appropriately to that of a full ETOA. This in-country segment began with an in-brief at USAID/Senegal (August 24, 2015) and ended with an out-brief delivery of key findings and recommendations (September 4, 2015).

The Assessment Team facilitated a half-day stakeholder workshop (Dakar) with participants representing GoS, NGOs and the private sector.[1] The workshop verified key issues and assumptions with regard to environmental threats, drivers, and opportunities. During the workshop, the Assessment Team solicited input on the need to consider additional environmental issues in preparing the ETOA. The results of the workshop's small-group exercise were used to validate the assumptions and key environmental threats identified through the desk review and initial stakeholder interviews. A secondary goal of the workshop was to foster a consensus among USAID and other environmental management actors. The workshop was in French.

This ETOA was finalized based on updated literature, geographic information system (GIS) analysis, stakeholder consultations (Annex A), and USAID comments and feedback on the draft consistent with the approved Scope of Work.

STATE OF THE ENVIRONMENT AND NATURAL RESOURCE MANAGEMENT

Senegal has a large protected area network with six national parks, six bird reserves, four Ramsar sites and 213 forest reserves.[2] In addition, rural populations retain many sites as places of worship. The total land area under protection in Senegal is 51,617 km^2 out of the total land area of 192,530 km^2 (25 percent). In addition, Senegal has 1,736 km^2 of Marine Protected Areas (MPAs) out of a total marine area of 158,450 km^2 (1 percent).[3] Per Target 11 of the Convention on Biological Diversity (to which Senegal is signatory), by 2020, at least 17 percent of terrestrial and inland water areas and 10 percent of coastal and marine areas should be under protection.[4] Senegal is meeting the terrestrial protection goal, but not the marine protection goal. Many of the protected areas are threatened by poor management, poaching, and overexploitation.

According to the International Union for Conservation of Nature (IUCN) Red List, one species in Senegal is extinct in the wild, nine are critically endangered, 26 are endangered, 71 are vulnerable, and 54 are near threatened. This includes both terrestrial and marine species. The damma gazelle and giraffe were extinct, but were then reintroduced.[5] The total number of plant species listed (14) is less than one percent of total plant diversity known in the country. However, the number of animal species listed (147) is about 27 percent of all terrestrial and marine animal life known in Senegal.

Senegal Forest ecosystems are found in three phytogeographical areas following a distribution from North to South (Sahelian domain, Sudanese domain and the Guinean domain). The main vegetation types occupy an area of 679,450 hectares of which 44 percent is savanna, 27 percent crop areas, 18 percent steppe, four percent forests and one percent mangroves. A 2015 estimate cites that Senegal loses about 40,000 ha of forest each year.[6] Forest cover is being steadily reduced by bush fires, conversion for agriculture, removal for charcoal, overgrazing, and pruning wood, the effects of which exacerbate climate change, and as a result, lead to longer periods of drought.

Agriculture, including both terrestrial crops and wild fisheries, is the driving force of the economy in Senegal, as almost 80 percent of the population relies on these sectors as their main source of employment and income. Rain-fed cereal crops occupy most of the cultivated land during the growing season. They are mainly intended for self-consumption, and are very sensitive to climate shocks. The main terrestrial cash crops are peanuts and cotton.[7] Agronomic potential has been seriously altered by population dynamics, the expansion and practice of extensive farming with slash burning, drought, bush fires, and the disappearance of plant

[1] List of participants in Annex A
[2] Forests reserves are designated to preserve fragile soils, flora and fauna (raised or diversified), and energy reserves (wood).
[3] (Protected Planet n.d.)
[4] (Convention on Biological Diversity n.d.)
[5] (ECODIT 2008)
[6] (Seneweb 2015)
[7] (Toure, et al. 2010)

cover.[8] Terrestrial agriculture – its use of fertilizers and diversion of environmental water flows – poses serious threats to marine biodiversity and the health of coastal habitats such as the productive deltas and estuaries.

Wild or capture fisheries play a particularly important economic role in Senegal. Wild fishery products make up 12.3 percent of export earnings and comprise 1.3 percent of gross domestic product (GDP), not including fish marketing, artisanal and industrial processing, inland capture, and other post-harvest activities. Fishing provides direct and indirect employment to around 600,000 people. Fisheries are also extremely important to food security, as annual per capita fish consumption is 26 kg, placing Senegal among Africa's biggest consumers of fish. However, many wild fisheries are harvested unsustainably and the sardinella population is at risk of collapse due to the lack of management both in Senegal and the West African region, threatening food security, livelihoods, the national economy and biodiversity.

The Senegalese territory offers great varieties of mineral substances including the noble metals (gold and platinum), the base metals (iron, copper, chromium, nickel), industrial minerals (industrial phosphates, limestone, salts, barytine, etc.) heavy minerals (zircon and titanium), decorative stones, and building materials.[9] The Kédougou region in particular has important deposits of gold, iron ore, marble, uranium, copper and chromium. Senegal also has a wealth of diverse, unexploited mineral deposits. A new mining code adopted in 2003 and the significant investment promotion driven by the Senegalese government and its development partners are resulting in diversification of the mining sector.

Senegal has significant potential for water resources, both for surface water and groundwater. The availability of water resources is estimated at around 4,747 m^3/capita/year. The main surface water resources are the Senegal River basin and the catchment areas of the Gambia, Casamace, and Kayanga rivers. There are also significant groundwater resources spread over the entire territory and through different types of aquifers. The deep groundwater aquifers in sand and sandstone of the Maastrichtian layer cover four-fifths of the Senegalese territory. The main threats to water quantity and quality are climate change, poor management at the landscape scale (and resulting overexploitation), and pollution from agriculture and industrial and domestic waste.

[8] (African Development Bank 2010)
[9] (Senegal International Mining Conference and Exhibition 2014)

DIRECT THREATS AND DRIVERS OF ENVIRONMENTAL DEGRADATION, AND NECESSARY ACTIONS

To identify the actions necessary to protect the environment and conserve natural resources, the drivers (i.e., ultimate factor or root cause) of the direct threats (i.e., proximate cause) must be identified and addressed. The table below defines the driver of environmental degradation for each of the direct threats identified. This synthesis categorization of drivers is based on the overall analysis of threats, stakeholder consultations, and documents reviewed.

To address each of the drivers, the assessment team identified the following necessary actions to enhance environmental protection and promote sustainable natural resource management (NRM).

Ecosystem Color key*:

ECOSYSTEM	COLOR REFERENCE
Forests	
Agricultural and Pastoral	
Marine and Coastal	
River and Lake	
Protected Areas	

DRIVERS AND THREATS TO BIODIVERSITY AND FORESTRY AND AFFECTED ECOSYSTEMS					
Priority	Threats	Drivers	Driver Category	Necessary Actions to Address Drivers	Ecosystem*
High	• Deforestation (particularly in the North and Anambe area of Casamance) resulting from low productivity agriculture and pastoralism/livestock management (including overgrazing) • Salinization/acidification of soil and water from irrigation expansion due to shorter, shifting growing seasons (climate change)	• Limited technical, managerial and financial capacity of pastoralists and livestock managers (resulting in low productivity practices that are not resilient to climate change or irrigation practices that are not sustainable in the long run)	 	1. Increase agricultural productivity on existing fertile lands (especially Tambacounda) through the use of improved technologies, seed varieties, and weather/climate information systems to increase overall long-term productivity (including climate resiliency).	

DRIVERS AND THREATS TO BIODIVERSITY AND FORESTRY AND AFFECTED ECOSYSTEMS					
Priority	Threats	Drivers	Driver Category	Necessary Actions to Address Drivers	Ecosystem*
	and increased demand for water for agriculture; sea level rise				
High	• Overfishing and illegal fishing causing overall marine resources, especially fisheries, to decline or disappear	• Unlimited open access to fisheries resources • Inappropriate fishing practices and gear (e.g., monofilament, bottom trawling, beach seines) • Lack of human resources, technical capacity and equipment to manage the resource • Lack of access to information on the status of resource stocks	  	2. Build Capacity for Fisheries Management.	
High	• Loss of habitat (terrestrial and marine) for charismatic indicator/endangered species (e.g., chimpanzees, dolphins, manatees, marine turtles and birds) driven by: o Land use change (e.g., agriculture, mining, large-scale energy infrastructure)	• Weak national-level strategic planning for the development of natural resources and conservation of ecosystems and species of concern • Weak local governance/capacity to implement existing laws • Urban population growth	 	3a. Conduct a strategic/programmatic environmental impact assessment for USAID agriculture activities to provide a framework/guidance for investments and prevent undesirable environmental impacts. 3b. Build GoS capacity for a strategic/programmatic environmental impact assessment for the mining sector that will provide a framework/guidance for industrial-scale mine	

DRIVERS AND THREATS TO BIODIVERSITY AND FORESTRY AND AFFECTED ECOSYSTEMS					
Priority	Threats	Drivers	Driver Category	Necessary Actions to Address Drivers	Ecosystem*
	o Deforestation o Climate change (shifting habitats)	• Increased demand for water, energy and food		investments and prevent undesirable environmental impacts. 4. Develop application text (i.e., directives) and other resources (e.g., conservation-specific guidelines, factsheets, monitoring and evaluation tools, technical models, training programs) to support GoS's decentralization efforts. 5. Support the translation of existing laws to local languages and the dissemination, enforcement, and continuous implementation of these laws at all levels. 6. Develop decentralized/distributed renewable energy supplies to expedite rural electrification and provide cost-effective alternative cooking fuel sources and innovative practices that decrease cooking time, reduce pressure on forested lands for fuel wood extraction, and improve women's health. 7. Support land use planning and capacity building needed to develop urban areas and natural resources (especially community forestry in Casamance), protect ecosystem services, and secure wildlife corridors for endangered species.	
Medium	• Poaching	• Lack of enforcement and incentives to comply with laws • Limited technical, managerial, and financial capacity of parks and park staff		4. Develop application text (i.e., directives) and other resources (e.g., conservation-specific guidelines, factsheets, monitoring and evaluation tools, technical models, training programs) to support GoS's decentralization efforts and protect	

DRIVERS AND THREATS TO BIODIVERSITY AND FORESTRY AND AFFECTED ECOSYSTEMS					
Priority	Threats	Drivers	Driver Category	Necessary Actions to Address Drivers	Ecosystem*
		• Increased demand from international markets and local markets (bush meat, wild parrot trade)		the environment and associated ecosystem services. 8. Ensure adequate funding for environment through the national budget, local tax revenues, and funding by natural resource-based industries, and establish mechanisms (e.g., payment of ecosystems services, conservation trust funds, carbon finance, and polluters' payment).	
Medium	• Illegal logging for illegal timber trade (especially in Cassamance)	• Lack of economic opportunity in Casamance • Strong black market in Gambia for illegal export of timber		7. Support land use planning and capacity building needed to develop urban areas and natural resources (especially community forestry in Casamance), protect ecosystem services, and secure wildlife corridors for endangered species.	
Medium	• Illegal logging for domestic use (pastoralism, construction-especially in Dakar) • Uncontrolled fires/bushfires from: o Slash and burn agriculture o Pastoralist fires • Greenhouse Gas Emissions (causing climate change) from: o Conversion of habitats (deforestation, wetlands development)	• Competing land uses because of unclear land tenure or weak enforcement of property rights • Insufficient financing for conservation of tropical forests and classified border enforcement • Lack of enforcement and incentives to comply with laws due to inadequate funds or training • Inadequate financial incentives/price signals for forest conservation (undervalued resource)		4. Develop application text (i.e., directives) and other resources (e.g., conservation-specific guidelines, factsheets, monitoring and evaluation tools, technical models, training programs) to support GoS's decentralization efforts and protect the environment and associated ecosystem services. 7. Support land use planning and capacity building needed to develop urban areas and natural resources (especially community forestry in Casamance), protect ecosystem services, and secure wildlife corridors for endangered species. 8. Ensure adequate funding for environment through the national budget, local tax revenues, and funding by natural resource-based industries, and establish mechanisms (e.g., payment of	

DRIVERS AND THREATS TO BIODIVERSITY AND FORESTRY AND AFFECTED ECOSYSTEMS					
Priority	Threats	Drivers	Driver Category	Necessary Actions to Address Drivers	Ecosystem*
	○ Bush/forest fires • Industry and transportation	• Lack of local enabling policies to protect habitats		ecosystems services, conservation trust funds, carbon finance, and polluters' payment).	
Medium	• Logging for charcoal (i.e., cooking fuel/energy)	• Demand for cooking fuel and high price of alternatives (e.g., natural gas)	  	6. Develop decentralized/distributed renewable energy supplies to expedite rural electrification and provide cost-effective alternative cooking fuel sources and innovative practices that decrease cooking time, reduce pressure on forested lands for fuel wood extraction, and improve women's health.	
Low	• Invasive species and spread of aquatic vegetation due to: ○ Introduction by foreign sources ○ Climate change (temperature or precipitation changes allowing for range expansion)	• Lack of access to information on non-native species introductions, population and distribution, and risk of environmental/economic risk		9. Support the strengthening of environmental monitoring systems and support the development of a data clearinghouse to improve access to existing information and support the exchange of information between related information sources (e.g., livestock, public health, fisheries).	

DRIVERS AND THREATS TO BIODIVERSITY AND FORESTRY AND AFFECTED ECOSYSTEMS					
Priority	Threats	Drivers	Driver Category	Necessary Actions to Address Drivers	Ecosystem*
Low	• Disease (causing low park attendance or damaging economic growth) from: o Poor waste management o Deforestation o Habitat degradation o Zoonosis (Ebola) o Malaria	• Lack of access to information on disease outbreaks and sources of disease	 	9. Support the strengthening of environmental monitoring systems and support the development of a data clearinghouse to improve access to existing information and support the exchange of information between related information sources (e.g., livestock, public health, fisheries).	

DRIVERS AND THREATS TO ENVIRONMENTAL HEALTH AND AFFECTED ECOSYSTEMS					
Priority	Threats	Drivers	Category	Strategic Actions to Address Drivers	Ecosystem*
High	• Pollution (i.e., inland surface, ground, and coastal water, and air) from: o Industry (e.g., mining, agribusiness, cement plants); offshore oil and gas development (prospection and exploitation) o Inadequate treatment of human and animal waste o Inadequate solid waste management systems o Poor design and management of roads	• Urban population growth • Lack of enforcement and incentives to comply with laws • Lack of technology to prevent or treat pollution	  	3a. Conduct a strategic/programmatic environmental impact assessment for USAID agriculture activities to provide a framework/guidance for investments and prevent undesirable environmental impacts. 3b. Build GoS capacity for a strategic/programmatic environmental impact assessments for the mining sector that will provide a framework/guidance for industrial-scale mine investments and prevent undesirable environmental impacts. 4. Develop application text (i.e., directives) and other resources (e.g., conservation-specific guidelines, factsheets, monitoring and evaluation tools, technical models, training programs) to support GoS's decentralization efforts. 5. Support the translation of existing laws to local languages and the dissemination, enforcement, and continuous implementation of these laws at all levels. 6. Develop decentralized/distributed renewable energy supplies to expedite rural electrification and provide cost-effective alternative cooking fuel sources and innovative practices that decrease cooking time, reduce pressure on forested lands for fuel wood extraction, and improve women's health. 7. Support land use planning and capacity building needed to develop urban areas and natural resources (especially community forestry in	

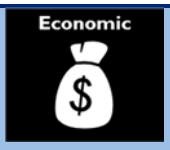
				Casamance), protect ecosystem services, and secure wildlife corridors for endangered species. -- 10. Build the formal organizational capacity of artisans in natural resource-based small and medium enterprises and community cooperatives to implement best practices for natural resource management, forestry, and fisheries management. 11. Build capacity for integrated water resource management that will promote the long-term resiliency of water-reliant industries and ecosystems and protect drinking water sources.	
High	• Flooding, including flooding exacerbated by climate change (exposure via alteration of rainfall patterns)	• Weak (or lack of) drainage infrastructure to reduce vulnerability of floods (grey) and regulation of flows (green) • Lack of scientific equipment for surveys, monitoring, and early warning	 	4. Develop application text (i.e., directives) and other resources (e.g., conservation-specific guidelines, factsheets, monitoring and evaluation tools, technical models, training programs) to support GoS's decentralization efforts and protect the environment and associated ecosystem services. 9. Support the strengthening of environmental monitoring systems and support the development of a data clearinghouse to improve access to existing information and support the exchange of information between related information sources (e.g., livestock, public health, fisheries).	
Low	• Coastal Erosion from extraction of marine sand and coastal construction (degrading buffering ecosystem services), climate change (sea level rise)	• Urban population growth (and resulting poorly designed and managed construction on the coast)		7. Support land use planning and capacity building needed to develop urban areas and natural resources (especially community forestry in Casamance), protect ecosystem services, and secure wildlife corridors for endangered species. 8. Ensure adequate funding for environment through the national budget, local tax revenues, and funding by natural resource-based industries, and establish mechanisms (e.g., payment of ecosystems services,	

			 	conservation trust funds, carbon finance, and polluters' payment).	

KEY RECOMMENDATIONS FOR USAID/SENEGAL AND ANTICIPATED OUTCOMES

Each of the necessary actions—regardless of the current status of USAID engagement—will support sustainable development, conserve natural capital upon which fisheries and food security in Senegal depend on, as well as improve climate change resilience and greenhouse gas emission reductions. Implementation of these actions will reduce environmental risks to USAID projects and, therefore, improve the outcomes of US Government interventions.

1. Increase agricultural productivity on existing fertile lands (especially Tambacounda) through the use of improved technologies, seed varieties, and weather/climate information systems to increase overall long-term productivity (including climate resiliency).

Anticipated Outcome	 Reduction in per capita land area used/cleared to achieve existing/ future food needs	 Reduction in poverty and economic instability driving rent/land seeking behavior	 Reduction in use of low-tech and low-productivity agricultural practices that result in the inefficient use of human and natural capital
Links to USAID Nature, Wealth, and Power Principles:	N1. Safeguard natural capital's productive capacities N3. Promote sustainable practices and systems that increase natural capital's productivity N4. Promote climate- and socioeconomically-resilient rural production systems W1. Strengthen natural capital accounting, valuation, and analytic tools to improve decisions		

While farmers across Senegal are steadily increasing production, major gains are needed to meet domestic food security needs and increase exports of peanuts, cotton, and other commodity crops. To protect the integrity of intact forested areas (important for water and climate-regulating ecosystem services) and maintain areas for livestock and other economic activities, increases in agricultural production must be achieved on fertile lands already under cultivation, instead of continued production on low-productivity agricultural lands. The opportunity is greatest in southern Senegal (e.g., Kedougou, Tambacounda) where soils are most fertile and water resources are more plentiful (and likely to be less affected by climate change).

Good agricultural practices (e.g., crop diversification and rotation) are already being implemented and should be reinforced. Efforts to support information-sharing on best practices on managing climate variability must also be implemented. Programs that bring together farmers from different regions to share best practices and cultivation methods can help build resilience to climate change. For example, agroforestry is being promoted in the north of Senegal after agro-ecosystems changed and water retention/regulation ecosystem services were lost after too many trees were cut down. Now, efforts are underway to replant trees and promote agroforestry in the north. However, due to a greater abundance of trees and water, agroforestry is not formally prioritized in the south.

Maintaining the genetic diversity of crops through additional/improved seed varieties is a necessary action for increasing agricultural productivity and adapting to climate change. The Government of Senegal currently limits the number of foundations that can develop seeds and new hybrids. This may limit the efficiency of farming, leading to more widespread low-productivity agriculture that competes with other land uses (e.g., livestock pasture, conservation). Additional seed banks should be developed to ensure that the right varieties of seeds are available for farmers.

While seed banks exist and farmers are interested in utilizing improved varieties, climate-smart decisions must also be informed by actionable, timely, and time-bound information (i.e., annual forecast that help farmers select and time the planting of specific varieties, or hedge by diversifying crops planted). Weather/climate information systems can help farmers adjust practices on their existing lands instead of migrating to new areas within the region or moving to other regions, a current practice that results in low productivity agriculture

over a broader land area without increasing yields. Stakeholders consulted indicated that inter-region migration, driven in part by climate changes in the north (of Senegal or in other Sahel countries) is taking place to a limited extent. Improved weather and climate information systems will also support the nascent market for crop insurance. Crop insurance has been adopted relatively slowly by farmers who are skeptical about insurance systems and lack information on payment methods and schedules of these systems.

Finally, increasing intensity on existing lands will require some infrastructure investments to manage on-farm water—specifically rainwater harvesting systems to manage drought conditions and drainage systems to manage flood conditions. These existing threats to farm productivity are likely to be exacerbated by climate change. Already, intra-region and intra-community migration is particularly common after crop failures. For example, farmers cultivate wetland areas in dry years, which experience damaging floods in wet years. These annual crop failures drive risky behaviors, including migration, which could be avoided with modest on-farm water control investments.

In terms of USAID programming, the implementation of this recommendation would directly complement existing USAID efforts, create opportunities for USAID to work with successful organizations like Société de Développement des Fibres Textiles (SODEFITEX), PROGEDE 2, and others to expand programs with positive impacts and outcomes.

2. Build capacity for sustainable fisheries management.

Anticipated Outcome					
	Demographic 	Management of fish supply to point of sustainable yield	**Political/ Institutional** 	Improved government capacity and community capacity to manage stocks	**Scientific/ Technological** 	Improved technology for monitoring and oversight, and communications
Links to USAID Nature, Wealth, and Power Principles:	N1. Safeguard natural capital's productive capacities N3. Promote sustainable practices and systems that increase natural capital's productivity N4. Promote climate- and socioeconomically-resilient rural production systems W1. Strengthen natural capital accounting, valuation, and analytic tools to improve decisions					

Fishing is the largest extractive use of wildlife in Senegal. The main threat to fisheries biodiversity in Senegal is overfishing provoked by national, but mainly foreign industrial fleets, and exacerbated by open access to the resource and a number of illegal practices, including the use of prohibited fishing techniques/tools. The situation is worsening because the legal framework for fisheries management is weak; even existing few texts are not properly implemented and enforced. There is a strong need to move away from open access towards managed access, in order to avoid the collapse of Sardinella, a main stay of the fisheries in Senegal and West Africa.

USAID can help GoS establish a Steering Committee (SCA, DEEC, USAID, DPM, Collaborative Management for a Sustainable Fisheries Future (COMFISH)) to strengthen coordination among high-level partners and project monitoring. USAID can also help establish MOUs which provide framework for contractual implementation with key collaborating institutions (e.g. FENAGIE, APTE, DEEC, ANACIM, Alliance, CSE).[10] This is critical for implementing and enforcing existing national fishing regulation.

At the local level, USAID should support and expand programs that have demonstrated success (e.g., COMFISH). This type of effort builds capacity for local fishing organizations. For example, As the enforcers of the "local conventions" which govern fisheries at the local level to support the Fisheries and Aquaculture Sector Policy letter, Local Councils of Artisanal Fishers (Conseil Local de la Pêche Artisanale or CLPA) should receive technical assistance to create revenue streams that allow for their continued operation (e.g.,

[10] Consistent with the recommendations of the March 2015 Mid-Term Performance Evaluation of the USAID/COMFISH project in Senegal

membership dues, organizing income-generating activities). Adequate financing will support CLPA-level investments in communication and information systems needed to monitor and oversee resources.

Community organizations not only serve as an entry point to promote education and sensitization on good management of the resources to preserve biodiversity, but also serve as a mechanism for strengthened civil society. A robust civil society in the marine sector is needed to provide input on proposed projects, such as offshore oil and gas industries, like the one starting extraction in the Marine Protected Area of the Saloum Delta that may threaten marine ecosystems and biodiversity and the local economies dependent on those resources.

3a. Conduct a strategic/programmatic environmental impact assessment for USAID agriculture activities to provide a framework/guidance for investments and prevent undesirable environmental impacts.

3b. Build GoS capacity for a strategic/programmatic environmental impact assessment for the mining sector that will provide a framework/guidance for industrial-scale mine investments and prevent undesirable environmental impacts.

Anticipated Outcome					
		Reduction in demographic drivers related to loss of habitat and pollution		Reduction in weak government capacity for comprehensive ESIAs and lack of guidance on ESIAs	 Reduction in economic and technology drivers related to flooding
Links to USAID Nature, Wealth, and Power Principles:	N1. Safeguard natural capital's productive capacities N3. Promote sustainable practices and systems that increase natural capital's productivity N4. Promote climate- and socioeconomically-resilient rural production systems W3. Create frameworks and incentives to improve alignment of public and private interests P2. Decentralize powers and responsibilities to representative and accountable authorities				

Done well, the environmental and social impact assessment (ESIA) process identifies, predicts, evaluates, avoids, and mitigates the adverse biophysical, social, and other relevant effects of development proposals prior to major decisions and financial commitments.[11] Strategic or programmatic ESIAs evaluate a class of similar actions in a sector or geographic region and can provide a framework for expediting and improving the quality of project-specific assessments required by Senegalese law. Strategic ESIAs are often tiered to policies in relevant sectors and regions and decision making.[12] This is particularly important for the mining sector in light of the mining reform regulation and for the agriculture sector where USAID is engaged on multiple fronts.

The impact assessment process in Senegal is well-established and ESIAs are routinely carried out for large-scale projects. Strategic ESIAs for the mining and agricultural sectors will complement required project-specific assessments by identifying environmental risks and establishing general best practices to avoid and mitigate the potential adverse environmental and social impacts. This is particularly important, as stakeholders noted that some parts of the mining production/refinement chain are outside current ESIA requirements. Therefore, some EIAs do not cover all pollution sources. A strategic ESIA for the mining sector will help close these gaps and establish means for civil society to engage early on for large-scale mining projects. The strategic assessment could also establish finance/funds management for the implementation of mitigation measures (e.g., forest restoration) in a way that meets the concerns of both the private sector and civil society, an issue that was raised by stakeholders.

By identifying key aspects of mining and agriculture projects that need to be prioritized to avoid or mitigate adverse environmental impacts, strategic ESIAs for mining and agriculture can help guide efforts to build financial and technical capacity for ESIAs at the regional level, where ESIAs are currently performed (further decentralization of the ESIA process is not recommended). Strategic assessments will also support and guide

[11] Adapted from http://www.iaia.org/publicdocuments/special-publications/Principles%20of%20IA_web.pdf
[12] See http://www.iaia.org/publicdocuments/special-publications/sp1.pdf

efforts to strengthen ESIA review capabilities at the national level. ESIAs conducted and first reviewed at the regional level are reviewed at the national level prior to approval—primarily with an eye towards identifying gaps in analysis. The strategic assessment can help support this gap analysis and ensure the quality of project-specific analyses. Furthermore, these strategic assessments can identify specific intervention points where climate change information can help improve decision-making and ensure that climate change is consistently considered in project design and in the design and implementation of mitigation measures.

In terms of USAID programming, the implementation of this recommendation will help mitigate adverse environmental impacts associated with mining (e.g., water pollution affecting drinking water supplies and public health, community relocation affecting social stability). It will also provide USAID and its implementing partners with concrete actions for mitigating the adverse cumulative impacts of agricultural programming (e.g., land use change affecting water availability) and mitigating the effects of climate change on agricultural systems.

4. Develop application text (i.e., directives) and other resources (e.g., conservation-specific guidelines, factsheets, monitoring and evaluation tools, technical models, training programs) to support GoS's decentralization efforts and protect the environment and associated ecosystem services.

Anticipated Outcome	Political/ Institutional 	Increased local governance/ capacity to implement existing laws and national-level strategic plans for the development of natural resources and conservation of ecosystems and species of concern
Links to USAID Nature, Wealth, and Power Principles:	N1. Safeguard natural capital's productive capacities P1. Strengthen inclusive rural land and natural resource tenure systems, and procedural rights P2. Decentralize powers and responsibilities to representative and accountable authorities	

With the third decentralization reform in 2013, environmental and natural resource management authority, as well as taxation and land use planning responsibilities, was transferred to the regional and community level. While the existing national laws are necessary for environmental protection, the lack of an implementation framework and application text (i.e., directives) that can be used at the community level is a barrier to empowerment of local officials and creation of funding options to ensure implementation. As a result, decisions over land use and resource management are based primarily on short-term economic development pressures and opportunities (e.g., mining rushes). These pressures are often at odds with sustainable development goals (SDGs) consistent with national plans. For example, the Assessment Team visited a small area of protected land in Dindefelo that had recently been deforested to make space for a water tower. Despite efforts by local conservationists to maintain the integrity of the protected area, a local strongman was able to push forward the proposal. The site had been regularly used by chimpanzees.

The effective implementation of environmental laws means that the Protected Areas will receive the full intended level of protection and that the areas surrounding, or adjacent to, Protected Areas will be developed with environmental considerations in mind. This is especially important for Senegal's small but developing ecotourism market, especially near coastal areas where tourists already visit beaches or see chimpanzees (Senegal is the closest country with a chimpanzee habitat to European markets).

Stakeholders and interview participants noted these types of regulatory constraints as a limiting factor in conservation efforts, citing both insufficient legal texts and authority, as well as weak implementation and enforcement of existing laws. Given the short-term economic gain of natural resource exploitation, comprehensive, enforceable laws and policies can help establish a framework for effective environmental protection and stable economic growth.

In terms of USAID programming, the implementation of this recommendation will support other democracy and governance efforts. In broad terms, application of directives will empower local officials and park guards

to fulfill national mandates, and will provide legal certainty for individuals, businesses, and NGOs pursuing economic development opportunities, investing in infrastructure, or expanding operations.

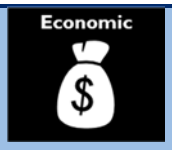
5. Support the translation of existing laws to local languages and the dissemination, enforcement, and continuous implementation of these laws at all levels.

Anticipated Outcome		Increased access to legal frameworks and protection for all segments of society		Increased local governance/ capacity to implement existing laws and national-level strategic plans for the development of natural resources and conservation of ecosystems and species of concern
Link to USAID Nature, Wealth, and Power Principle:	P2. Decentralize powers and responsibilities to representative and accountable authorities			

While French is the official language of Senegal, it is used by a minority of educated Senegalese peoples. Most people speak their own ethnic language (e.g., Wolof) and French is a second language. Therefore, translating existing laws into local languages will support dissemination and application of these laws. Individuals and communities cannot be reasonably expected to follow a law they do not understand or hold others accountable to rule of law, and without knowledge of the laws and legal framework, civil society is limited in its ability to hold firms and politicians accountable.

In terms of USAID programming, the implementation of this recommendation will support democracy and governance efforts by improving the understanding necessary for citizens to participate in Senegal's political processes.

6. Develop decentralized/distributed renewable energy supplies to expedite rural electrification and provide cost-effective alternative cooking fuel sources and innovative practices that decrease cooking time, reduce pressure on forested lands for fuel wood extraction, and improve women's health.

Anticipated Outcome		Reduction in pressures on forests because of the availability alternative sources of energy/fuel		Reduction in financial and labor costs associated with cooking and energy		Increased availability and use of high-efficiency cooking and energy production technologies
Links to USAID Nature, Wealth, and Power Principles:	W3. Create frameworks and incentives to improve alignment of public and private interests W4. Strengthen markets and the role of rural producers in competitive but non-extractive natural resource value chains					

Senegal has substantial needs for energy development and distribution to increase economic growth and reduce reliance on existing inefficient fuel sources (e.g., charcoal for cooking). This has a disproportionate effect on women in terms of time needed to secure fuel wood/charcoal for cooking and effects on health from breathing in particulates from charcoal-based cooking. Opportunities to develop distributed energy sources across the country should be identified and developed as a means to provide energy to households and provide a potential alternative to wood-based charcoal cooking, if electricity-based cooking methods (e.g., induction stovetops) are available. Innovative cooking techniques that decrease cooking time should also be researched and promoted. This will reduce the health risk for those tasked with cooking in households by reducing the time they are exposed to gas and heat produced by fuel sources.

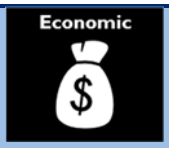
Energy projects designed to meet base load requirements—especially in Dakar—are necessary and may come from renewable resources like hydropower. While there are often substantive environmental and social impacts associated with hydropower, projects in the south may help with flood regulation and create opportunities for irrigation if they are designed well.

While Senegal has oil and natural gas reserves that can be exploited, natural gas has not been a cost-effective alternative source of energy for cooking due to high prices driven by the need for substantive distribution networks. Further, decreasing natural gas prices will require significant additional market interventions. Development of small- and medium-scale renewable resources—particularly solar power sources, including those on rooftops in cities—can help meet electricity demand quickly.

The Assessment Team does not recommend further biogas promotion. Senegal has limited arable land and growing bio matter to fuel biogas facilities will compete for land with agriculture and biodiversity priorities. Specifically, biogas operations tend to favor fast-growing monocultures and often use non-native species that diminish, instead of enhance, local biodiversity. Recent biogas efforts in the Tambacounda area failed due to lack of technical capacity to operate the facilities. In Senegal, other renewable options such as solar power are simpler and more realistic.

In terms of USAID programming, the implementation of this recommendation will increase adaptive capacity by increasing access to electricity, and providing opportunities to manage extreme temperatures (e.g., air conditioning) and improve phytosanitary food processing (e.g., refrigeration in food processing).

7. Support land use planning and capacity building needed to develop urban areas and natural resources (especially community forestry in Casamance), protect ecosystem services, and secure wildlife corridors for endangered species.

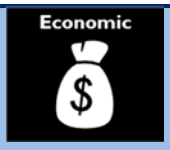
Anticipated Outcome					
		Reduction in pressures from urban population growth and demand for natural resources		Enabling economic growth because land uses/tenure is secure		Increased local governance/ capacity to implement existing laws
Links to USAID Nature, Wealth, and Power Principles:	N1. Safeguard natural capital's productive capacities W3. Create frameworks and incentives to improve alignment of public and private interests P1. Strengthen inclusive rural land and natural resource tenure systems, and procedural rights P2. Decentralize powers and responsibilities to representative and accountable authorities				

Senegal is in a unique position for the management of many charismatic endangered species that migrate across borders and within the country itself. Considering the need for economic development, land use planning needs to be prioritized to create certainty over land tenure and set aside areas for conservation and ecosystem services. This is particularly important in the south where there is a need to strengthen the cross-border park partnership with Guinea to conserve migratory corridors for elephants, chimpanzees, and other threatened or endangered species by identifying options to support transboundary protected areas.

In the Casamance region, there is substantial need for economic development to promote social stability. Considering the natural resources and biodiversity in the region, USAID should work with Casamance regional and local officials to identify conservation and ecotourism priorities to build off of the existing (strong) tourism industry and elevate the Casamance as a destination and integral part of Senegal's economic and environmental future.

In terms of USAID programming, this recommendation will help ensure that endangered species are protected from habitat degradation and therefore have a better chance of recovery, and will also reduce the potential for existing political and social strife while contributing to the development of the economy in the Casamance region in particular.

8. Ensure adequate funding for environment through the national budget, local tax revenues, and funding by natural resource-based industries, and establish mechanisms (e.g., payment of ecosystems services, conservation trust funds, carbon finance, and polluters' payment).

Anticipated Outcome	 Reduction in pressures from urban population growth (and resulting poorly designed and managed construction on the coast)	 Increased financing for conservation of tropical forests and classified border enforcement and stronger financial incentives/price signals for forest conservation	 Increased technical, managerial, and financial capacity of parks and park staff
Links to USAID Nature, Wealth, and Power Principles:	N1. Safeguard natural capital's productive capacities W2. Invest revenues from resource extraction into creation of new assets and incomes P2. Decentralize powers and responsibilities to representative and accountable authorities		

Inadequate financial resources constrain the protection of conservation area, limiting availability and technical and managerial skills of staff to enforce conservation. Management of Protected Areas is often compromised due to the inability of staff to police against illegal activities such as poaching, illegal hunting and fishing, and exploitation of forest resources. Therefore, increased authority of and resources for agencies overseeing environmental conservation and increased funding for environmental protection programs in the Senegalese national budget can support conservation efforts in Senegal.

Beyond central funding, more can be done to establish decentralized funding sources to improve local environmental performance. Several stakeholders remarked that the decentralization reform allows for local taxation and decentralized revenue streams, but this transition has not yet been fully realized due to a lack of financial and human resources.

One specific mechanism to support decentralized funding is the establishment of trust funds for protected areas and environmental programs paid into by the industries reliant on those areas' ecosystem services or effecting the ecosystem services in a particular geographic area (e.g., fisheries and agriculture industries paying to conserve and manage specific watersheds, or extractive industries disrupting ecosystem structure and function to access sub-surface resources). An increasing number of African countries are following this model (e.g., Guinea).

Currently, the environmental performance of the mining industry is supported by a trust fund or environmental bond program where each mine operator holds funds in-trust to ensure that environmental and social mitigation measures are implemented. However, community stakeholders have no means for checking that funds are being deposited, and they do not have any recourse available to them if the funds are not used to implement mitigation measures. Private companies should disclose to the Government regulator the availability of funds, and communities should be able to seek recourse and intervention by the regulator in the case of abandonment by the firm.

Financial accountability should be a priority in considering expansion of the mining sector. With appropriate financial resources, GoS agencies and institutions can adequately oversee mining activities (that are being promoted by GoS) and assure that miners/mining companies are held financially responsible if they fail to address post-closure restoration. The establishment of independently held (e.g., third-party bank) trust funds can help support the polluter-pays-principle at specific project sites, and could be utilized more broadly to support the management of key ecosystem services or habitats for species of concern (e.g., chimpanzees) outside of Protected Areas. These types of financial responsibility mechanisms are well-established means for environmental financing, and the establishment of these types of mechanisms can be supported by USAID- or NGO-enacted legislation or on a voluntary/negotiated basis with the private sector.

Financial mechanisms also need to be established for other renewable natural-resource based industries (e.g., timber and fisheries). Systems for permitting, permitting feeds, and taxation need to be fully implemented and enforced to ensure adequate funding for the sustainable management of these renewable resources.

In terms of USAID programming, the implementation of this recommendation will assure that the technical capacity building efforts directed at the agricultural and fisheries sectors in particular are complemented by adequate financing. The implementation of this recommendation will also ensure that investments in improved access to drinking water are not undermined by pollution or hazards from the mining industry.

9. Support the strengthening of environmental monitoring systems and support the development of a data clearinghouse to improve access to existing information and support the exchange of information between related information sources (e.g., livestock, public health, fisheries).

Anticipated Outcome	Political/ Institutional 	Improved information on enviornment, natural resources stocks and flows, and to information on non-native species introductions, population and distribution, and risk of environmental/economic risk. Increased access to information on disease outbreaks and sources of disease	Scientific/ Technological 	Availability of centralized information
Links to USAID Nature, Wealth, and Power Principles:	N5. Strengthen the use of monitoring, science, and technology in agriculture and resource management W1. Strengthen natural capital accounting, valuation, and analytic tools to improve decisions			

A number of the stakeholders consulted noted that there is a need for more detailed and readily available information in particular sectors (e.g. data on fish stocks, livestock numbers) that would support management decisions. For example, a better knowledge base on marine biological resources would help strengthen evidence-based decision-making in the sector. In agricultural and livestock systems, the Government of Senegal prioritizes measures that prevent the introduction of new pests (e.g., avian influenza which resulted in a ban on U.S. poultry). However, realization of this objective depends not just on the adoption of appropriate policies and availability of science-based solutions to pests, but on monitoring and information systems.

While in some cases data need to be collected, in many cases data have been collected but are not readily available or can be difficult to find. This information may also be important to decision-making in other sectors, or at the national level, and rapid response depends on adequate environmental surveillance systems and timely access to information.

In terms of USAID programming, the implementation of this recommendation will support efforts to promote early detection of invasive species, and increased surveillance for antibiotic-resistant zoonotic and animal pathogens.

Detection and management of invasive species can also ensure ecosystem composition (structure) is not disrupted and that changes to the provisioning of ecosystem services are prevented. Individuals working at borders, in agriculture, and in protected areas must be aware of invasive species. This requires development of awareness campaigns and the promotion of systems for early detection and ultimately the management or eradication of invasive species.

10. Build the formal organizational capacity of artisans in natural resource-based small and medium enterprises and community cooperatives to implement best practices for natural resource management, forestry, and fisheries management.

Anticipated Outcome		Reduction in pressure on natural resources from population growth		Understanding of laws, including incentives to comply with laws		Improved understanding of, and access to technology to prevent or treat pollution and protect public health
Links to USAID Nature, Wealth, and Power Principles:	N3. Promote sustainable practices and systems that increase natural capital's productivity N4. Promote climate- and socioeconomically-resilient rural production systems W2. Invest revenues from resource extraction into creation of new assets and incomes P3. Improve broadly based representation and continuous rural input on resource decisions P5. Integrate and empower women and marginalized groups to participate in management, decisions, and benefits					

In extractive industries like gold mining there are substantial scale economies to be achieved compared to artisanal-scale production. Not only are there economic advantages, but environmental and social impacts are easier to identify, mitigate, and monitor. Specifically, formalizing artisanal miners is a strategic means to improving environmental performance and reducing social problems (i.e., public health) associated with poorly governed artisanal mining.

Miners are attracted to formalization because of the existing incentives for forming cooperatives or small production companies (e.g., legal permit/right to operate, higher price for gold in formal market vs. black market). These incentives should be more clearly and broadly articulated.

In terms of USAID programming, the implementation of this recommendation will enhance civil society and organized labor. It will also reduce the risk of pollution contamination of water supplies and of fish in streams.

11. Build capacity for integrated water resource management that will promote the long-term resiliency of water-reliant industries and ecosystems and protect drinking water sources.

Anticipated Outcome		Reduction in pressures of water management from population growth		Increased government capacity at the local/ regional level to manage water resources		Specified infrastructure / technology and ecosystem services needs to manage water availability and quality
Links to USAID Nature, Wealth, and Power Principles:	N1. Safeguard natural capital's productive capacities N3. Promote sustainable practices and systems that increase natural capital's productivity W1. Strengthen natural capital accounting, valuation, and analytic tools to improve decisions W3. Create frameworks and incentives to improve alignment of public and private interests P2. Decentralize powers and responsibilities to representative and accountable authorities					

Water availability is a constant concern and constraint to growth in Senegal—particularly in the agricultural sector. Because water availability varies greatly within the year and across years and is predicted to become more variable as a result of climate change, water should be managed at the basin level with detailed planning for competing uses (e.g., human, agricultural, livestock use). Water resource management plans should focus on, and identify, geographic areas that are critical for water purification, flow regulation, and retention.

Drinking water access is improving across Senegal, but in many cases water is still not safe to drink from the tap. Ultimately, community water systems need the technical, managerial, and financial capacity to provide safe drinking water to communities and maintain treatment and distribution systems. By working towards the establishment of price signals, USAID is supporting the development of self-sustaining and self-financing water systems that will not be dependent on foreign donors. These efforts should continue to be supported.

As a part of integrated water resource management, source water protection should be incorporated into water management to ensure the sustainability and lowest cost options for treatment (i.e., avoiding the need for more and more treatment by avoiding the contamination of drinking water sources). Forested areas and grasslands in source water areas provide water retention/flow and purification ecosystems services, and protection of these areas will help avoid additional stress to drinking water purification systems and higher purification costs.

In terms of USAID programming, the implementation of this recommendation will help ensure the sustainability of agricultural and drinking water systems, and will increase the adaptive capacity of communities, particularly those with the greatest current climate vulnerability (i.e., rural populations and populations in the north).

EXTENT TO WHICH PROPOSED AND CURRENT USAID PROGRAM ACTIONS MEET IDENTIFIED NEEDS

O = OPPORTUNITY FOR USAID, ACTIVITIES ARE NOT CURRENTLY MEETING THE NECESSARY ACTION, BUT COULD IN FUTURE PROGRAMS

+ = EXISTING PROGRAMS AND POTENTIAL NEW ACTIVITIES MEET THE NECESSARY ACTION

NECESSARY ACTIONS	Agriculture	Conflict/ Peace Building	Democracy & Governance	Education	Energy/ Power Africa	Fisheries	Public Health, Nutrition & Family Planning	Water/ Wash
1. Increase agricultural productivity on existing fertile lands (especially Tambacounda) through the use of improved technologies, seed varieties, and weather/climate information systems to increase overall long-term productivity (including climate resiliency).	+							
2. Build capacity for fisheries management.						+		
3a. Conduct a strategic/programmatic environmental impact assessment for USAID agriculture activities to provide a framework/guidance for investments and prevent undesirable environmental impacts.	O							
3b. Build GoS capacity for a strategic/programmatic environmental impact assessment for the mining sector that will provide a framework/guidance for industrial-scale mine investments and prevent undesirable environmental impacts.			O					
4. Develop application text (i.e., directives) and other resources (e.g., conservation-specific guidelines, factsheets, monitoring and evaluation tools, technical models, training programs) to support GoS's decentralization efforts and protect the environment and associated ecosystem services.		O	O					
5. Support the translation of existing laws to local languages and the dissemination, enforcement, and continuous implementation of these laws at all levels.			O	O				
6. Develop decentralized/distributed renewable energy supplies to expedite rural electrification and provide cost-effective alternative cooking fuel				O	O		O	

	O = OPPORTUNITY FOR USAID, ACTIVITIES ARE NOT CURRENTLY MEETING THE NECESSARY ACTION, BUT COULD IN FUTURE PROGRAMS + = EXISTING PROGRAMS AND POTENTIAL NEW ACTIVITIES MEET THE NECESSARY ACTION							
NECESSARY ACTIONS	Agriculture	Conflict/ Peace Building	Democracy & Governance	Education	Energy/ Power Africa	Fisheries	Public Health, Nutrition & Family Planning	Water/ Wash
sources and innovative practices that decrease cooking time, reduce pressure on forested lands for fuel wood extraction, and improve women's health.								
7. Support land use planning and capacity building needed to develop urban areas and natural resources (especially community forestry in Casamance), protect ecosystem services, and secure wildlife corridors for endangered species.	O		O	O				
8. Ensure adequate funding for environment through the national budget, local tax revenues, and funding by natural resource-based industries, and establish mechanisms (e.g., payment of ecosystems services, conservation trust funds, carbon finance, and polluters' payment)			O					
9. Support the strengthening of environmental monitoring systems and support the development of a data clearinghouse to improve access to existing information and support the exchange of information between related information sources (e.g., livestock, public health, fisheries)	O			O		O	O	
10. Build the formal organizational capacity of artisans in natural resource-based small and medium enterprises and community cooperatives to implement best practices for natural resource management, forestry, and fisheries management.	O			O				
11. Build capacity for integrated water resource management that will promote the long-term resiliency of water-reliant industries and ecosystems and protect drinking water sources.	O							O

RESUME EXECUTIF

OBJET ET PORTÉE

Le but de cette évaluation est d'analyser les menaces environnementales et leurs causes profondes et ensuite d'identifier les opportunités de conservation de l'environnement, la protection et l'amélioration de gestion des ressources naturelles spécifiquement en lien avec la programmation de l'USAID. En intégrant les préoccupations relatives à la biodiversité et à la conservation des forêts tropicales et autres aspects connexes, cette évaluation est conforme aux articles 117, 118, et 119 du *Foreign Assistance Act* de 1961, tel que modifié. Elle sera utilisée pour appuyer la Mission de l'USAID au Sénégal en planification stratégique, eu égard au Système de Directives Automatisées (Automated Directives System) ADS 201.3.4.11 et ADS 204.5.

Pour soutenir ces objectifs, l'évaluation ressort les liens importants entre secteurs de même que de nouvelles initiatives en matière de conditions environnementales ainsi que les menaces dont l'USAID / Sénégal doit être conscient au moment de l'élaboration de la prochaine Stratégie de Coopération au Développement Pays (CDCS). Cette évaluation fournit également des recommandations sur la meilleure façon d'aborder ces conditions en vue de protéger la base de ressources naturelles, préserver la biodiversité et les forêts tropicales, et promouvoir l'utilisation durable des ressources, permettant ainsi à l'écosystème de continuer à fournir les biens et services nécessaires pour des collectivités saines et pour la croissance économique. Cette évaluation vient en remplacement de l'Evaluation 118/119 sur la Biodiversité et les Forêts Tropicales achevée en 2008.

Cette évaluation résume l'état actuel du développement au Sénégal (section 2) -y compris sa dépendance économique sur les écosystèmes et les services écosystémiques, ensuite elle décrit la programmation de l'USAID (section 3) et l'état de l'environnement et de la gestion des ressources naturelles (section 4). Cela comprend une description de la biodiversité, des forêts et des activités axées sur les ressources naturelles (par exemple, l'agriculture, la pêche et l'exploitation minière). Les menaces environnementales (article 5) sont décrites en termes de menaces directes (actions humaines directes qui nuisent à la biodiversité, aux forêts tropicales et à l'environnement) et de leurs facteurs ou de leurs causes profondes.
Les actions nécessaires pour conserver et gérer durablement la biodiversité et les forêts tropicales, et autrement protéger l'environnement (article 6) sont décrites en termes généraux, puis liées à la stratégie de l'USAID (section 7) et discutées en termes d'opportunités pour l'USAID de travailler avec le Gouvernement du Sénégal (GdS), d'autres donateurs, des organisations non-gouvernementales (ONG), et les parties prenantes (article 8). Cette évaluation conclut par une brève discussion des principales recommandations en termes de cadre de résultats de l'USAID (section 9).

METHODOLOGIE

L'équipe d'évaluation a mené l'Evaluation des Menaces et Opportunités Environnementales (ETOA – sigle en anglais) à travers trois phases se recoupant partiellement, y compris la recherche de bureau, les consultations des parties prenantes, et l'analyse. L'équipe d'évaluation a commencé par une semaine d'examen de dossier de l'information disponible sur les questions socio-économiques, l'écologie, la conservation, la gestion environnementale et la programmation de l'USAID au Sénégal. Cette information a été utilisée pour élaborer un avant-projet de rapport visant à identifier les ressources clés et les lacunes dans les connaissances et préparer les consultations des parties prenantes du pays. Une revue de documentation clé est incluse à l'annexe B. Cette revue a été achevée en même temps que les préparatifs pour les missions sur le terrain de deux semaines.

La consultation des parties prenantes a commencé par Washington incluant du personnel de l'environnement de l'USAID, notamment le coordonnateur de l'Agence environnementale, le personnel du Bureau des forêts et de la biodiversité, ainsi que du personnel représentant d'autres agences du gouvernement américain comme l'USAID, et des organisations non gouvernementales. Un suivi de ces consultations a été mené avant la visite dans le pays-hôte.

Une visite de travail de deux semaines dans le pays-hôte a commencé le 24 Août 2015, axée sur des entrevues et des consultations auprès des intervenants afin de vérifier sur le terrain les résultats préliminaires et d'élargir la portée de l'étude pour répondre de manière appropriée aux exigences d'une ETOA complète. Cette visite de travail dans le pays a démarré par une entrevue introductive (24 Août 2015) et s'est achévée par une réunion de présentation des principales conclusions et recommandations (4 Septembre, 2015) à la Mission de l'USAID/Sénégal.

L'équipe d'évaluation a animé un atelier des parties prenantes d'une demi-journée (Dakar) avec des participants représentant du Gouvernement sénégalais, d'ONG et du secteur privé. L'atelier a présenté et discuté de questions clés et d'hypothèses en lien avec les menaces environnementales, leurs facteurs et les opportunités d'y faire face. Au cours de l'atelier, l'équipe d'évaluation a sollicité des participants leurs contributions par rapport à des questions environnementales supplémentaires à prendre en compte dans la préparation de l'ETOA. Les résultats de l'exercice mené en petits-groupes ont été utilisés pour valider les hypothèses et les menaces environnementales clés identifiés par le travail de bureau préalablement effectué et les entrevues initiales avec certaines parties prenantes. Un objectif secondaire de l'atelier était de favoriser un consensus entre l'USAID et d'autres acteurs de la gestion de l'environnement. Le Français était la langue de l'atelier.

Cette ETOA a été finalisée sur la la base d'une revue mise à jour de littérature, une analyse SIG, des consultations des parties prenantes (annexe A), et les commentaires et retour d'information de l'USAID sur la version provisoire du rapport eu égard aux termes de référence approuvés.

ETAT DE L'ENVIRONNEMENT ET GESTION DES RESSOURCES NATURELLES

Le Sénégal dispose d'un grand réseau d'aires protégées avec six parcs nationaux, six réserves d'oiseaux, quatre sites Ramsar et 213 réserves forestières. En outre, les populations rurales conservent de nombreux sites comme des lieux de culte. La superficie totale des terres sous protection au Sénégal est 51,617 km2, soit 25 pour cent de la superficie totale du pays qui est de 192,530 km2. En outre, le Sénégal a 1.736 km2 d'aires marines protégées (AMP) représentant 1% de la zone marine totale qui est de 158,450 km2. Eu égard à l'objectif 11de la Convention sur la diversité biologique (dont le Sénégal est signataire), d'ici 2020, au moins 17 pour cent des zones terrestres et d'eaux intérieures et 10 pour cent des zones côtières et marines devraient être sous la protection. Le Sénégal répond à l'objectif de protection terrestre, mais pas à l'objectif de protection du milieu marin. Beaucoup de zones protégées sont menacées par la mauvaise gestion, le braconnage et la surexploitation.

Selon la Liste Rouge de l'Union Internationale pour la Conservation de la Nature (UICN), une espèce au Sénégal est éteinte à l'état sauvage, neuf sont en danger critique, 26 sont menacées, 71 sont vulnérables, et 54 sont près d'être menacées. Cela englobe à la fois des espèces terrestres et marines. La gazelle de Damma et la girafe avaient disparu, mais ont ensuite été réintroduits. Le nombre total d'espèces de végétaux énumérés (14) est inférieure à 1% de la diversité végétale totale connue dans le pays. Cependant, le nombre d'espèces animales inscrites (147) est d'environ 27% du total de la vie animale terrestre et marine connue au Sénégal.

Les écosystèmes forestiers du Sénégal se répartissent entre trois domaines phytogéographiques selon une distribution du Nord au Sud (du domaine sahélien au domaine soudanien et au domaine guinéen). Les principaux types de végétation occupent une superficie de 679,450 hectares, dont 44% de savane, 27% de zones de cultures, 18 % de steppes, 4% de forêts et 1% de mangroves. Une estimation de 2015 mentionne que le Sénégal perd environ 40.000 hectares de forêt chaque année. Le couvert forestier est progressivement réduit par les feux de brousse, la conversion pour l'agriculture, la production de charbon de bois, le surpâturage et la coupe de bois, dont les effets aggravent le réchauffement climatique, et, par conséquent, conduisent à des périodes de sécheresse plus longues.

L'agriculture, y compris les cultures terrestres et les pêches ouvertes sont la force motrice de l'économie au Sénégal, où 80% de la population dépend de ces secteurs comme leur principale source d'emplois et de revenus. Les céréales pluviales occupent la plupart des terres cultivées pendant la saison des cultures. Elles sont principalement destinées à l'auto-consommation, et sont très sensibles aux chocs climatiques. Les principales cultures de rente terrestres sont l'arachide et le coton. Le potentiel agronomique a été sérieusement altéré par la dynamique de la population, l'expansion et la pratique de l'agriculture extensive sur brûlis, la sécheresse, les feux de brousse, et la disparition de la couverture végétale. L'agriculture terrestre à travers son utilisation d'engrais et le détournement des flux d'eau provoque de graves menaces sur la biodiversité marine et la santé des habitats côtiers tels que les deltas et estuaires productifs.

La pêche par capture joue un rôle économique particulièrement important au Sénégal. Les produits de ce type de pêche représentent 12,3% des recettes d'exportation et participent à hauteur de 1,3% au PIB, non compris la commercialisation du poisson, la transformation artisanale et industrielle, les captures continentales, et d'autres activités post-récolte. La pêche fournit des emplois directs et indirects à environ 600.000 personnes. Elle est aussi extrêmement importante pour la sécurité alimentaire, la consommation annuelle de poisson par habitant étant de 26 kg, plaçant le Sénégal parmi les plus grands consommateurs de poissons de l'Afrique. Cependant, de nombreuses pêches de capture sont faites de manière non durable et la population de la sardinelle est à risque d'effondrement en raison de l'absence de gestion à la fois au Sénégal et en Afrique de l'Ouest, menaçant tout à la fois la sécurité alimentaire, les moyens de subsistance, l'économie nationale et la biodiversité.

Sur un tout autre plan, le sous-sol sénégalais offre de grandes variétés de substances minérales, y compris les métaux dits nobles (or et platine), les métaux de base (fer, cuivre, chrome, nickel), des minéraux industriels (phosphates industriels, calcaire, sels, barytine, etc.) de minéraux lourds (zircon et titane), des pierres décoratives, et des matériaux de construction. La région de Kédougou en particulier, a d'importants gisements d'or, de minerai de fer, le marbre, d'uranium, de cuivre et de chrome. Le Sénégal a aussi une richesse dans d'autres gisements de minéraux divers, inexploitées. Un nouveau code minier adopté en 2003 et la promotion d'un investissement significatif encouragé et soutenu par le gouvernement sénégalais et ses partenaires de développement s'est traduit par la diversification dans le secteur minier.

Quant aux ressources en eau, le Sénégal dispose d'un potentiel important tant pour les eaux de surface et que les eaux souterraines. La disponibilité des ressources en eau est estimée à environ 4747 m3 / habitant / an. Les principales ressources en eau de surface sont le bassin du fleuve Sénégal et les bassins versants des rivières Gambie, Casamance et Kayanga. Il y a aussi des ressources en eaux souterraines importantes réparties sur l'ensemble du territoire et à travers différents types d'aquifères. Des nappes souterraines profondes dans le sable et le grès de la couche Maastrichtienne couvrent les 4/5ème du territoire sénégalais. Les principales menaces pour la quantité et la qualité de l'eau sont le changement climatique, la mauvaise gestion à l'échelle du paysage et la surexploitation qui en résulte, et les pollutions provoquées par l'agriculture et les déchets industriels et domestiques.

MENACES DIRECTES/FACTEURS DE DÉGRADATION DE L'ENVIRONNEMENT ET ACTIONS NÉCESSAIRES

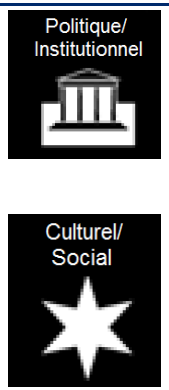
Pour identifier les actions nécessaires en vue de protéger l'environnement et préserver les ressources naturelles, les facteurs (facteurs ultimes ou causes fondamentales) des menaces directes (causes immédiates) doivent être identifiés et traités. Un tableau a été élaboré pour présenter les facteurs de dégradation de l'environnement pour chacune des menaces directes identifiées. Cette synthèse de catégorisation des causes fondamentales ou profondes est basée sur l'analyse globale des menaces et des conclusions faites à partir des consultations avec les parties prenantes et des documents examinés.

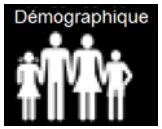
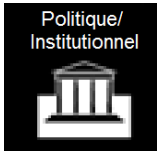
Pour répondre à chacune des causes fondamentales (facteurs), l'équipe d'évaluation a identifié les actions nécessaires inscrites dans le tableau ci-après, permettant de renforcer la protection de l'environnement et de promouvoir la gestion durable des ressources naturelles (GRN).

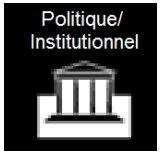
Code Couleur d'Ecosystème**:

ECOSYSTEME	COULEUR DE REFERENCE
Forêts	
Agriculture et Elevage	
Marin and Côtier	
Rivière et Lac	
Aires Protégées	

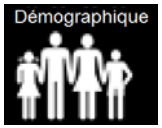
MENACES ET FACTEURS DE MENACES SUR LA BIODIVERSITE, LES FORETS ET LES ECOSYSTEMES AFFECTÉS					
Priorité	Menaces	Facteurs	Catégorie de Facteur	Actions nécessaires face aux Facteurs	Ecosystème**
Elevé	• Déforestation (notamment dans la zone Nord et de l'Anambé de la Casamance) issue de l'agriculture à faible productivité et du pastoralisme (y compris le surpâturage).	• les capacités techniques, managériales et financières limitées des pasteurs et des gestionnaires de l'élevage occasionnant des pratiques à faible productivité qui ne sont pas résistantes au changement climatique.		1. Augmenter la productivité agricole globale à long terme sur les terres fertiles existantes (en particulier de Tambacounda) à travers l'utilisation de technologies améliorées, de meilleures variétés de semences, et de systèmes météorologiques et d'information climatique (y compris pour la résilience climatique).	

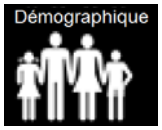
MENACES ET FACTEURS DE MENACES SUR LA BIODIVERSITE, LES FORETS ET LES ECOSYSTEMES AFFECTÉS					
Priorité	Menaces	Facteurs	Catégorie de Facteur	Actions nécessaires face aux Facteurs	Ecosystème**
Elevé	• Salinisation / acidification des sols et de l'eau issue du développement de l'irrigation en raison de plus courtes saisons culturales, du changement climatique et d'une augmentation de la demande en eau pour l'agriculture.	• les capacités techniques, managériales et financières limitées des agriculteurs et des gestionnaires de l'agriculture occasionnant des pratiques d'irrigation à faible productivité et qui ne sont ni viables à long terme et ni résistantes au changement climatique.		1. Augmenter la productivité agricole globale à long terme sur les terres fertiles existantes (en particulier de Tambacounda) à travers l'utilisation de technologies améliorées, de meilleures variétés de semences, et de systèmes météorologiques et d'information climatique (y compris pour la résilience climatique)	
Elevé	• surpêche et pêche illégale provoquant le déclin ou la disparition des ressources marines globales, notamment celles des pêcheries.	• accès libre et illimité aux ressources halieutiques • mauvaises pratiques de pêche et utilisation d'engins inappropriés (par exemple, monofilament, chalutage de fond, sennes de plage) • manque de ressources humaines, de capacités techniques et d'équipements pour gérer la ressource • manque d'accès à l'information sur l'état des stocks des ressources.		2. Renforcer les capacités en gestion des pêches	

MENACES ET FACTEURS DE MENACES SUR LA BIODIVERSITE, LES FORETS ET LES ECOSYSTEMES AFFECTÉS					
Priorité	Menaces	Facteurs	Catégorie de Facteur	Actions nécessaires face aux Facteurs	Ecosystème**
					
Elevé	• Perte d'habitat (terrestre et marin) pour des espèces clés menacées (par exemple, les chimpanzés, les dauphins, les lamantins, les tortues marines et les oiseaux) provoquée par: - l'utilisation des terres (par exemple, l'agriculture, l'exploitation minière, les grandes infrastructures d'énergie comme les barrages hydroélectriques) ; - la déforestation ; - le changement climatique (déplacement d'habitats).	• faible planification stratégique au niveau national pour le développement des ressources naturelles et la conservation des écosystèmes et des espèces en menacées • faible gouvernance et capacité locale à mettre en œuvre les lois existantes •croissance de la population urbaine • augmentation de la demande pour l'eau, l'énergie et la nourriture.	 	3a. Procéder à une évaluation stratégique programmatique de l'impact environnemental des activités de l'USAID dans l'agriculture offrant un cadre d'orientation des investissements et permettant de prévenir les impacts environnementaux indésirables. 3b. Renforcer les capacités du Gouvernement sénégalais en évaluation stratégique et programmatique des impacts environnementaux du secteur minier en vue d'offrir un cadre de conseils pour les investissements miniers à l'échelle industrielle et pour prévenir les impacts environnementaux indésirables. 4. Développer les textes d'application (par exemple, les directives) et d'autres ressources (par exemple, les lignes directrices spécifiques de conservation, des fiches d'information, de suivi et outils d'évaluation, des modèles techniques, des programmes de formation) pour soutenir les efforts de décentralisation du Gouvernement sénégalais. 5. Soutenir la traduction des lois existantes en langues locales et assurer leur diffusion, ainsi que l'application et la mise en œuvre continue de ces lois à tous les niveaux. 6. Développer et décentraliser l'approvisionnement en énergie renouvelable pour accélérer l'électrification rurale et fournir des sources	

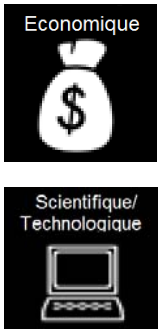
MENACES ET FACTEURS DE MENACES SUR LA BIODIVERSITE, LES FORETS ET LES ECOSYSTEMES AFFECTÉS					
Priorité	Menaces	Facteurs	Catégorie de Facteur	Actions nécessaires face aux Facteurs	Ecosystème**
				alternatives d'énergie de cuisson qui soient rentables, pratiques et innovantes et qui diminuent le temps de cuisson, réduisent la pression sur les terres boisées sources d'extraction de bois de chauffage, et améliorent la santé des femmes. 7. Soutenir la planification de l'utilisation des terres et le renforcement des capacités nécessaires pour développer les zones urbaines, le développement des ressources naturelles (par exemple, la foresterie communautaire), protéger les services écosystémiques, et les corridors fauniques sécurisés pour les espèces menacées.	
Moyenne	Braconnage	• Manque d'application et d'incitation à se conformer aux lois • Faibles capacités techniques, financières et de gestion des parcs. • Augmentation de la demande sur les marchés internationaux et les marchés locaux (viande de brousse, commerce d'espèces sauvages telles que les perroquets gris).	  	4. Développer les textes d'application (par exemple, les directives) et d'autres ressources (par exemple, les lignes directrices spécifiques de conservation, des fiches d'information, outils de suivi et d'évaluation, les modèles techniques, programmes de formation) pour soutenir les efforts de décentralisation du Gouvernement sénégalais et de protéger l'environnement et les services écosystémiques associés. 8. Assurer un financement adéquat pour l'environnement par le budget national, les recettes fiscales locales, et le financement par les industries axées sur les ressources naturelles, et établir des mécanismes (par exemple, le paiement des services écosystémiques, fonds fiduciaires pour la conservation, finance carbone, et loi pollueur-payeur).	

MENACES ET FACTEURS DE MENACES SUR LA BIODIVERSITE, LES FORETS ET LES ECOSYSTEMES AFFECTÉS					
Priorité	Menaces	Facteurs	Catégorie de Facteur	Actions nécessaires face aux Facteurs	Ecosystème**
Moyenne	• L'exploitation forestière illégale pour le commerce illégal du bois (surtout en Casamance)	• Manque d'opportunités économiques en Casamance • Marché noir fort en Gambie pour l'exportation illégale de bois.		7. Soutenir la planification de l'utilisation des terres et le renforcement des capacités nécessaires pour développer les zones urbaines, développer les ressources naturelles (par exemple la foresterie communautaire), protéger les services écosystémiques, et les corridors fauniques sécurisées pour les espèces menacées.	
Moyenne	• Exploitation forestière illégale pour des usages domestiques (pastoralisme, construction, surtout à Dakar) • incendies incontrôlés / feux de brousse causés par: - l'agriculture sur brûlis - les feux pastoraux • les émissions de gaz à effet de serre (origine du changement climatique) à partir de: - conversion des habitats (déforestation, développement des zones humides) - feux de brousse / forestier • Industrie et transport	• Concurrence dans les utilisations des terres en raison de la tenure foncière peu claire ou la faible application des droits de propriété. • Financement insuffisant pour la conservation des forêts tropicales et refus de respect des limites de zones classées • Manque d'application et d'incitation à se conformer aux lois en raison de l'insuffisance des fonds ou de la formation • incitations financières inadéquates / niveau de coûts pour la conservation des forêts (ressources sous-évaluées) • Manque de politiques locales permettant de protéger les habitats	  	4. Développer le texte d'application (par exemple, les directives) et d'autres ressources (par exemple, les lignes directrices spécifiques de conservation, des fiches d'information, outils de suivi et d'évaluation, les modèles techniques, programmes de formation) pour soutenir les efforts de décentralisation du Gouvernement sénégalais et de protéger l'environnement et les services écosystémiques associés. 7. Soutenir la planification de l'utilisation des terres et le renforcement des capacités nécessaires pour développer les zones urbaines, développer les ressources naturelles (esp. De la foresterie communautaire en Casamance), protéger les services écosystémiques, et des corridors fauniques sécurisées pour les espèces menacées. 8. Assurer un financement adéquat pour l'environnement par le budget national, les recettes fiscales locales, et le financement par les industries axées sur les ressources naturelles, et établir des mécanismes (par exemple, le paiement des services écosystémiques, fonds fiduciaires pour la conservation, finance carbone, et loi pollueur-payeur).	

MENACES ET FACTEURS DE MENACES SUR LA BIODIVERSITE, LES FORETS ET LES ECOSYSTEMES AFFECTÉS					
Priorité	Menaces	Facteurs	Catégorie de Facteur	Actions nécessaires face aux Facteurs	Ecosystème**
Moyenne	• fabrication de charbon de bois (combustibles de cuisson / énergie)	• La demande de combustible pour la cuisson et le prix élevé des alternatives (par exemple, le gaz naturel)	  	6. Développer et décentraliser l'approvisionnement en énergie renouvelable pour accélérer l'électrification rurale et fournir des sources alternatives d'énergie de cuisson qui soient rentables, pratiques et innovantes et qui diminuent le temps de cuisson, réduisent la pression sur les terres boisées sources d'extraction de bois de chauffage, et améliorent la santé des femmes.	
Faible	• Espèces envahissantes et propagation de la végétation aquatique en raison : - de l'introduction par des sources étrangères - du changement climatique (changements de température ou de régime des précipitations)	• Le manque d'accès à l'information sur les introductions d'espèces non indigènes, la population et la distribution, et le risque environnemental / économique		9. Soutenir le renforcement des systèmes de surveillance de l'environnement et la création d'un centre de données pour améliorer l'accès à l'information existante et soutenir l'échange d'informations entre les sources d'information (par exemple, l'élevage, la santé publique, de la pêche).	

MENACES ET FACTEURS DE MENACES SUR LA BIODIVERSITE, LES FORETS ET LES ECOSYSTEMES AFFECTÉS					
Priorité	Menaces	Facteurs	Catégorie de Facteur	Actions nécessaires face aux Facteurs	Ecosystème**
Faible	• Maladies (zoonoses, paludisme) causant la faible fréquentation des parcs nationaux et affectant la croissance économique de:	• Le manque d'accès à l'information sur les épidémies et les sources de la maladie	 	9. Soutenir le renforcement des systèmes de surveillance de l'environnement et la création d'un centre de données pour améliorer l'accès à l'information existante et soutenir l'échange d'informations entre les sources d'information (par exemple, l'élevage, la santé publique, de la pêche).	
Elevée	• Pollutions (eaux intérieures de surface, souterraines et des eaux côtières, et de l'air) à partir de: o Industries (mines, agro-industrie, usines de ciment, pétrole et gaz) o traitement inadéquat des déchets humains et animaux o systèmes de gestion des déchets solides inadéquats.	• Croissance de la population urbaine • Manque d'application et faible incitation à se conformer aux lois • Manque de technologie pour prévenir ou traiter les pollutions.	  	3a. Procéder à une évaluation stratégique programmatique de l'impact environnemental des activités de l'USAID dans l'agriculture offrant un cadre d'orientation des investissements et permettant de prévenir les impacts environnementaux indésirables. 3b. Renforcer les capacités du Gouvernement sénégalais en évaluation stratégique et programmatique des impacts environnementaux du secteur minier en vue d'offrir un cadre de conseils pour les investissements miniers à l'échelle industrielle et pour prévenir les impacts environnementaux indésirables. 4. Développer les textes d'application (par exemple, les directives) et d'autres ressources (par exemple, les lignes directrices spécifiques de conservation, des fiches d'information, de suivi et outils d'évaluation, des modèles techniques, des programmes de formation) pour soutenir les efforts de décentralisation du	

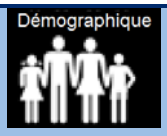
MENACES ET FACTEURS DE MENACES SUR LA BIODIVERSITE, LES FORETS ET LES ECOSYSTEMES AFFECTÉS					
Priorité	Menaces	Facteurs	Catégorie de Facteur	Actions nécessaires face aux Facteurs	Ecosystème**
				Gouvernement sénégalais. 5. Soutenir la traduction des lois existantes en langues locales et assurer leur diffusion, ainsi que l'application et la mise en œuvre continue de ces lois à tous les niveaux. 6. Développer et décentraliser l'approvisionnement en énergie renouvelable pour accélérer l'électrification rurale et fournir des sources alternatives d'énergie de cuisson qui soient rentables, pratiques et innovantes et qui diminuent le temps de cuisson, réduisent la pression sur les terres boisées sources d'extraction de bois de chauffage, et améliorent la santé des femmes. 7. Soutenir la planification de l'utilisation des terres et le renforcement des capacités nécessaires pour développer les zones urbaines, développer les ressources naturelles (esp. la foresterie communautaire en Casamance), protéger les services écosystémiques, et des corridors fauniques sécurisées 10. Renforcer la capacité organisationnelle formelle des artisans des petites et moyennes entreprises axées sur les ressources et les coopératives communautaires pour mettre en œuvre les meilleures pratiques de gestion des ressources naturelles, la foresterie et la gestion des pêches . 11. Renforcer les capacités pour la gestion intégrée des ressources en eau qui fera la promotion de la résilience à long terme des industries qui dépendent de l'eau et des écosystèmes et protéger les sources d'eau potable.	

MENACES ET FACTEURS DE MENACES SUR LA BIODIVERSITE, LES FORETS ET LES ECOSYSTEMES AFFECTÉS					
Priorité	Menaces	Facteurs	Catégorie de Facteur	Actions nécessaires face aux Facteurs	Ecosystème**
Elevé	• • Inondations, y compris les inondations exacerbées par le changement climatique et l'altération des régimes de précipitations.	• Faible ou le manque d'infrastructure de drainage pour réduire la vulnérabilité face aux risques d'inondation et au besoin de régulation des flux. • Manque de matériel scientifique pour conduire des enquêtes, assurer la surveillance et déclencher l'alerte précoce.		4. Développer les textes d'application (par exemple, les directives) et d'autres ressources (par exemple, les lignes directrices spécifiques de conservation, des fiches d'information, de suivi et outils d'évaluation, des modèles techniques, des programmes de formation) pour soutenir les efforts de décentralisation du Gouvernement sénégalais. 9. Soutenir le renforcement des systèmes de surveillance de l'environnement et la création d'un centre de données pour améliorer l'accès à l'information existante et soutenir l'échange d'informations entre les sources d'information (par exemple, l'élevage, la santé publique, de la pêche).	
Faible	• Erosion côtière due à l'extraction du sable marin et aux constructions anarchiques en zone côtière entraînant la dégradation des services écosystémiques tampons et la montée du niveau de la mer	Croissance de la population urbaine et manque de planification des constructions urbaines		7. Soutenir la planification de l'utilisation des terres et le renforcement des capacités nécessaires pour développer les zones urbaines, développer les ressources naturelles (esp. de la foresterie communautaire en Casamance), protéger les services écosystémiques, et des corridors fauniques sécurisées 8. Assurer un financement adéquat pour l'environnement par le budget national, les recettes fiscales locales, et le financement par les industries axées sur les ressources naturelles, et établir des mécanismes (par exemple, le paiement des services écosystémiques, fonds fiduciaires pour la conservation, finance carbone, et loi pollueur-payeur).	

PRINCIPALES RECOMMANDATIONS POUR L'USAID / SENEGAL ET RESULTATS ESCOMPTES

Chacune des actions nécessaires-indépendamment de l'état actuel de l'engagement de l'USAID, contribuera à soutenir le développement durable, à conserver le capital naturel dont dépendent la pêche et la sécurité alimentaire au Sénégal, ainsi qu'à réduire les émissions de gaz effet de serre et renforcer la résilience au changement climatique. La mise en œuvre de ces mesures permettra aussi de réduire les risques environnementaux des projets de l'USAID et, par conséquent, d'améliorer les résultats des interventions du Gouvernement américain.

1. Augmenter la productivité agricole sur les terres fertiles existantes (en particulier de Tambacounda) à travers l'utilisation de technologies améliorées, de meilleures variétés de semences, et des systèmes météorologiques / d'information climatique pour augmenter la productivité globale à long terme (y compris la résilience climatique).

Résultats prévus	 Réduction de la superficie des terres utilisées par habitant/effacés pour atteindre les besoins alimentaires existants et futurs.	 Réduction de la pauvreté et l'instabilité économique la conduite loyer/comportement de recherche terrestre.	 Réduction de l'utilisation de de pratiques agricoles basse technologie et à faible productivité conduisant à l'utilisation inefficace des ressources humaines et du capital naturel.
Liens avec les principes de l'USAID : Nature-Richesse-et Pouvoir	N1. Sauvegarder les capacités de production du capital naturel N3. Promouvoir des pratiques durables et qui permettent d'augmenter la productivité du capital naturel N4. Promouvoir un développement socio-économique et des systèmes de production rurale résilients au climat. R1. Renforcer le système comptable du capital naturel, l'évaluation, et les outils d'analyse pour améliorer les prises de décisions		

Alors que les agriculteurs à travers le Sénégal augmentent considérablement leur production, il reste néanmoins que des gains importants sont encore nécessaires pour répondre aux besoins de sécurité alimentaire intérieure et augmenter les exportations d'arachide, de coton et d'autres cultures de base. Pour protéger l'intégrité des zones forestières intactes (important pour l'eau et les services écosystémiques, la régulation climatique) et maintenir des zones pour le bétail et d'autres activités économiques, l'augmentation de la production agricole doit être réalisée sur des terres fertiles déjà en culture, à la place de la poursuite de la production sur des terres agricoles à faible productivité. L'occasion est plus opportune dans le sud du Sénégal (par exemple, Kédougou, Tambacounda) où les sols sont plus fertiles et les ressources en eau plus abondantes et susceptibles d'être moins touchés par le changement climatique.

De bonnes pratiques agricoles (par exemple, la diversification des cultures et leur rotation) sont déjà mises en œuvre et devraient être renforcées. Les efforts pour soutenir le partage d'informations sur les meilleures pratiques sur la gestion de la variabilité du climat doivent également être mises en œuvre. Des programmes qui rassemblent des agriculteurs de différentes régions en vue de partager les meilleures pratiques et les bonnes méthodes de culture peuvent aider à développer la résilience au changement climatique. Par exemple l'agroforesterie est promue dans le nord du Sénégal, après que les agro-écosystèmes ont été modifiés et les services de rétention d'eau et de régulation de l'écosystème ont été perdus du fait de trop intenses coupes des arbres. Maintenant, des efforts sont en cours pour replanter des arbres et promouvoir l'agroforesterie dans le nord. Cependant, en raison d'une plus grande abondance de l'eau et des arbres, l'agroforesterie n'est pas perçue formellement comme une priorité dans le sud.

Le maintien de la diversité génétique des cultures grâce à des variétés de semences supplémentaires/améliorées est une action nécessaire pour accroître la productivité agricole et l'adaptation au changement climatique. Le Gouvernement du Sénégal limite actuellement le nombre de fondations qui peuvent produire des semences et de nouveaux hybrides. Cela peut limiter l'efficacité de la production,

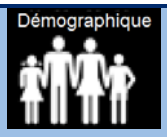
favorisant l'expansion de l'agriculture à faible productivité rivalisant avec d'autres utilisations des terres (par exemple, le pâturage du bétail, la conservation). Des banques de semences supplémentaires devraient être développées pour assurer que les bonnes variétés de semences sont disponibles pour les agriculteurs.

Alors que les banques de semences existent et les agriculteurs sont intéressés à utiliser et améliorer les variétés de semences, les décisions prenant en compte le climat doivent également être soutenues par des informations actionnables, à temps opportun, et limitées dans le temps (par exemple, les prévisions annuelles qui aident les agriculteurs à décider des meilleurs moments pour planter des variétés spécifiques, ou s'engager à la diversification des cultures plantées). Des systèmes d'information météo/climatiques peuvent aider les agriculteurs à adapter les pratiques sur leurs terres existantes au lieu de migrer vers de nouvelles zones dans la région ou de passer à d'autres régions, une pratique courante qui occasionne une agriculture à faible productivité sur des zones de terre plus larges sans augmenter les rendements. Les intervenants consultés ont indiqué que la migration inter-régions est due en partie aux changements climatiques dans le nord (du Sénégal ou dans d'autres pays du Sahel) se déroulant dans une mesure limitée. L'amélioration des systèmes d'information météorologiques et climatiques va également soutenir le marché naissant de l'assurance-récolte. L'assurance-récolte a été adoptée relativement lentement par les agriculteurs qui sont sceptiques sur les systèmes d'assurance et manquent d'information sur les méthodes et les calendriers de paiement de ces systèmes.

Enfin, une intensité croissante d'activités sur les terres existantes nécessitera certains investissements en infrastructures pour gérer l'eau, plus spécifiquement promouvoir des systèmes de collecte d'eau de pluie à la ferme pour gérer les conditions de sécheresse et des systèmes de drainage pour gérer les inondations. Ces menaces existantes sur la productivité agricole sont susceptibles d'être exacerbées par le changement climatique. Déjà, la migration intra-région et intra-communautaire est particulièrement fréquente après de mauvaises récoltes. Par exemple, les agriculteurs cultivent dans les années de sécheresse des zones humides, qui connaissent des inondations dévastatrices dans les années humides. Ces échecs de cultures annuelles conduisent à des comportements à risque, notamment les migrations qui pourraient être évitées avec de modestes investissements dans l'exploitation et le contrôle de l'eau.

En termes de programmation de l'USAID, la mise en œuvre de cette recommandation viendrait compléter directement les efforts de l'USAID existantes, créer des opportunités pour l'USAID de travailler avec des organisations qui ont réussi comme la SODEFITEX, PROGEDE 2, et d'autres pour élargir les programmes avec des impacts et des résultats positifs.

2. Renforcer les capacités pour la gestion durable de la pêche

Résultats prévus		Gestion de l'offre de poisson pour atteindre un point de rendement durable		Amélioration des capacités du gouvernement et des capacités de la collectivité à gérer les stocks		Amélioration de la technologie de contrôle, de surveillance, et des moyens de communication.
Liens avec les principes de l'USAID : Nature-Richesse-et Pouvoir	N1. Sauvegarder les capacités de production du capital naturel N3. Promouvoir des pratiques durables et qui permettent d'augmenter la productivité du capital naturel N4. Promouvoir un développement socio-économique et des systèmes de production rurale résilients au climat. R1. Renforcer le système comptable du capital naturel, l'évaluation, et les outils d'analyse pour améliorer les prises de décisions						

La pêche est la plus grande activité de prélèvement de la faune au Sénégal. La principale menace sur la biodiversité des ressources de la pêche au Sénégal est la surpêche provoquée par les flottes industrielles nationales et surtout étrangères et exacerbée par le libre accès à la ressource et un certain nombre de pratiques illégales, y compris l'utilisation de techniques et d'outils de pêche interdits. La situation du secteur se dégrade parce que son cadre juridique est faible, même quelques textes existants ne sont pas correctement appliquées

et respectés. Il est fort nécessaire de passer de l'accès ouvert à l'accès réglementé afin d'éviter l'effondrement des sardinelles, une espèce phare de la pêche au Sénégal et en Afrique de l'Ouest.

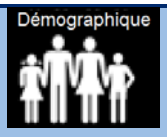
L'USAID peut aider Gouvernement sénégalais à créer un comité de pilotage (SCA, DEEC, USAID, DPM, COMFISH) pour renforcer la coordination entre les partenaires de haut niveau et la capacité en gestion de projet, et à établir des protocoles d'entente qui fournissent le cadre pour la mise en œuvre contractuelle entre les principales institutions collaboratrices (par exemple FENAGIE, APTE, DEEC, ANACIM, Alliance, CST). Cela est essentiel pour l'application et le respect du code et autres textes réglementaires de la pêche.

Au niveau local, l'USAID pourrait soutenir et développer les programmes qui ont fait leurs preuves (par exemple, la gestion collaborative pour un avenir durable de la pêche -COMFISH). Ce type d'effort renforce les capacités des organisations locales de pêcheurs. Par exemple, les responsables de l'application des "conventions locales" qui régissent la pêche au niveau local pour soutenir la lettre de politique nationale de la pêche dans les zones où sont établis les conseils locaux de pêcheurs artisanaux (Conseil local de la Pêche Artisanale ou CLPA) devraient recevoir l'assistance technique dont ils ont besoin pour créer des flux de revenus qui permettent leur fonctionnement continu (cotisations des membres, activités génératrices de revenus). Un financement adéquat appuiera des investissements au niveau du conseil dans les systèmes de communication et d'information nécessaires pour contrôler et superviser les ressources.

Les organismes communautaires ne servent pas seulement comme point d'entrée pour promouvoir l'éducation et la sensibilisation sur la bonne gestion des ressources en vue de préserver la biodiversité, mais servent aussi comme un mécanisme de renforcement de la société civile. Une société civile forte dans le secteur maritime est nécessaire pour fournir des commentaires sur les projets proposés, tels que les industries pétrolières et gazières en mer, comme celle concernant l'extraction dans l'Aire Marine Protégée de Delta du Saloum qui peut menacer les écosystèmes marins et la biodiversité et les économies locales dépendantes de ces ressources.

3a. Procéder à une évaluation stratégique programmatique de l'impact environnemental des activités de l'USAID dans l'agriculture offrant un cadre d'orientation des investissements et permettant de prévenir les impacts environnementaux indésirables.

3b. Renforcer les capacités du Gouvernement sénégalais en évaluation stratégique et programmatique des impacts environnementaux du secteur minier en vue d'offrir un cadre de conseils pour les investissements miniers à l'échelle industrielle et pour prévenir les impacts environnementaux indésirables.

Résultats prévus	 Réduction des facteurs démographiques liés à la perte de l'habitat et à la pollution	 Réduction de la faible capacité du Gouvernement en EIES globale et manque d'orientation en EIES	 Réduction des facteurs économiques et technologiques liés à l'inondation.
Liens avec les principes de l'USAID : Nature-Richesse-et Pouvoir	N1. Sauvegarder les capacités de production du capital naturel N3. Promouvoir des pratiques durables et qui permettent d'augmenter la productivité du capital naturel N4. Promouvoir un développement socio-économique et des systèmes de production rurale résilients au climat. R3. Créer des cadres et des incitations pour améliorer l'alignement des intérêts publics et privés P2. Décentraliser les pouvoirs et responsabilités aux autorités représentatives et responsables		

Lorsqu'il est bien mené, le processus d'évaluation d'impact environnemental et social (EIES) permet d'identifier, prédire, évaluer, éviter, et atténuer les effets pertinents biophysiques, sociaux, et autres effets indésirables des propositions de développement avant les grandes décisions et les engagements financiers. Des EIES stratégiques ou programmatiques permettent d'évaluer une classe d'actions similaires dans un secteur ou une région géographique et peuvent fournir un cadre pour accélérer et améliorer la qualité des

évaluations des projets spécifiques prévues par la loi sénégalaise. Les EIES stratégiques sont souvent planifiées à plusieurs niveaux pour être liées à des politiques dans des secteurs spécifiques ou des régions données en vue d'avoir des nases de prises de décisions. Ceci est particulièrement important pour le secteur minier à la lumière de la réforme du règlement du secteur minier et pour le secteur de l'agriculture où l'USAID est engagée sur plusieurs fronts.

Le processus d'évaluation d'impact environnemental au Sénégal est bien établi et des EIES sont régulièrement menées pour des projets à grande échelle. Les EIES stratégiques pour les secteurs miniers et agricoles seront complément requis des évaluations spécifiques au projet en identifiant les risques environnementaux et établir les meilleures pratiques générales pour éviter et atténuer les impacts environnementaux et sociaux négatifs potentiels. Ceci est particulièrement important, car les intervenants ont fait remarquer que certaines parties de la / chaîne de raffinement production minière sont les exigences actuelles en dehors de l'EIES. Par conséquent, certains EIE ne couvrent pas toutes les sources de pollution. Une EIES stratégique pour le secteur minier contribuera à combler ces lacunes et d'établir des moyens de la société civile à engager dès le début des projets miniers de grande échelle. L'évaluation stratégique pourrait également établir la gestion des finances / de fonds pour la mise en œuvre des mesures d'atténuation (par exemple, la restauration de la forêt) d'une manière qui répond aux préoccupations de la fois le secteur privé et la société civile, une question qui a été soulevée par les parties prenantes.

En identifiant les principaux aspects des projets miniers et de l'agriculture qui doivent être une priorité pour éviter ou atténuer les impacts négatifs sur l'environnement, ESIA stratégiques pour l'exploitation minière et l'agriculture peut aider à guider les efforts pour renforcer la capacité financière et technique pour EIES au niveau régional, où les EIES sont actuellement effectuées (poursuite de la décentralisation du processus EIES est pas recommandé). Les évaluations stratégiques contribueront également à soutenir et guider les efforts visant à renforcer les capacités de l'EIES examen au niveau national. ESIA menées et la première revue au niveau régional sont examinés au niveau national avant l'approbation-avant avec un oeil vers l'identification des lacunes dans l'analyse. L'évaluation stratégique peut aider à soutenir cette analyse des lacunes et d'assurer la qualité des analyses spécifiques au projet. En outre, ces évaluations stratégiques peuvent identifier les points d'intervention spécifiques où l'information sur le changement climatique peut aider à améliorer la prise de décision et de veiller à ce que le changement climatique est systématiquement pris en compte dans la conception du projet et dans la conception et la mise en œuvre des mesures d'atténuation.

En termes de programmation de l'USAID, la mise en œuvre de cette recommandation aidera à atténuer les impacts environnementaux négatifs associés à l'extraction (par exemple, la pollution des eaux affectant approvisionnement en eau potable et la santé publique, la réinstallation de la communauté affectant la stabilité sociale). Il fournira également l'USAID et ses partenaires d'exécution avec des actions concrètes pour atténuer les impacts cumulatifs négatifs de la programmation agricole (par exemple, l'utilisation des terres changement affectant la disponibilité de l'eau) et atténuer les effets du changement climatique sur les systèmes agricoles.

4. Développer les textes d'application (par exemple, les directives) et d'autres ressources (par exemple, les lignes directrices spécifiques de conservation, des fiches d'information, de suivi et outils d'évaluation, des modèles techniques, des programmes de formation) pour soutenir les efforts de décentralisation du Gouvernement sénégalais.

Résultats prévus	Politique/ Institutionnel 	Accroissement de la gouvernance locale et de la capacité à appliquer les lois existantes et des plans stratégiques au niveau national pour le développement des ressources naturelles et de la conservation des écosystèmes et des espèces préoccupantes
Liens avec les principes de l'USAID : Nature-Richesse-et Pouvoir	N1. Sauvegarder les capacités de production du capital naturel P1. Renforcer inclusivement des terres rurales et systèmes fonciers des ressources naturelles, et les droits de nature procédurale P2. Décentraliser les pouvoirs et responsabilités aux autorités représentatives et responsables	

Avec la troisième réforme de la décentralisation en 2013, l'autorité de gestion des ressources environnementales et naturelles, ainsi que la planification fiscale et les responsabilités de l'utilisation des terres, ont été transférés au niveau régional et communautaire. Bien que les lois nationales existantes soient nécessaires pour la protection de l'environnement, l'absence d'un cadre de mise en œuvre et de textes d'application (par exemple, directives) pouvant être utilisés au niveau de la communauté est un obstacle à l'autonomisation des responsables locaux et à a création d'options de financement pour assurer la mise en œuvre. En conséquence, les décisions sur l'utilisation des terres et la gestion des ressources sont basées principalement sur les pressions et les opportunités de développement économique à court terme (par exemple exploitation minière à la hâte). Ces pressions sont souvent en contradiction avec les objectifs de développement économique durable, conformément aux plans nationaux. Par exemple, l'équipe d'évaluation a visité une petite zone de terres protégées dans Dindefelo qui avait été récemment déboisées pour faire place à un château d'eau. Malgré les efforts déployés par les écologistes locaux pour maintenir l'intégrité de la zone protégée, un homme fort local a été en mesure de faire avancer la proposition alors qu'auparavant ce site avait été régulièrement utilisé par les chimpanzés.

La mise en œuvre effective des lois environnementales induit que les aires protégées recevront le niveau souhaité de protection et que les zones adjacentes ou à proximité seront développés avec des considérations environnementales à l'esprit. Ceci est particulièrement important pour les petits, mais émergents marchés écotouristiques près des zones côtières et ailleurs où les touristes fréquentent déjà les plages ou observent des chimpanzés (Le Sénégal est le pays abritant des habitats de chimpanzés le plus proche des marchés Européens).

Les intervenants et les participants aux entrevues ont noté ces types de contraintes réglementaires comme un facteur limitant dans les efforts de conservation, citant à la fois l'insuffisance de textes juridiques et la faiblesse de l'autorité, ainsi que la non application et le non-respect des lois existantes. Étant donné le gain économique à court terme de l'exploitation des ressources naturelles, des lois et des politiques applicables peuvent aider à établir un cadre pour la protection effective de l'environnement et pour une croissance économique stable.

En termes de programmation de l'USAID, la mise en œuvre de cette recommandation viendrait en appui à d'autres efforts de démocratie et de gouvernance. En termes généraux, l'application des directives permettra aux responsables locaux et aux gardes de parcs de remplir les mandats nationaux, et d'assurer la sécurité juridique pour les individus, les entreprises et les ONG qui poursuivent des opportunités de développement économique, en investissant dans les infrastructures ou l'expansion d'opérations.

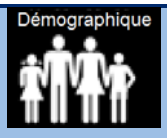
5. Soutenir la traduction des lois existantes en langues locales et assurer leur diffusion, ainsi que l'application et la mise en œuvre continue de ces lois à tous les niveaux.

Résultats prévus	 Accès accru aux cadres juridiques et protection pour tous les segments de la société	 Accroissement de la gouvernance locale et de la capacité à appliquer les lois existantes et des plans stratégiques au niveau national pour le développement des ressources naturelles et de la conservation des écosystèmes et des espèces menacées.
Liens avec les principes de l'USAID : Nature-Richesse-et Pouvoir	P2. Décentraliser les pouvoirs et responsabilités aux autorités représentatives et responsables	

Bien que le français soit la langue officielle du Sénégal, il n'est utilisé que par une minorité de sénégalais instruits. La plupart des gens parlent leur propre langue ethnique (par exemple le Wolof) et le français est pour ceux-là une langue seconde. Par conséquent, traduire les lois en vigueur dans les langues locales servira à soutenir la diffusion et l'application de ces lois. Les individus et les communautés ne peuvent pas être raisonnablement attendus de suivre une loi qu'ils ne comprennent pas ou qu'ils considèrent comme étant de la responsabilité d'autres d'observer, or sans connaissance des lois et du cadre juridique, la société civile est limitée dans sa capacité à tenir les entreprises et les politiciens responsables.

En termes de programmation de l'USAID, la mise en œuvre de cette recommandation vient en soutien des efforts de démocratie et de gouvernance en améliorant la compréhension des lois qui est nécessaire aux citoyens pour leur participation effective aux processus politiques au Sénégal.

6. Développer et décentraliser l'approvisionnement en énergie renouvelable pour accélérer l'électrification rurale et fournir des sources alternatives d'énergie de cuisson qui soient rentables, pratiques et innovantes et qui diminuent le temps de cuisson, réduisent la pression sur les terres boisées sources d'extraction de bois de chauffage, et améliorent la santé des femmes.

Résultats prévus	 Réduction des pressions sur les forêts en raison de la disponibilité d'autres sources de l'énergie/du carburant	 Réduction des coûts de main-d'oeuvre et financières associées à la cuisson et de l'énergie	 Disponibilité et utilisation accrues de cuisson à haute efficacité et technologies de production d'énergie
Liens avec les principes de l'USAID : Nature-Richesse-et Pouvoir	R3. Créer des cadres et des incitations pour améliorer l'alignement des intérêts publics et privés R4. Renforcer les marchés et le rôle des producteurs ruraux dans concurrentiel mais non extractives chaînes de valeur des ressources naturelles		

Le Sénégal a des besoins importants en matière de développement et de distribution d'énergie pour alimenter la croissance économique et réduire la dépendance de sources existantes énergivores (charbon pour la cuisson). Cela a un effet négatif particulièrement sur les femmes en termes de temps nécessaire pour assurer la cuisson avec les combustibles bois/charbon de bois. Les effets négatifs notoires sur la santé des femmes proviendraient de l'inhalation de gaz carbonique et de particules à base de charbon. Les opportunités de promouvoir à travers le pays et au bénéfice des ménages des sources d'énergie plus saines devraient être identifiées et développées pour offrir des alternatives à la cuisson au bois/charbon de bois, incluant l'introduction de cuisinières électriques à induction. Des techniques de cuisson novatrices qui diminueraient le temps de cuisson doivent également être recherchés et promues. Cela permettra de réduire le risque pour la santé des personnes chargées de la cuisson dans les ménages.

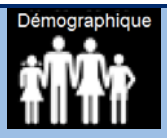
Des projets énergétiques destinés à répondre aux besoins en électricité, surtout pour Dakar, sont nécessaires et peuvent provenir des ressources renouvelables comme l'hydroélectricité. Bien qu'il existe souvent des impacts environnementaux et sociaux de fond liés à l'énergie hydroélectrique, les projets dans le sud peuvent aider à la régulation des inondations et créer des opportunités pour l'irrigation si elles sont bien conçues.

Si le Sénégal possède des réserves de pétrole et de gaz naturel qui peuvent être exploitées, l'expérience a montré que le gaz naturel n'a pas été une source d'énergie alternative rentable pour la cuisson en raison de son prix élevé entraîné par le poids des réseaux de distribution. En outre, la baisse des prix du gaz naturel nécessitera des interventions de marché supplémentaire important. Le développement des ressources renouvelables en particulier-les petites et moyennes entreprises d'énergie solaire, y compris celles sur les toits dans les villes-peut aider à répondre rapidement à la demande d'électricité.

L'équipe d'évaluation recommande de ne pas poursuivre la promotion du biogaz. Le Sénégal a des terres arables limitées et de plus en plus les bio-matières servant à alimenter les installations de biogaz seront en compétition pour la terre avec l'agriculture et les priorités de la biodiversité. Plus précisément, les opérations de production de biogaz ont tendance à favoriser les monocultures à croissance rapide et utilisent souvent des espèces non indigènes qui diminuent, au lieu de renforcer, la biodiversité locale. Des efforts récents pour promouvoir le biogaz dans la région de Tambacounda ont échoué en raison du manque de capacité technique à exploiter les installations. Au Sénégal, d'autres options de sources d'énergie renouvelables comme l'énergie solaire sont plus simples et plus réalistes.

En termes de programmation de l'USAID, la mise en œuvre de cette recommandation permettra d'accroître la capacité d'adaptation en améliorant l'accès à l'électricité, et en fournissant des occasions de gérer les températures extrêmes (par exemple, climatisation) et améliorer les conditions phytosanitaires dans la transformation des aliments (par exemple, la réfrigération dans la transformation des aliments).

7. Soutenir la planification de l'utilisation des terres et le renforcement des capacités nécessaires pour développer les zones urbaines, développer les ressources naturelles (foresterie communautaire en Casamance), protéger les services écosystémiques et sécuriser des corridors fauniques.

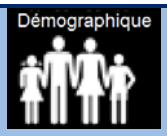
Résultats prévus	 Réduction des pressions exercées par la croissance de la population urbaine et de la demande pour les ressources naturelles	 La facilitation de la croissance économique parce que la terre est sécurisé/durée de l'emploi utilise	 Accroissement de la gouvernance locale et de la capacité de mettre en oeuvre les lois existantes
Liens avec les principes de l'USAID : Nature-Richesse-et Pouvoir	N1. Sauvegarder les capacités de production du capital naturel R3. Créer des cadres et des incitations pour améliorer l'alignement des intérêts publics et privés P1. Renforcer inclusivement des terres rurales et systèmes fonciers des ressources naturelles, et les droits de nature procédurale P2. Décentraliser les pouvoirs et responsabilités aux autorités représentatives et responsables		

Le Sénégal est dans une position unique pour la gestion de nombreuses espèces menacées charismatiques qui migrent à travers les frontières et à l'intérieur même du pays. Considérant la nécessité pour le développement économique, la planification de l'utilisation des terres doit être une priorité en vue de créer une certitude sur le régime foncier et mettre de côté les zones de conservation et de services écosystémiques. Ceci est particulièrement important dans le sud où il y a un besoin de renforcer le partenariat du Parc transfrontalier avec la Guinée et à préserver les couloirs de migration pour les éléphants, les chimpanzés et d'autres espèces en danger ou menacées, et identifier des options pour soutenir les aires protégées transfrontières.

Dans la région de la Casamance, il y a un besoin important de développement économique afin de promouvoir la stabilité sociale. Compte tenu de l'état des ressources naturelles et de la biodiversité dans la région, l'USAID devrait travailler avec les autorités régionales et locales de la Casamance pour identifier les priorités de conservation et d'écotourisme à développer en marge de la grande et forte industrie touristique existante et élever la Casamance en une destination et une partie intégrante du futur économique et environnemental du Sénégal

En termes de programmation de l'USAID, cette recommandation aidera à assurer que les espèces en voie de disparition sont protégés de la dégradation de l'habitat et donc une meilleure chance de relèvement, et permettra également de réduire le potentiel de conflit politique et social existant, tout en contribuant au développement de l'économie dans la région de la Casamance en particulier.

8. Assurer un financement adéquat pour l'environnement par le budget national, les recettes fiscales locales, et le financement par les industries axées sur les ressources naturelles, et établir des mécanismes (par exemple, paiement des services écosystémiques, fonds fiduciaires pour la conservation, finance carbone, et loi pollueur-payeur).

Résultats prévus	 Réduction des pressions exercées par la croissance de la population urbaine (mal conçus et mal gérés résultant de la construction sur la côte)	 Un financement accru pour la conservation des forêts tropicales et classé la frontière et la plus forte des signaux de prix/incitatifs financiers pour la conservation de la forêt	 Augmentation techniques, de gestion et la capacité financière des parcs et le personnel du parc
Liens avec les principes de l'USAID : Nature-Richesse-et Pouvoir	N1. Sauvegarder les capacités de production du capital naturel R2. Investir les recettes provenant de l'extraction des ressources dans la création de nouveaux éléments d'actif et des revenus P2. Décentraliser les pouvoirs et responsabilités aux autorités représentatives et responsables		

Des ressources financières insuffisantes limitent la protection des aires de conservation, limitant la disponibilité et les compétences techniques et de gestion du personnel pour faire respecter la conservation. La gestion des aires protégées est souvent compromise en raison de l'incapacité du personnel d'engager des poursuites policières contre les activités illégales telles que le braconnage, la chasse et la pêche illégale, et l'exploitation des ressources forestières. Par conséquent, une autorité renforcée et des ressources à la disposition des organismes chargés de la conservation et un financement accru pour les programmes de protection de l'environnement dans le budget national sénégalais peuvent soutenir les efforts de conservation au Sénégal.

Au-delà du financement central, il est recommandé d'établir des sources de financement décentralisées pour améliorer la performance environnementale locale. Plusieurs intervenants ont fait remarquer que la réforme de la décentralisation permet d'améliorer la fiscalité locale et d'engranger des flux de revenus décentralisés, mais cette transition n'a pas encore été pleinement réalisée en raison d'un manque de ressources financières et humaines.

Un mécanisme spécifique pour soutenir le financement décentralisé est la création de fonds d'affectation spéciale pour les zones protégées et les programmes environnementaux apportés par les industries qui dépendent des services écosystémiques dans une zone géographique particulière (par exemple, la pêche et les industries agricoles, payant pour la conservation et la gestion des bassins versants spécifiques, ou les industries extractives qui perturbent les fonctions et les structures des écosystèmes pour accéder aux ressources du sous-sol). Un nombre croissant de pays africains suivent ce modèle (par exemple, la Guinée).

Actuellement, la performance environnementale de l'industrie minière est soutenue par un fonds d'affectation spéciale ou d'un programme obligataire de l'environnement où chaque exploitant de la mine détient des fonds en fiducie pour garantir que les mesures d'atténuation environnementales et sociales sont mises en œuvre. Toutefois, les intervenants communautaires n'ont pas les moyens de vérifier que les fonds sont déposés, et ils ne disposeront d'aucun recours à leur disposition, si les fonds ne sont pas utilisés pour mettre en œuvre des mesures d'atténuation. Les entreprises privées devraient indiquer au régulateur de gouvernement de la disponibilité des fonds, et les communautés devraient être en mesure d'exercer un recours et intervenir par le régulateur dans le cas de l'abandon par la firme.

La responsabilité financière devrait être une priorité dans l'examen de l'expansion du secteur minier. Avec des ressources financières appropriées, les organismes et les institutions du Gouvernement sénégalais peuvent surveiller adéquatement les activités minières (qui sont promus par SMO) et assurer que les mineurs/sociétés minières sont tenus financièrement responsables si elles ne parviennent pas à répondre à la restauration post-fermeture. La mise en place de façon indépendante (par exemple, banques tierces) de fonds d'affectation spéciale peut aider à soutenir le principe du pollueur-payeur dans les sites de projets spécifiques, et pourrait être utilisé plus largement pour soutenir la gestion des services clés de l'écosystème ou des habitats pour les espèces menacées (par exemple, les chimpanzés) en dehors des zones protégées. Ces types de mécanismes de responsabilité financière sont des moyens de financement de l'environnement bien établis, et la mise en place de ces types de mécanismes contraints par la loi ou sur une base volontaire/négociée avec le secteur privé peut être soutenue par l'USAID ou des ONG.

Des mécanismes financiers doivent également être mis en place pour d'autres industries utilisatrices des ressources naturelles renouvelables (par exemple, le bois et la pêche). Des systèmes d'autorisation, d'alimentation et la fiscalité doivent être pleinement mises en œuvre et appliquées pour assurer un financement adéquat pour la gestion durable de ces ressources renouvelables.

En termes de programmation de l'USAID, la mise en œuvre de cette recommandation fera en sorte que les efforts de renforcement des capacités techniques en direction des secteurs de l'agriculture et de la pêche en particulier, sont complétés par un financement adéquat. La mise en œuvre de cette recommandation contribuera également à veiller à ce que les investissements dans l'amélioration de l'accès à l'eau potable ne soient pas compromis par la pollution ou les risques de l'industrie minière.

9. Soutenir le renforcement des systèmes de surveillance de l'environnement et la création d'un centre de données pour améliorer l'accès à l'information existante et soutenir l'échange d'informations entre les sources d'information (par exemple, l'élevage, la santé publique, de la pêche).

Résultats prévus	 Amélioration de l'information sur l'environnement, les stocks de ressources naturelles et le flux d'information sur les introductions d'espèces non indigènes, leur population et leur répartition, et lesz risques environnementaux et risques économiques. Accroissement de l'accès à l'information sur les éclosions de maladies et les sources de la maladie		Disponibilité d'informations centralisées
Liens avec les principes de l'USAID : Nature-Richesse-et Pouvoir	N5. Renforcer l'utilisation de la surveillance, de la science et de la technologie dans l'agriculture et la gestion des ressources R1. Renforcer le système comptable du capital naturel, l'évaluation, et les outils d'analyse pour améliorer les prises de décisions		

Un certain nombre de parties prenantes consultées ont noté qu'il existe un besoin pour des informations plus détaillées et facilement disponibles dans des secteurs particuliers (par exemple les données sur les stocks de poissons, le cheptel) qui appuieraient les décisions de gestion. Par exemple, une meilleure base de connaissances sur les ressources biologiques de la mer aiderait à renforcer le système de décision fondée sur des données évidentes dans le secteur. Dans les systèmes agricoles et d'élevage, le Gouvernement du Sénégal

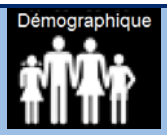
accorde la priorité aux mesures qui empêchent l'introduction de nouveaux ravageurs (par exemple, la grippe aviaire qui a entraîné une interdiction de volailles américaines). Cependant, la réalisation de cet objectif dépend non seulement de l'adoption de politiques et de la disponibilité de solutions fondées sur la science aux ravageurs appropriées, mais également sur des systèmes de surveillance et d'information.

Alors que dans certains cas, les données doivent être collectées, dans de nombreux cas, les données ont été recueillies, mais ne sont pas facilement disponibles ou peuvent être difficiles à trouver. Cette information peut aussi être importante pour la prise de décisions dans d'autres secteurs, ou au niveau national, et la réaction rapide dépend de systèmes de surveillance de l'environnement adéquats et l'accès rapide à l'information.

En termes de programmation de l'USAID, la mise en œuvre de cette recommandation permettra de soutenir les efforts visant à promouvoir la détection précoce des espèces envahissantes, et une surveillance accrue des agents pathogènes zoonotiques et animales résistantes aux antibiotiques.

La détection et la gestion des espèces envahissantes peuvent également assurer que la composition de l'écosystème (structure) ne soit pas perturbée et que les changements de fourniture de services écosystémiques sont empêchés. Les personnes qui travaillent à la frontière, dans l'agriculture et dans les zones protégées doivent être conscients des espèces envahissantes. Cela nécessite le développement de campagnes de sensibilisation et la promotion de systèmes de détection précoce et, finalement, la gestion ou l'éradication des espèces envahissantes.

10. Renforcer la capacité organisationnelle formelle des artisans des petites et moyennes entreprises axées sur les ressources et les coopératives communautaires pour mettre en œuvre les meilleures pratiques de gestion des ressources naturelles, la foresterie et la gestion des pêches .

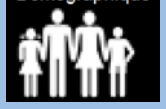
Résultats prévus	 Réduction de la pression de la croissance de la population sur les ressources naturelles	 Compréhension des lois, y compris les incitations à se conformer aux lois	 Amélioration de la compréhension et de l'accès à la technologie de manière à prévenir ou à traiter la pollution et à protéger la santé publique
Liens avec les principes de l'USAID : Nature-Richesse-et Pouvoir	N3. Promouvoir des pratiques durables et qui permettent d'augmenter la productivité du capital naturel N4. Promouvoir un développement socio-économique et des systèmes de production rurale résilients au climat. R2. Investir les recettes provenant de l'extraction des ressources dans la création de nouveaux éléments d'actif et des revenus P3. Améliorer une large représentation et entrée rural continue sur les décisions en matière de ressources P5. Intégrer et l'autonomisation des femmes et des groupes marginalisés à participer à la gestion, les décisions et les avantages		

Dans les industries extractives comme l'exploitation minière de l'or, il y a des économies d'échelle substantielles à atteindre par rapport à la production artisanale. Non seulement il y a des avantages économiques, mais les impacts environnementaux et sociaux sont plus faciles à identifier, atténuer et surveiller. Plus précisément, la formalisation de l'exploitation minière artisanale est un moyen stratégique pour améliorer la performance environnementale et la réduction des problèmes sociaux (par exemple, la santé publique) par rapport à une exploitation minière artisanale informelle mal gouvernée.

Les mineurs sont attirés vers la formalisation en raison des incitations existantes pour former des coopératives ou des petites sociétés de production (par exemple, permis légal / droit d'exploiter, prix plus élevé de l'or sur le marché formel contre le marché noir). Ces mesures incitatives devraient être plus clairement et largement articulées.

En termes de programmation de l'USAID, la mise en œuvre de cette recommandation permettra d'améliorer la société civile et les syndicats. Elle permettra également de réduire le risque de contamination de la pollution des réserves d'eau et de poissons dans les ruisseaux.

11. Renforcer les capacités pour la gestion intégrée des ressources en eau qui fera la promotion de la résilience à long terme des industries qui dépendent de l'eau et des écosystèmes et protéger les sources d'eau potable.

Résultats prévus	Démographique 	Réduction des pressions de la croissance de la population sur la gestion de l'eaur	Politique/ Institutionnel 	Capacité accrue du gouvernement à l'échelon régional/local de gérer les ressources en eau	Scientifique/ Technologique 	Des infrastructures, des technologies et des services écosystémiques nécessaires pour gérer la disponibilité et la qualité de l'eau.
Liens avec les principes de l'USAID : Nature-Richesse-et Pouvoir	N1. Sauvegarder les capacités de production du capital naturel N3. Promouvoir des pratiques durables et qui permettent d'augmenter la productivité du capital naturel R1. Renforcer le système comptable du capital naturel, l'évaluation, et les outils d'analyse pour améliorer les prises de décisions R3. Créer des cadres et des incitations pour améliorer l'alignement des intérêts publics et privés P2. Décentraliser les pouvoirs et responsabilités aux autorités représentatives et responsables					

La disponibilité de l'eau est une préoccupation constante et contraignante dans la croissance au Sénégal, en particulier dans le secteur agricole. Parce que la disponibilité de l'eau varie considérablement au sein de l'année et sur plusieurs années et devrait devenir plus variable en raison du changement climatique, l'eau doit être gérée au niveau du bassin avec une planification détaillée pour les utilisations concurrentes (par exemple, humaine, agriculture, élevage). Des plans de gestion des ressources en eau devraient identifier et se concentrer sur les zones géographiques qui sont essentielles pour la purification de l'eau, la régulation du débit et la rétention.

L'accès à l'eau potable s'est amélioré à travers le Sénégal, mais dans de nombreux cas, il n'est pas toujours sûr de boire de l'eau du robinet. En fin de compte, les systèmes d'eau communautaires doivent avoir la capacité technique, managériale et financière afin de fournir de l'eau potable aux communautés et maintenir des systèmes de traitement et de distribution. En travaillant à la mise en place de signaux de prix, l'USAID soutient le développement des systèmes autofinancés, autonomes d'eau et qui ne sera pas dépendant des donateurs étrangers. Ces efforts devraient continuer à être soutenus.

Dans le cadre de la gestion intégrée des ressources en eau, la protection des sources d'eau devrait être intégrée dans la gestion de l'eau pour assurer la pérennité et les options du plus bas coût pour le traitement (par exemple, en évitant la nécessité de plus en plus de traitement en préservant les sources d'eau potable de la contamination). Les zones boisées et les prairies dans les zones de source d'eau fournissent des services de rétention d'eau / débit et les écosystèmes de purification, et la protection de ces zones permettra d'éviter un stress supplémentaire à l'eau potable et aux systèmes de purification d'eau et des coûts plus élevés de purification.

En termes de programmation de l'USAID, la mise en œuvre de cette recommandation permettra d'assurer la durabilité des systèmes d'eau potable et d'agriculture, et accroître la capacité d'adaptation des communautés, en particulier celles avec la plus grande vulnérabilité au climat actuel (à savoir, les populations rurales et les populations dans le nord.

CORRELATION ENTRE LES ACTIONS PROPOSEES, LES PROGRAMMES EN COURS DE L'USAID ET LES BESOINS IDENTIFIES

	O = OPPORTUNITÉ pour l'USAID, activities ne correspondant pas actuellement à l'action necessaire, mais pourrait l'être dans les programmes futurs. + = Les programmes en cours et les nouvelles activités potentielles correspondent à l'action nécessaire.

Actions nécessaires	Agriculture	Conflict/ Peace Building	Democracy & Governance	Education	Energy/ Power Africa	Fisheries	Public Health, Nutrition & Family Planning	Water Wash
1. Augmenter la productivité agricole globale à long terme sur les terres fertiles existantes (en particulier de Tambacounda) à travers l'utilisation de technologies améliorées, de meilleures variétés de semences, et de systèmes météorologiques et d'information climatique (y compris pour la résilience climatique).	+							
2. Renforcer les capacités en gestion des pêches						+		
3a. Procéder à une évaluation stratégique programmatique de l'impact environnemental des activités de l'USAID dans l'agriculture offrant un cadre d'orientation des investissements et permettant de prévenir les impacts environnementaux indésirables.	O							
3b. Renforcer les capacités du Gouvernement sénégalais en évaluation stratégique et programmatique des impacts environnementaux du secteur minier en vue d'offrir un cadre de conseils pour les investissements miniers à l'échelle industrielle et pour prévenir les impacts environnementaux indésirables.			O					
4. Développer les textes d'application (par exemple, les directives) et d'autres ressources (par exemple, les lignes directrices spécifiques de conservation, des fiches d'information, de suivi et outils d'évaluation, des modèles techniques, des		O	O					

	O = OPPORTUNITÉ pour l'USAID, activities ne correspondant pas actuellement à l'action necessaire, mais pourrait l'être dans les programmes futurs. + = Les programmes en cours et les nouvelles activités potentielles correspondent à l'action nécessaire.

Actions nécessaires	Agriculture	Conflict/ Peace Building	Democracy & Governance	Education	Energy/ Power Africa	Fisheries	Public Health, Nutrition & Family Planning	Water Wash
programmes de formation) pour soutenir les efforts de décentralisation du Gouvernement sénégalais.								
5. Soutenir la traduction des lois existantes en langues locales et assurer leur diffusion, ainsi que l'application et la mise en œuvre continue de ces lois à tous les niveaux.			O	O				
6. Développer et décentraliser l'approvisionnement en énergie renouvelable pour accélérer l'électrification rurale et fournir des sources alternatives d'énergie de cuisson qui soient rentables, pratiques et innovantes et qui diminuent le temps de cuisson, réduisent la pression sur les terres boisées sources d'extraction de bois de chauffage, et améliorent la santé des femmes.				O	O		O	
7. Soutenir la planification de l'utilisation des terres et le renforcement des capacités nécessaires pour développer les zones urbaines, développer les ressources naturelles (foresterie communautaire en Casamance), protéger les services écosystémiques et sécuriser des corridors fauniques.	O		O	O				
8. Assurer un financement adéquat pour l'environnement par le budget national, les recettes fiscales locales, et le financement par les industries axées sur les ressources naturelles, et établir des mécanismes (par exemple, paiement des services écosystémiques, fonds fiduciaires			O					

	O = OPPORTUNITÉ pour l'USAID, activities ne correspondant pas actuellement à l'action necessaire, mais pourrait l'être dans les programmes futurs. + = Les programmes en cours et les nouvelles activités potentielles correspondent à l'action nécessaire.

Actions nécessaires	Agriculture	Conflict/ Peace Building	Democracy & Governance	Education	Energy/ Power Africa	Fisheries	Public Health, Nutrition & Family Planning	Water Wash
pour la conservation, finance carbone, et loi pollueur-payeur).								
9. Soutenir le renforcement des systèmes de surveillance de l'environnement et la création d'un centre de données pour améliorer l'accès à l'information existante et soutenir l'échange d'informations entre les sources d'information (par exemple, l'élevage, la santé publique, de la pêche).	O			O		O	O	
10. Renforcer la capacité organisationnelle formelle des artisans des petites et moyennes entreprises axées sur les ressources et les coopératives communautaires pour mettre en œuvre les meilleures pratiques de gestion des ressources naturelles, la foresterie et la gestion des pêches.	O			O				
11. Renforcer les capacités pour la gestion intégrée des ressources en eau qui fera la promotion de la résilience à long terme des industries qui dépendent de l'eau et des écosystèmes et protéger les sources d'eau potable.	O							O

1. INTRODUCTION

PURPOSE AND SCOPE

The purpose of this assessment is to analyze environmental threats and their root causes and then identify opportunities for environmental conservation, protection, and improved natural resource management—specifically as it relates to USAID programming. By incorporating biodiversity and tropical forestry conservation needs and related issues, this assessment complies with sections 117, 118, and 119 of the Foreign Assistance Act of 1961, as amended. It will be used to inform the USAID/Senegal mission in strategic planning, under Automated Directives System (ADS) 201.3.4.11 and ADS 204.5.

While this assessment discusses climate change—primarily as a factor exacerbating existing environmental threats and vulnerabilities—this assessment is not a stand-alone climate vulnerability assessment, and may or may not meet the criteria needed to meet Executive Order 13677 on Climate-Resilient International Development considering this document was drafted prior to the finalization of USAID guidance.

To support these objectives, this assessment identifies important linkages across sectors and new initiatives with respect to environmental conditions and threats which USAID/Senegal must be aware of as it drafts its next Country Development Cooperation Strategy (CDCS).[13] The assessment will also provide recommendations for how best to address these conditions to protect the natural resource base and thereby continue to provide the goods and services needed for healthy communities and economic growth.

This assessment supersedes the 118/119 Biodiversity and Tropical Forests Assessment completed in 2008. Incorporation of environmental threats and opportunities into USAID/Senegal's strategic planning process will ensure compliance with the above regulations as well as guide development activities. In addition, the Environmental Threats and Opportunities Assessment (ETOA) will inform technical teams on how to better address and integrate critical environmental issues that affect and/or are affected by their programs to enhance results across the USAID Senegal Mission's strategy. This is especially important in the context of a rapidly changing programmatic environment within not only USAID/Senegal but also within the Agency. Many new initiatives are being implemented within the USAID/Senegal Mission's programming including the Global Health Initiative (GHI), Feed the Future (FtF), and Global Climate Change (GCC). In addition, the USAID Forward reform agenda brings additional complexity to question of capacity and effectiveness of USAID programming to conserve and mitigate impacts to biodiversity and tropical forests.

To address the expanded scope in programs and priorities—to the greatest extent possible and in terms of USAID programming—the assessment will examine potential challenges and opportunities for innovative, integrated strategic approaches to address global climate change, food security, water governance, and global health issues in the context of procurement reform initiatives, and make recommendations regarding environmental risk mitigation.

This assessment summarizes the current state of development in Senegal (see Section 2)—including its economic dependency on ecosystems and ecosystem services—then describes USAID Programming (Section 3) and the state of the environment and natural resource management (see Section 4). This includes a description of biodiversity, forests, and natural resource-based industries (e.g., agriculture, fisheries, and mining). Environmental threats (Section 5) are described in terms of direct threats (i.e., priority issues) that contribute to root causes.

[13] At the time of the drafting of this Assessment USAID/Senegal was in the process of determining whether the existing CDCS would be extended to 2017, or be allowed to expire in 2015.

The actions necessary to conserve biodiversity, sustainably manage tropical forests, and otherwise safeguard the environment (Section 6) are described in general terms and then linked to USAID strategy (Section 7) and discussed in terms of opportunities for USAID to work with the Government of Senegal (GoS), other donors, non-governmental organizations (NGOs), and stakeholders (Section 8). The assessment concludes with a brief discussion of the key recommendations in terms of USAID's results framework (Section 9).

DIRECT THREATS

The proximate human activities or processes that have caused, are causing, or may cause the destruction, degradation, and/or impairment of biodiversity targets (e.g., unsustainable fishing or logging). Direct threats are synonymous with sources of stress and proximate pressures. Threats can be past (historical), ongoing, and/or likely to occur in the future.

DRIVERS

The ultimate factors, usually social, economic, political, institutional, or cultural, that enable or otherwise add to the occurrence or persistence of proximate direct threats. There is typically a chain of contributing factors behind any given direct threat. In a situation analysis, these factors are often subdivided into indirect threats (factors with a negative effect, such as market demand for fish) and opportunities (factors with a positive effect, such as a country's land-use planning system that favors conservation).

Source: Salafsky et al. (2007).

METHODOLOGY

The Assessment Team conducted the ETOA through three partially overlapping phases, including desk research, stakeholder consultations, and analysis. The Assessment Team started with a one-week desk review of available information on socioeconomic issues, ecology and conservation, environmental management, and USAID programming in Senegal. This information was used to draft a pre-field draft report—to identify key resources and gaps in knowledge—and inform in-country stakeholder consolations. Key literature reviewed is included in Annex B. This desk review was completed concurrent with preparations for the two-week field missions.

Stakeholder consultations started in Washington D.C. and included USAID environment staff (e.g., Agency Environmental Coordinator, Office of Forestry and Biodiversity staff) and staff representing other U.S. Government agencies (e.g., USAID) and non-governmental organizations. Follow-up consultations were conducted before the in-country field visit.

A two-week in-country segment started on August 24, 2015. This in-country segment began with an in-brief at USAID/Senegal (August 24, 2015) and ended with an out-brief delivery of key findings and recommendations (September 4, 2015).

The Assessment Team facilitated a half-day stakeholder workshop (Dakar) with participants representing GoS, NGOs and the private sector.[14] The workshop verified key issues and assumptions with regard to environmental threats and opportunities. During the workshop, the Assessment Team solicited input on the need to consider additional environmental issues in preparing the ETOA. The results of the workshop's small-group exercise were used to validate the assumptions and key environmental threats identified through the desk review and initial stakeholder interviews. A secondary goal of the workshop was to foster a consensus among USAID and other environmental management actors. The workshop was in French.

The field visits, held from August 26 to September 3, 2015, focused on interviews and stakeholder consultations. The objectives of the field visits were to "ground-truth" the draft report's preliminary findings and appropriately expand the scope of assessment to that of a full ETOA. This phase included visits to Saint-Louis, Toubacouta, Tambacounda, Kedougou and Dakar. The majority of meetings were held with GoS entities, such as the DEEC, IREF and *DRDR*. A complete list of meetings held is provided as Annex A.

[14] List of participants in Annex A

This ETOA was finalized based on updated literature, geographic information system (GIS) analysis, stakeholder consultations (Annex A), and USAID comments and feedback on the draft consistent with the approved Scope of Work.

The Assessment Team was not able to meet with: Africa Parks, University of Rhode Island Coastal Resources Center, or the Centre de Recherches Océanographiques Dakar-Thiaroye (Center for Oceanographic Research of Dakar-Thiaroye-CRODT).

2. SOCIAL, ECONOMIC, AND POLITICAL CONTEXT

This section provides an overview of the social and economic context of the country as well the governmental institution, policies, and laws affecting the sustainable management and conservation of biodiversity (both marine and terrestrial), forests, and ecosystems and their enforcement and effectiveness.

SOCIETY

Senegal is the western-most country in Africa, bordered to the north by Mauritania, to the east by Mali, and to the south by Guinea and Guinea-Bissau. Senegal completely surrounds the Gambia. Senegal was granted independence from France in 1960, and is largely considered one of the most stable democracies in Africa. Senegal's economy is largely driven by agriculture, mining, construction, tourism, and fisheries.[15]

Senegal is ranked 163 out of 187 countries and territories on the United Nations Development Program's Human Development Index (HDI), which measures three factors: long and healthy lives, access to knowledge, and standard of living.[16] According to a 2011 estimate, 46.7 percent of the population is below the poverty line.[17]

Senegal has an estimated population of almost 14 million people. Forty-two percent of the population is under the age of 15, 20 percent are between the ages of 15 and 24, and 30 percent are between the ages of 25-54. Life expectancy at birth is about 61 years. About 70 percent of males are literate, while 46 percent of females are literate. The Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS) prevalence rate among adults is 0.46 percent, with 38,700 total people living with HIV/AIDS as of 2013.

The majority ethnic group in Senegal is the Wolof, at 43.3 percent, followed by the Pular at 23.8 percent, the Serer at 14.7 percent, and various others (Jola, Mandinka, Soninke, European and Lebanese, other) comprising the rest of the population. French is the official language, but Wolof is more widely spoken. Pulaar, Jola and Mandinka are also spoken in Senegal. Ninety-four percent of the population is Muslim, adhering to one of the four main Sufi brotherhoods, and five percent of the population is Christian (mainly Roman Catholic). Only one percent follow indigenous beliefs.[18]

A long-running separatist movement in the southern region of Casamance has killed hundreds of people since the conflict began in 1982. People living in the Casamance felt marginalized by Senegal's majority ethnic group, the Wolof. Since the election of President Macky Sall in 2012, violence has decreased, and a unilateral ceasefire was declared in 2014.[19]

[15] (CIA 2015)
[16] (United Nations Development Program 2013)
[17] (CIA 2015)
[18] Ibid
[19] (BBC Monitoring 2015)

Elections will take place in 2017 and will inevitably have an impact on USAID programming/priorities.

POPULATION TRENDS

Senegal's population growth rate is 2.45 percent. Dakar is the capital city, and also the largest city, located on Senegal's peninsula with a population of 3.52 million.[20] Together with its peri-urban neighborhoods of Pikine, Guediawaye and Rufisque Bargny, Dakar is home to almost 50 percent of the urban population. Dakar's population is growing at about 4 percent, with over 60 percent of its population below the age of 25, two-thirds of the country's workforce, and more than 80 percent of the country's infrastructure and services. Dakar's status as the main economic hub of Senegal coupled with its high immigration rates make Dakar a fast-growing city.[21]

The spatial layout of the population of Senegal is highly concentrated in the west. Thiès and Diourbel are the next largest regions beside Dakar, with populations of 1.78 million and 1.5 million inhabitants, respectively. Located in the southeast, Kedougou is the smallest region by population, with 150,000 people. Tambacounda is the largest region by size (21.5 percent of the country), but is home to only five percent of the population.[22]

ECONOMY

While poverty is widespread in Senegal (46.7 percent in 2011) and unemployment is high (10.4 percent in 2011), Senegal has one of the more stable economies in the region. Senegal's Gross Domestic Product (GDP) was estimated at $15.58 billion in 2014. GDP has grown between 3.4 and 4.5 percent each year since 2012. The main economic sectors are mining, construction, tourism, fisheries, and agriculture. Senegal's GDP is comprised of agriculture at 15.6 percent, industry at 23.8 percent and services at 60.6 percent. Agriculture makes up 77.5 percent of the labor force; the main products are peanuts, millet, corn, sorghum, rice, cotton, tomatoes, green vegetables, cattle, poultry, pigs, and fish. The main export industries are phosphate mining, fertilizer production, agricultural products, and commercial fishing. Senegal depends heavily on foreign assistance, and received technical support from the International Monetary Fund (IMF) from 2012-2014 for assistance in economic reform to reduce the fiscal deficit, improve transparency, and encourage private investment. Senegal's President, Macky Sall, elected in 2012, has developed the "Emerging Senegal Plan" with the goal of increasing economic growth through economic reforms and investment projects.[23]

Senegal faces challenges related to costly energy, week governance, and poor management of exports. Tourism, which is a major source of foreign exchange in Senegal, was seriously negatively impacted by the Ebola epidemic. The end of this epidemic, coupled with more favorable oil prices and a rebound in agriculture could accelerate Senegal's economic growth in 2015. However, unreliable rainfall and shocks in neighboring countries (another Ebola outbreak or increased insecurity in Mali) could affect tourism, trade, and transport.[24]

ECOSYSTEM SERVICES

Ecosystems in Senegal can be grouped into five major categories, each providing an array of ecosystem services to surrounding communities:

1) Sahelian
2) Sudanian
3) Sub-Guinean

[20] (CIA 2015)
[21] (Toure, et al. 2010)
[22] (Agence Nationale de la Statistique et de la Demographie (ANSD) 2015)
[23] (CIA 2015)
[24] (The World Bank 2015)

4) Freshwater
5) Coastal, Estuarine and Marine[25]

Given that the majority of the Senegalese population is engaged with either agriculture or fishing, these ecosystems are crucial to maintaining their livelihoods. The degradation of these ecosystems poses a major threat to the country's economy, and disproportionally towards subsistence-level households that rely on non-market benefits of these ecosystem services. The Centre de Suivi Ecologique (CSE) calculated the economic value of natural resources in 2006, which totaled 42.2 billion for primary products. However, some of the activities related to natural resource management that contribute to GDP are actually degrading these resources, such as deforestation due to the expansion of agricultural land (resulting in 3.5 percent lower agricultural yields per year) and logging for wood-fired energy.[26]

The pressure on ecosystem services in Senegal is highly related to demographic dynamics and territorial occupation. Population has been growing at a high rate and the allocation of equipment and infrastructure, as well as the renewal of resources, cannot keep up. Depending on the context (urban versus rural), ecosystem services are viewed with different priorities. In urban areas, the main concerns are securing property rights, access to clean water and sanitation, energy, and efficient waste removal systems. In rural areas, the main concerns are loss of biodiversity, land and resource degradation, and maintaining livelihood activities (agriculture, etc.). However, the degradation of ecosystem services is exacerbated in rural areas due to the intensification and diversification of agriculture.[27]

Two of the most valuable ecosystems providing services in Senegal are mangroves and forests. Mangrove ecosystems are important in Senegal for fresh water, soil erosion protection, and habitat for fish. Major threats to mangroves in Senegal include drought (especially the long drought in the 1970s and 1980s), domestic use (unsustainable extraction for fuel wood, fishing, and construction), human infrastructure (roads and dykes), and upland clearance (lower vegetation density increases water flow and erosion). Mangroves are especially important in the Sine-Saloum Delta, where 60 percent of the 300,000 ha are covered with mangroves, which also serve as a breeding ground for migratory birds.[28]

Forests are another major ecosystem in Senegal that provide essential services to the population, including supply services (water, fish, plants, fruits); regulation services (establishing a forest reserve can improve weather conditions (increased rainfall), soil fixation, etc.); cultural services (spiritual, educational); and support services (soil formation, stabilization and fertility; nutrient cycling).[29]

ECOSYSTEM SERVICES

Ecosystem services are the benefits provided by ecosystems to humans. The types of services generated by ecosystems include:

- Supporting (e.g., soil formation, nutrient cycling, primary production);
- Provisioning (e.g., food, fresh water, fuelwood, fiber, genetic resources);
- Regulating (e.g., climate regulation, disease regulation, water purification, pollination); and
- Cultural (e.g., spiritual and religious, recreation, sense of place, cultural heritage).

Biodiversity is a valuable ecosystem service. A wide range of genetic materials increases the resiliency of an ecosystem and its inhabitants, and interaction between species generates vital regulatory functions. As the effects of climate change are more profoundly felt, the conservation of healthy ecosystems can help to mitigate the associated environmental stressors.

Source: FAO. (2014). AGP - Biodiversity and Ecosystem Services.

[25] (Centre Suivi Ecologique (CSE) 2010)
[26] (Toure, et al. 2010)
[27] (Toure, et al. 2010)
[28] (WeForest n.d.)
[29] (Centre Suivi Ecologique (CSE) 2010)

GEOGRAPHY

Senegal is the western-most country in Africa, with 2,684 km of coastline along the Atlantic Ocean. Senegal is bordered by Mauritania to the North, Mali to the East, and Guinea and Guinea-Bissau to the south and southeast. The Gambia is completed enclosed by Senegal. Senegal's total area is 196,722 km^2 (slightly smaller than South Dakota). Senegal mainly consists of low, rolling plains but rises to foothills in the southeast (Kedougou).[30]

The three main phytogeographical domains can be distinguished as Sahelian, Sudanian, and Guinean. The Sahelian domain is characterized by open vegetation dominated by various Acacua trees, desert date, African myrrh, and annual grasses that more or less form a continuous carpet. The Sudanian area is characterized by wooded savannah and dry woodland forest vegetation, and is dominated by herbaceous perennial grasses. The Guinean area is characterized by a dense semi-dry forest with a dense undergrowth formed by sarmentose shrubs, vines, and herbs.

The main surface water resources in Senegal are the Senegal River (1,800 km) and the Gambia River (1,150 km) which both originate in the Fouta Djallon highlands of Guinea. There are other smaller rivers such as the Casamance, Kayanga, Anambé, Sine, and Saloum, as well as coastal basins. There are also several lakes and ponds that complete the water network, such as the Guiers Lakes and pools in the Niayes region.[31]

BIODIVERSITY

Senegal's wild fauna can currently only be found in national parks and reserves, which total 10 percent of the country's territory. The Niokolo Koba National Park is home to 330 species of birds, 80 species of mammals, 60 species of fish, 36 species of reptiles and 20 species of amphibians. The Senegal River Delta is a highly diverse site, and is the only ecosystem affected by invasive species. Mangrove ecosystems and the Niaye (inter-dune depressions) and Djoudj area are particularly fragile, and also have high biodiversity and important ecological roles. Senegal has 2,500 species of flower plants, over 2,000 species of insects, and more than 1,000 species of mollusks and fish. The marine biodiversity of Senegal remains largely unknown, however. Certain animals in Senegal benefit from strict protection, including elephants, sea turtles, Derby élans and bamboo.[32]

ECOREGION BIODIVERSITY[33]

SAHELIAN

This region is dominated by steppe shrubs and shrub lands, but has suffered loss of productivity and diversity in the past few decades due to bush fires, overgrazing, and pressure on marginal resources.

SUDANIAN

The Sudanian zone is characterized by a mix of shrub savanna, wooded grassland, and savanna woodlands. The central and western part used to carry dense vegetation, but is now a manmade park dominated by acacias. The southern and eastern zones now have heterogeneous vegetation due to colonization and agriculture.

SUB-GUINEAN

This zone is characterized by wooded savannas, woodlands, dry forests (currently being degraded), and riparian forests near the Gambia River and Niokolo River. This region is one of the most biodiverse in Senegal.

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[30] (CIA 2015)
[31] (Toure, et al. 2010)
[32] (Convention on Biological Diversity n.d.)
[33] For more information on ecoregions, see the 2008 USAID/Senegal Environmental Threats and Opportunities Assessment (ETOA)

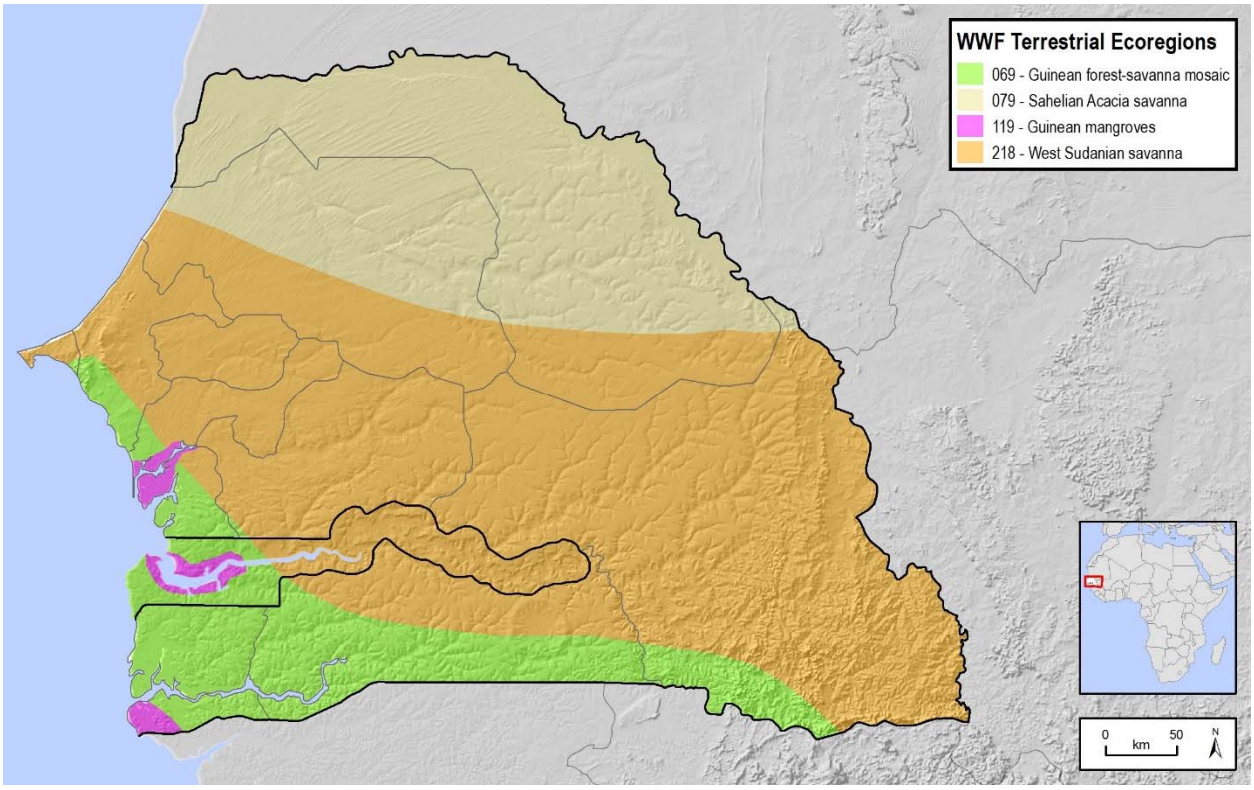
FRESHWATER

Freshwater resources, as well as the endemic plants and animals located therein, have been seriously degraded due to drought and human activities, and therefore are home to some of the more rare and/or endangered species. Along the Senegal River, the Acacia nilotica, which use to form a large riparian forest, has faced severe deforestation.

COASTAL, ESTUARINE AND MARINE

Coastal, estuarine and marine resources are under threat of human activities, drought, and overexploitation. The Saloum estuary in Senegal already experiences land losses due to coastal zone inundation. Due to the low altitude of the estuary, a one-meter rise in sea level can result in 27 percent of the land area flooding, of which 50 percent is covered by mangroves. [34] The degradation of the mangroves has in turn led to salinization of the Saloum Delta and the coastal ecosystems of the Casamance region.

Figure 1. Ecoregions of Senegal[35]



ENERGY[36]

In 2012, Senegal's total primary energy supply was 157.9 PJ. The share of renewables in total energy supply was 86.8 petajoule (PJ), or 54.8 percent. Total electricity capacity in 2008 was 4,800 Gigawatt hour (GWh), of which 2,858 GWh were actually generated. The share of renewable energy in total electricity generated was 292 GWh, or 10.2 percent. Senegal is 55.5 percent self-sufficient in the energy sector, but imports all fossil

[34] (African and Latin American Resilience to Climate Change Project 2014)

[35] Source: WWF: Terrestrial Ecosystems of the World

[36] (International Renewable Energy Agency (IRENA) 2012)

fuels, including $1.2 billion in fuel from the US (23.2 percent of total imports), leaving the country vulnerable to changes in oil prices.

Household use accounts for a little over 50 percent of total energy consumption, followed by transportation (30 percent), industry (14 percent) and agriculture and public services (4 percent). About a quarter of the population still relies on solid fuels, such as wood and charcoal, which contributes to deforestation and puts immense pressure on forest resources. To try to reduce biomass use, Senegal has had a policy on subsidizing liquefied petroleum gas (LPG) for the last two decades.

About 40 percent of households have access to electricity, mainly through the National Power Utility of Senegal (SENELEC)'s interconnected grid. New connections to this main grid and small off-grid projects are increasing connectivity, but those connected still face unstable and unreliable electricity supply, which can lead to revenue and productivity losses for businesses and the economy. Senegal's energy infrastructure has not kept up with demand, which has led to increased power generation costs. The average wholesale cost of power is $0.14/kWh compared to $0.13/kWh in the Sub-Saharan region's larger power systems.

Senegal has oil reserves in the Casamance region estimated at 100 million m^3, but upstream and downstream production has not been developed. Imported crude oil is refined at Societe Africaine de Raffinage, which can process 1.2 million tons annually. Gas reserves are estimated at 30.4 billion m^3 in Gadiage as of 2011 but are used exclusively for powering four gas turbines that have a combined total output of 88 GWh (8 percent of electricity production within Senegal).

RENEWABLES

Senegal has high potential for solar energy. Throughout most of the country, solar irradiation is above 2,000 kWh/m^2/year for Global Horizontal Irradiation and above 1,800 kWh/m^2/year for Direct Normal Irradiation. Given that photovoltaic (PV) panels and system components are decreasing in price, solar energy is a very attractive solution for energy needs. Senegal's coast also has significant wind energy potential, especially between Saint Louis in Dakar, where the average wind speed is estimated at 4 m/s at 10 meters high. The total potential for large hydropower is estimated at 1,400 MW on the Senegal and Gambia Rivers. Solid biomass and liquid biofuels also have the potential for grid-distributed and off-grid electricity generation.

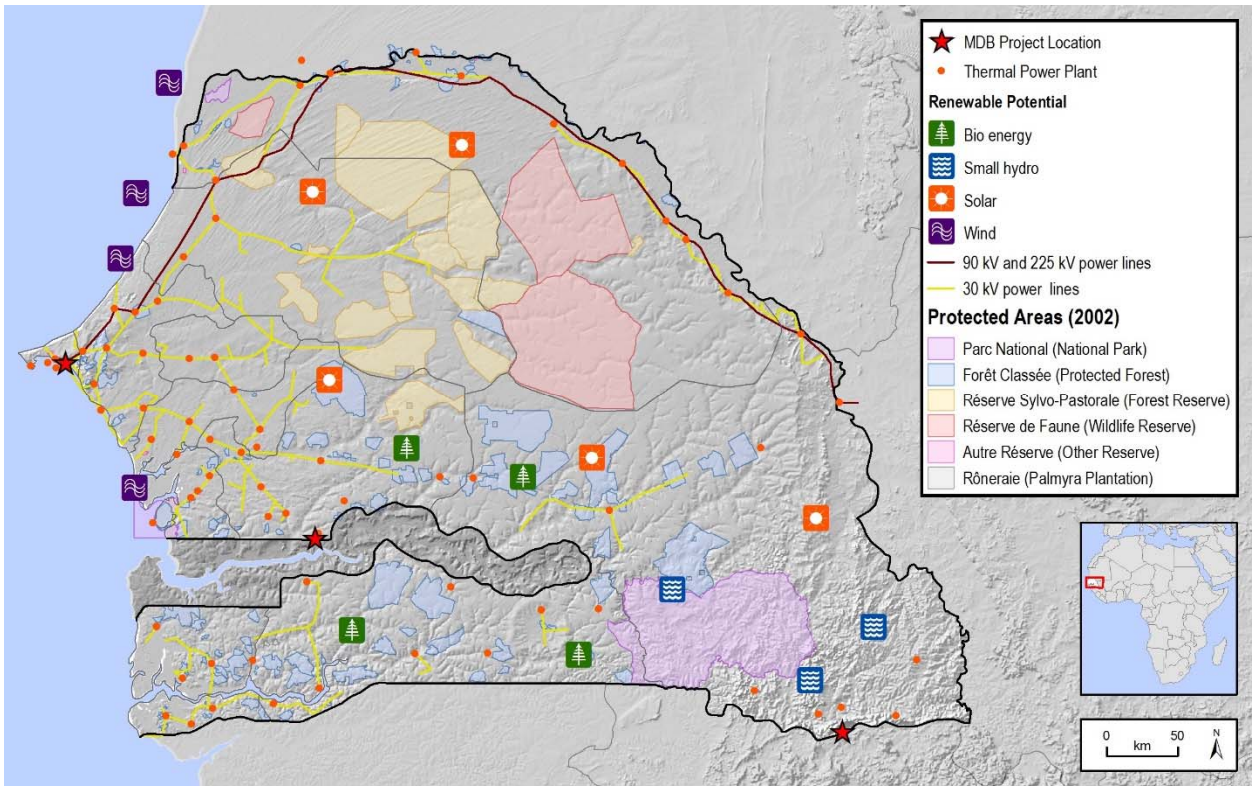
MULTILATERAL DEVELOPMENT BANK (MDB) ENERGY SECTOR PROJECTS IN PROGRESS OR ANTICIPATED IN SENEGAL[37]

- **Sendou II (125 megawatt (MW) coal power plant).** The plant will be constructed on a land area of 29 ha near the Minam village, a few villas, and a fishing wharf, and is 32 km from Dakar. It is intended to cover about 12 percent of annual power consumption projected for 2052. Total cost is TBD.[38]
- **OMVG II and OMVG I (2 HPP).** The objective of this project is to enable electricity trade between the Gambia, Guinea, Guinea-Bissau, and Senegal. The project includes construction of transmission lines (1,677 km of 225 kV) and substations (fifteen 225-230 kV substations).[39] Total cost is unknown.

[37] See full list of MDB projects anticipated in Senegal in Annex F
[38] (African Development Bank 2009)
[39] (The World Bank n.d.)

- **Senegal Banda Gas to Power Guarantee.** The goal of this project is to enable the production of natural gas for electricity generation to reduce costs and increase supply in Mauritania, who will then export electric power to Senegal and Mali. Total cost is $99 million.[40]
- **Senegal Taiba Ndiaye Independent Power Producer Project.** The goal of this project is to increase the power generated by independent power producers by supporting affordable, reliable and sustainable energy supply. Total cost is $160 million.[41]
- **Electricity Sector Support Project.** The goal of this project is to reduce the technical and commercial loses of SENELEC and to improve the reliability of electricity, mainly in Greater Dakar. Total cost is $93.5 million.[42]
- **Second Sustainable and participatory Energy Management (PROGEDE II).** The goal of this project is to increase the availability of diversified household fuels to help preserve forest ecosystems. Total cost is $19.37 million.[43]
- **Rural Lighting Efficiency.** This project aims to address the imbalance of developing rural electrification by removing the SENELEC monopoly in rural areas and transferring responsibility to private sector investors and operators, under the coordination of the Senegalese Agency for Rural Electrification (ASER). Total cost is $1.8 million.[44]

Figure 2. National Electricity Grids, Renewable Energy Potential, and Selected MDB Projects in Senegal[45]



[40] (The World Bank n.d.)
[41] (The World Bank n.d.)
[42] (The World Bank n.d.)
[43] (The World bank n.d.)
[44] (The World Bank n.d.)
[45] Source: Anthony Medeiros (USAID), SENELEC

CLIMATE CHANGE

The Senegal Climate Change Vulnerability Assessment and Options Analysis[46] completed in October 2014 cites that rainfall models predict a reduction in rainfall consistent with the reduced rainfall period observed between 1970 and 1990. An increase in maximum and minimum temperature is also expected across the regions included in the study, ranging from 2 °C to over 5° C in certain months. Maximum temperatures are expected to increase the most from December to February and June to September which are currently the coldest months, but even a limited temperature increase from April-May would bring monthly averages closer to 45 °C rather than current averages of 40° C.[47]

One of the major climate change concerns in Senegal is sea level rise along the coast. The coastal zone is part of a regional sediment transportation corridor which causes ongoing erosion. The Senegalese coastal zone already experiences acute erosion at a rate of close to 137 meters per year in the areas near the breach in the Sangomar sand spit.[48] This, coupled with changes in rainfall patterns and saline intrusion, has reduced fresh water supply. It is likely that between 55 and 86 km of beach will disappear by 2100 if erosion continues to intensify. Low areas, namely estuaries, are at a very high risk of flooding.[49] However, it is important to note that inundation is predicted to cause higher land loss than erosion.

Current trends in agriculture and population growth could lead to a 30 percent reduction per capita in cereal production by 2025. The transition to a warmer climate will likely reduce crop harvests and pasture availability, in turn exacerbating the impact of droughts. In areas that already have high average air temperatures, increased warming will increase water shortages. From the 1960s to the 2000s, the amount of farmland per person has declined by 300 percent, and yields only increased by about 70 percent. If these trends continue, food security will be seriously threatened.[50]

The following assessments document climate change vulnerabilities in Senegal generally, and for specific sectors, and are described in the Annotated Bibliography in Section 11:

- Senegal's Second National Communication on Climate Change (report to United Nations Framework Convention on Climate Change (UNFCC))
- USAID African and Latin American Resilience to Climate Change (ARCC) Climate Vulnerability Assessment and Options Analysis
- USAID COMFISH Coastal Communities Climate Change Vulnerability Assessment and Adaptation Strategies
- Regional Climate Change Vulnerability Assessment for West Africa
- Climate Change and Water Resources in West Africa: Coastal Biophysical and Institutional Analysis
- The Status and Possible Evolution of Climate Projections in West Africa

This assessment discusses climate change in the following sections as one of many factors exacerbating or alleviating environmental baseline conditions, not as a direct stand-alone threat, since the actions necessary to adapt to climate change from a biodiversity, forestry, and environmental standpoint are inseparable.

[46] This analysis focused on the departments of Matam, Kanel, Goudiry and Bakel in order to focus on a relatively coherent set of livelihood systems that are likely to be most vulnerable to climate change impacts
[47] (African and Latin American Resilience to Climate Change Project 2014)
[48] (African and Latin American Resilience to Climate Change Project 2014)
[49] (Akoh and Parry 2011)
[50] (Faming Early Warning Systems Network 2012)

ADDITIONAL RESOURCES

For additional resources, see the USAID Biodiversity and Development Handbook, 2015. This handbook is a fundamental tool for implementation of USAID's Biodiversity policy, which was approved and launched in 2014. The USAID Biodiversity Policy outlines how the agency will achieve sustainable, resilient development by conserving biodiversity. The Handbook provides guidance for integrating biodiversity into agency programming (including agency programming in other development sectors, drawing on a wide range of USAID programming experiences in forestry, marine and coastal programming, community based natural resource management, conservation enterprises, and multi-sectoral approaches.

POLICY AND INSTITUTIONAL FRAMEWORKS

[See Annex B for Legislation and Institutional Stakeholders and Partners]

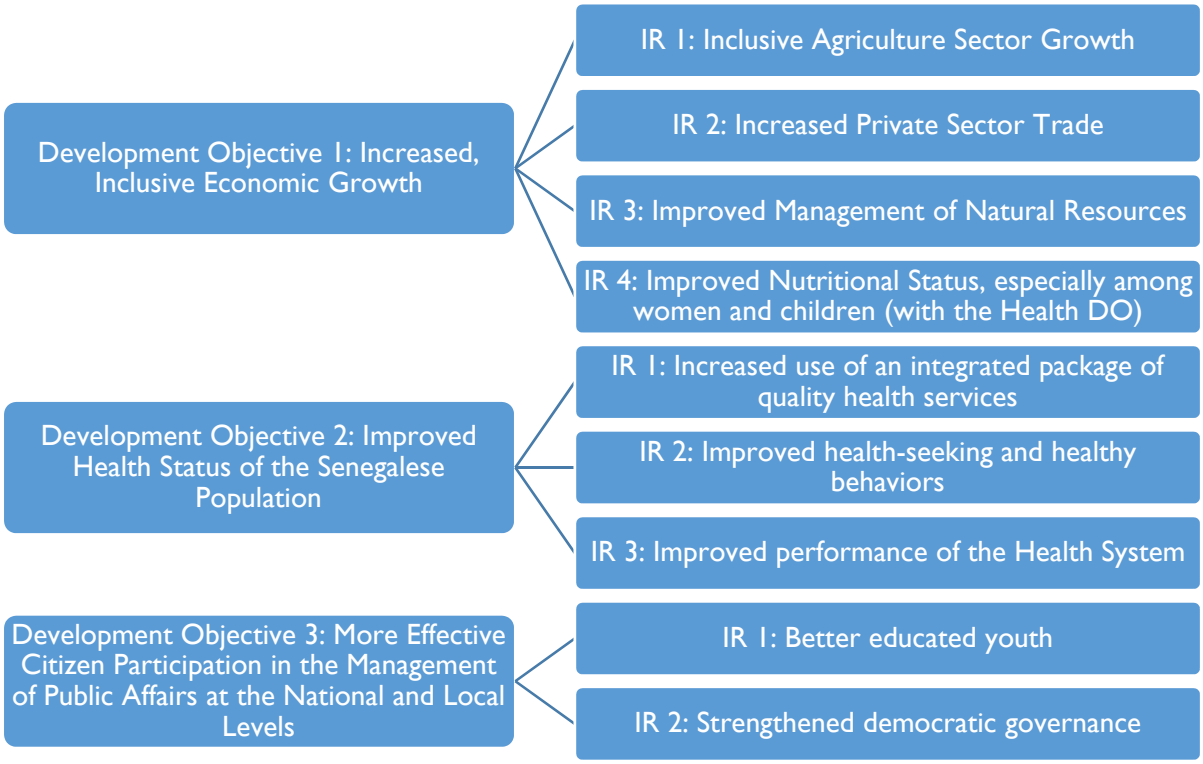
3. USAID PROGRAMMING

OBJECTIVES

USAID programming is designed using Development Objectives (DOs), which are strategic and specific goals intended to maximize the impact of development cooperation. DOs are the highest-level, most ambitious result that a USAID mission, together with development partners, can achieve.

Within DOs are Intermediate Results (IRs). IRs are smaller objectives which, when combined, can achieve a DO. IRs can be the starting point for project design, but projects can also be designed for sub-IRs, or even at the DO-level. Senegal's DOs and IRs are outlined in Figure 3 below.[51]

Figure 3. USAID/Senegal Development Objectives and Results Framework (USAID, year = CDCS)



PROGRAMMING

This section describes USAID programing in terms of key subject areas, not the current organizational structure of USAID/Senegal offices.

AGRICULTURE

(4A)

Senegal's Improved Agriculture for a Future with Abundance (4A) project's purpose is to "increase the agriculture sector's contribution to economic growth through an inclusive, private sector-driven approach." There are three objectives within this project to help reach his goal: 1) increased productivity in Staple Cereals

[51] (USAID/PPL 2014)

Sector; 2) increased private sector investment in agriculture; and 3) strengthened agriculture policy environment.

Objective 1 aims to increase access to factors of production (including management and finance) by increasing access to business development services, effective use of verified agriculture technologies and land stewardship practices, scale-up of enterprise models, and increasing access to financing mechanisms. Objective 2 aims to expand credit and savings in order to access mechanized agriculture equipment and technologies, and to improve the market environment. Objective 3 aims to increase access to agricultural credit, improve access to inputs by supporting subsidies, provide technical assistance to support agricultural data and analysis, and facilitate the agriculture policy reform processes.[52]

Naatal Mbay. USAID/Senegal's Naatal Mbay ("flourishing agriculture" in Wolof) project supports Senegal's DO 1 by aiming to increase the resilience of Senegalese livelihoods by improving efficiencies across specific agricultural chains, increasing private sector engagement, and strengthening the agricultural policy environment.[53] This project has found success by creating a "virtuous circle" of development between the farmer, wholesalers, insurance industry, bankers, etc.

Yaajeende. USAID/Yaayeende is a Feed the Future initiative that combats food insecurity by working with rural producers to promote nutrition-led agriculture. Agriculture and food products that diminish nutritional deficiencies are promoted through rural value chains. Yaajeende also works with entrepreneurs, lenders, supplies, civil society members, and consumers in an integrated approach.[54] This project has been extended to 2017.

DEMOCRACY AND GOVERNANCE

USAID/Senegal Democracy and Governance (D&G) programming supports DO 3, IR 2: Strengthened democratic governance. The sub-IRs are improved government transparency and accountability and strengthened effective local government, especially in the Casamance area. At the national level, USAID's strategy is to work with GoS to improve internal transparency processes, supporting civil society in playing a larger oversight role, and raising awareness among the general population of their role in improving governance. At the local level, USAID will support increased transparency and accountability and will likewise support civil society in engaging in a monitoring role. To improve decentralization, USAID will support local governments in raising and managing their own revenues.[55]

EDUCATION

USAID/Senegal education programing supports DO 3, IR 1: Better educated youth. The sub-IRs are improved reading performance, improved education system performance (through teacher training, curriculum reform, and improved school governance oversight), and increased access to education for marginalized groups. The focus is on improving reading skills of children in grades 1-8 and increasing access to upper primary education (grades 7 and 8), especially in the conflict-affected Casamance region. To a lesser extent, resources will be directed toward improving math skills.[56]

ENERGY

While USAID programming is not currently focused on developing the energy sector, Senegal has been identified as a priority country for the next round of Power Africa activities. The Power Africa initiative supports economic growth and development by increasing electricity access across Sub-Saharan Africa.

[52] (USAID/Senegal 2013)
[53] (Engility Holdings, Inc 2015)
[54] (NCBA CLUSA n.d.)
[55] (USAID/Senegal 2012)
[56] (USAID/Senegal 2012)

Power Africa focuses on facilitating transactions to encourage private sector investment and directly supporting energy sector reforms to further improve the enabling environment for investment. The overall objective is to increase access to affordable, reliable and clean energy while also improving regional and global trade. The Power Africa Transactions and Reforms Program (PATRP) is USAID's main mechanism for Power Africa activities. PATRP provides technical assistance, capacity building, and transaction support under Power Africa. PATRP's transaction-centered approach facilitates collaboration between host-country governments, the private sector, and donors in order to prioritize electricity generation, transmission, and distribution transactions.[57]

FISHERIES

USAID supports the fisheries sector through the USAID/COMFISH (Collaborative Management for a Sustainable Fisheries Future) program. COMFISH is helping to reform the fisheries sector to sustain productivity and enhance the participation of artisanal fishermen in fishery value chains. Specifically, the project supports GoS in implementing the Fisheries and Aquaculture Sector Policy letter (Lettre de politique sectorielle des peche et de l'aquaculture-LPS) which serves as a national framework for sustainable management of fisheries resources. As funding for climate change adaptation, resiliency, and variability has increased, COMFISH has begun to focus more on climate change by increasing awareness among stakeholders, developing and implementing climate change adaptation plans for coastal communities, enhancing the scientific database of climate trend information, and supporting the integration of climate change adaptation into the national fisheries policy. The project has seen significant success and will therefore continue for at least five more years.[58]

NUTRITION AND FAMILY PLANNING

Nutrition support from USAID/Senegal is cross-cutting, and has activities in both DO 1, IR 4: Improved nutritional status, especially among women and children; and DO 2, IR 2: Improved health-seeking and healthy behaviors. The mission will work to strengthen the private sector to improve the markets for inexpensive, nutritious, local foods. This coincides with many of the mission's agricultural activities, which incorporate nutrition interventions to link Feed the Future and Global Health Initiative strategies (e.g., Yaajeende). In combination with this approach, the mission will also deploy behavior-change strategies and social marketing campaigns to raise awareness about nutrition and hygiene best practices. Finally, the mission will support local governments to engage with civil society and other stakeholders to improve food security and natural resource management policies and procedures.[59]

Family planning programming supports DO 2, IR 2: Improved health seeking and healthy behaviors. The adoption of progressive family planning methods is very low in Senegal, as 12.6 percent. The main strategy used to improve this statistic is comprehensive behavior-change communications across all levels via media, social marketing, and community mobilization. The mission will also focus on improving the health systems to increase better family planning by providing incentives through performance-based financing.[60]

PUBLIC HEALTH

The USAID/Senegal Public Health portfolio supports DO 2 and all of the IRs and Sub-IRs within DO2. The IRs are to increase access to quality priority services and products, increase commitment of individuals and communities in the management of their own heath and health services, and to improve the performance of the health system. Activities in the health portfolio focus on the following elements: HIV/AIDS, maternal and child health, family planning and reproductive health, pandemic influenza and other emerging threats,

[57] (Knausenberger and Erwin 2015)
[58] (The Cadmus Group, Inc. 2015)
[59] (USAID/Senegal 2012)
[60] Ibid.

and malaria. The mission will also be focusing on strategies to respond to public health shocks, such as heat waves, droughts, floods, and diseases such as Ebola.

The President's Malaria Initiative also operates in Senegal to prevent and treat malaria, and includes an indoor residual spraying component (including St. Louis). USAID also works with GoS at the health facility level and the community level. The main activities that the President's Malaria Initiative supports are achieving and sustaining high levels of use of long-lasting insecticidal nets (particularly among vulnerable populations), indoor residual spraying campaigns, providing sulfadoxine pyrimethamine and preventive treatment for pregnant women, improving case management, chemo-prevention for children under 10 years old, behavior change communication (BCC), strengthening supply chain management, and monitoring and evaluation.[61]

The Global Health Security Agenda was started in February 2014 to elevate global health security by bringing nations together to commit to security from infectious disease threats. The agenda has the following goals: preventing the spread of antimicrobial drug-resistant organisms and emerging zoonotic diseases; strengthening international regulatory frameworks governing food security; promotion of national biosafety and biosecurity systems; and reduction of the number and magnitude of infectious disease outbreaks.[62]

WATER, SANITATION, AND HYGIENE (WASH)

The USAID/Senegal WASH program supports DO 1 (increased inclusive economic growth) and DO 2 (improved health status of the Senegalese population). Currently, rural water users pay twice as much as urban water users because of the inefficiency of the water systems in rural areas. The program contributes to DO 1 by improving access to clean water, sanitation, and improved hygiene, as well as by strengthening private sector WASH actors and increasing access to multiple-use water points. To increase the purchasing power of communities and the private sector for WASH infrastructure and services, USAID will use public-private partnerships, Development Credit Authority loans, revolving grants funds, and microfinance mechanisms. The project supports DO 2 by stimulating changes in sanitation and hygiene behavior.

4. STATE OF THE ENVIRONMENT AND NATURAL RESOURCE MANAGEMENT

Disclaimer: At the time this report was drafted, CSE was preparing an update to the Senegal State of the Environment Report. While the Assessment Team made best efforts to use the most up-to-date facts, the reader should refer to the CSE publication available online at: http://www.cse.sn/spip.php?rubrique30

PROTECTED AREAS AND RAMSAR SITES

PROTECTED AREAS

Senegal has a large protected area network with six national parks, six bird reserves, and 213 forest reserves. [63] In addition, rural populations retain many sites as places of worship. The total land area under protection in Senegal is 51,617 km^2 out of the total land area of 192,530 km^2 (25 percent). In addition, Senegal has 1,736 km^2 of Marine Protected Areas (MPAs) out of a total marine area of 158,450 km^2 (1 percent). [64] Per Target 11 of the Convention on Biological Diversity (to which Senegal is signatory), by 2020 at least 17 percent of terrestrial and inland water areas and 10 percent of coastal and marine areas should be under protection[65].

[61] (Abt Associates 2015)
[62] (GlobalHealth.gov n.d.)
[63] Forests reserves are designated to preserve fragile soils, flora and fauna (raised or diversified), and energy reserves (wood)
[64] (Protected Planet n.d.)
[65] (Convention on Biological Diversity n.d.)

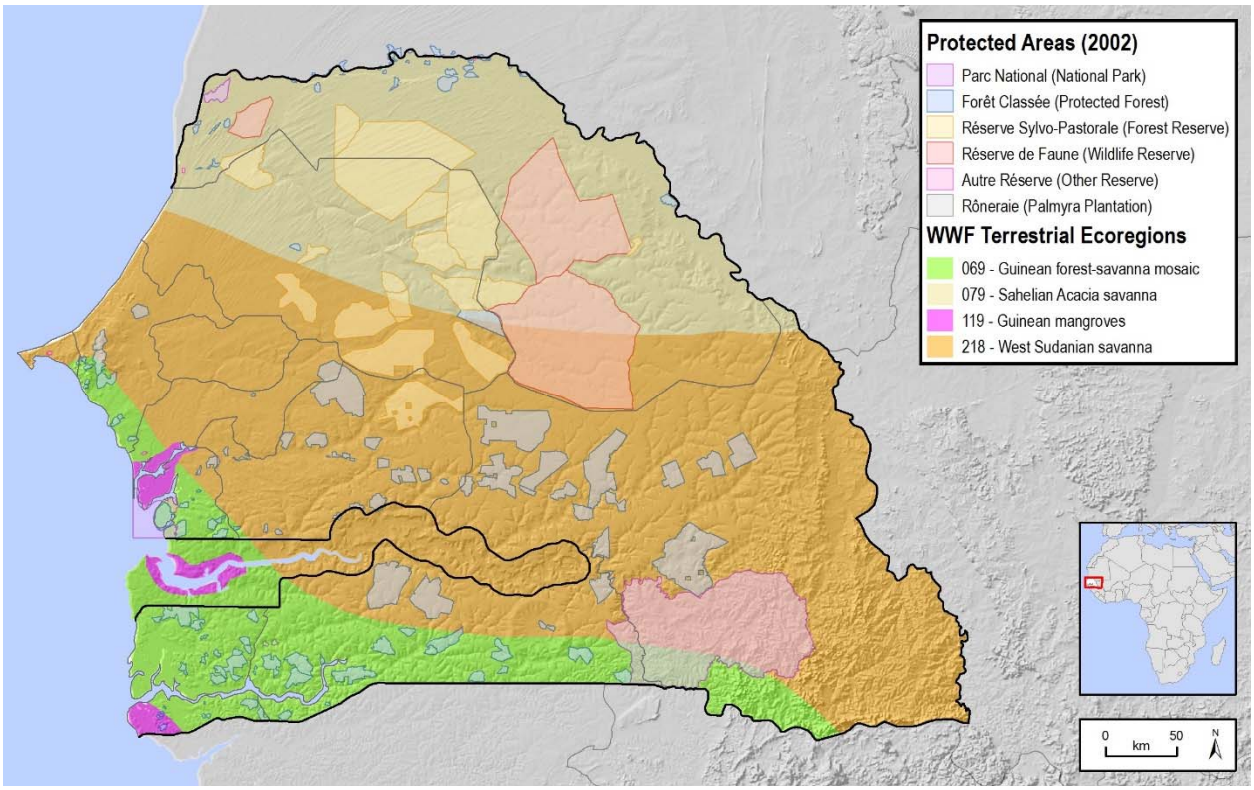
Senegal is meeting the terrestrial protection goal, but not the marine protection goal. Many of the protected areas are threatened by poor management, poaching, and overexploitation.

NATIONAL PARKS

1. **Le Parc National du Niokolo Koba, 913,000 ha.** This United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage site and biosphere reserve is located in the southeastern part of the country. It was created to preserve large fauna and their habitat. The vegetation consists of woodlands, savanna woodlands, brush savannah and gallery forests. About 1,500 plant species have been recorded there as well as 330 species of birds, 36 species of reptiles, 20 species of amphibians, 60 species of fish and invertebrates, and 80 species of mammals, including elephants.[66]
2. **Le Parc National du Delta du Saloum, 76,000 ha.** See below section on Ramsar sites.
3. **Le Parc National de Basse Casamance, 5,000 ha.** This park was created in 1970 to safeguard Guinean flora and fauna. The park consists mainly of dry forest and contains more than 50 mammal species as well as over 200 species of birds.[67]
4. **Le Parc National des Oiseaux du Djoudj, 16,000 ha.** See below section on Ramsar sites.
5. **Parc National de la Langue de Barbarie, 2,000 ha.** This park includes the Langue de Barbarie peninsula, the estuary of the Senegal River (containing two small islands) and a section of the mainland on the opposite side of the estuary. The park is home to numerous water birds and, from November to April, migrant birds from Europe.[68]
6. **Le Parc National des Iles de la Madeleine, 45 ha.** This park consists of three rocky volcanic islands about 4 km off of Senegal's coast. The largest, "snake island", is about 15 ha. The islands are covered in steppe-grassland and contain breeding bird species as well as sea turtles, dolphins and tortoises.[69]

[66] (Centre Suivi Ecologique (CSE) 2010)
[67] Ibid.
[68] (Lonely Planet n.d.)
[69] (BirdLife International n.d.)

Figure 4. Distribution and Size of Protected Areas of Senegal (2002) by Ecoregion[70]



RAMSAR SITES

Senegal has four designated Ramsar sites, covering almost 100,000 ha, and a fifth site that has been submitted for the list. Ramsar sites signify designated wetlands of importance, as guided by the Ramsar Convention. In helping to maintain and preserve the biodiversity and productivity of wetlands, Ramsar Convention countries must work to identify wetland areas to protect while pledging support for transnational wetlands.[71] These wetland areas include: lakes and rivers; underground aquifers; swamps and marshes; wet grasslands; peatlands; oases; estuaries; deltas and tidal flats; mangroves and other coastal areas; coral reefs; and all human-made sites such as fish ponds, rice paddies, reservoirs, and salt pans.

1. **Gueumbeul.** Designated September 29, 1985, Gueumbeul is an extensive saline lagoon surrounded by Sahelian vegetation. It is fed by seasonal rainfall and saltwater inflow from the Senegal River. Various water birds are supported by Gueumbeul, as well as Palearctic migrants and nesting Afrotropical species. The site also contains an experimental breeding center for Sahelian mammals and reptiles. Human activities in the area include nature conservation and education, tourism, and recreation.[72]

2. **Djoudj.** Designated June 16, 1993, Djoudj is an inland delta with a complex system of brackish lakes and pools linked through channels of the Senegal River floodplain. Water levels are controlled artificially. Vegetation in the area consists of Sahelian Tamarix and savannah with herbs and grasses in dry areas and reed beds in flooded areas. Up to 400,000 birds can be present in January for breeding, staging, and wintering, making this site an internationally important bird area. The main

[70] Source: Anthony Medeiros (USAID); WWF
[71] (Ramsar n.d.)
[72] Ibid

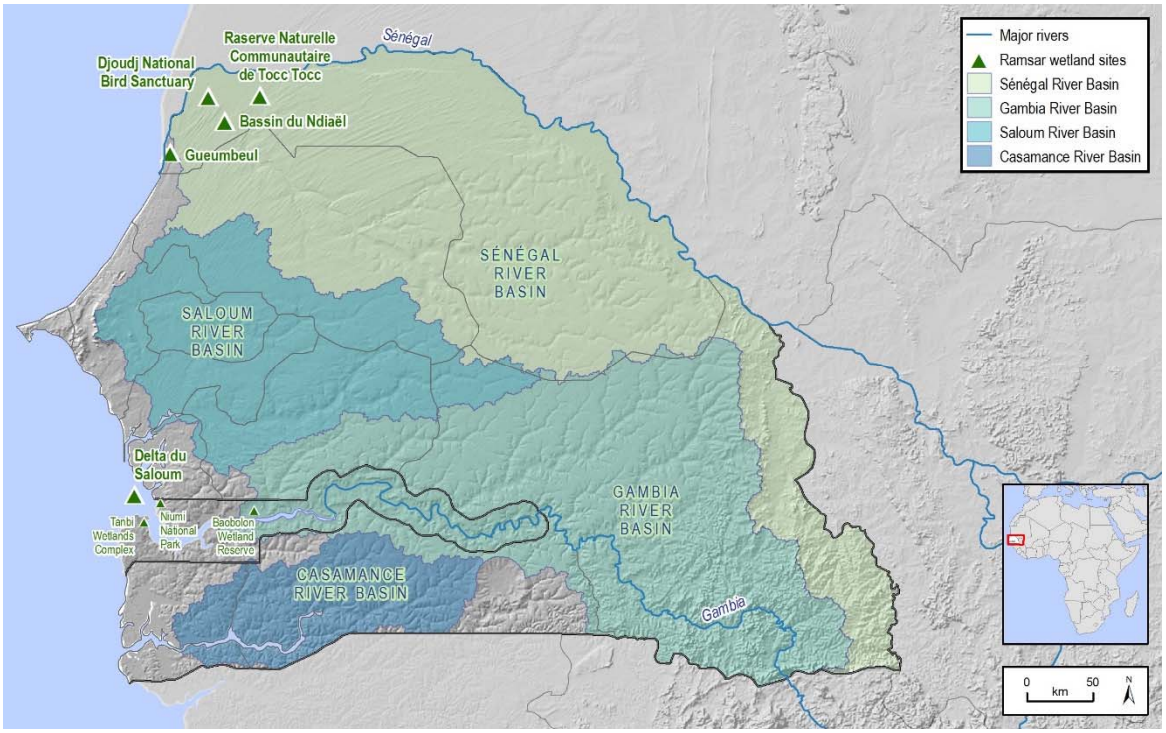
human activities in the area are nature conservation and ecotourism, and, in surrounding areas, rice cultivation, livestock rearing, and hunting.[73]

3. **Bassin du Ndiaël.** Designated July 11, 1977, the Bassin du Ndiaël is a basin of saline soil in the Senegal River floodplain. Vegetation is mostly annual grasses and Acacia scrub. In the 1960's, the natural hydrology of the region was changed to improve agricultural conditions, leading to drought and its subsequent listing as a Ramsar site. A hydrological restoration plan is in place to return the site to its prior international importance. There are now a large number of wintering migrant birds visiting the area, highlighting the success of this restoration plan.[74]

4. **Delta du Saloum.** Designated April 3, 1984, the Saloum Delta consists of mangrove forests dissected by saline channels, lagoons, islands and islets. The area also has dune areas with dry, open forest. The site is home to varied fauna, including breeding turtles and nesting water birds. Human activities in the area include nature conservation, tourism, and pastoralism. Surrounding areas are used for agriculture, livestock, fishing, and hunting. Management issues in the area include illegal gathering of mollusk, bird, and turtle eggs and exploitation of plant products.[75]

5. **Reserve Naturelle Communautaire de Toc Tocc (tentative).** This site is a permanent coastal freshwater lake that provides habitat for spawning, nursery and feeding for over 98 fish species, including species of significant nutritional and commercial value to surrounding communities. The site is also home to a large colony of water birds and supports the hydrological balance of the Senegal River basin. [76]

Figure 5. Distribution of Ramsar Wetlands Sites in Senegal[77]



[73] Ibid
[74] Ibid
[75] Ibid
[76] Ibid
[77] Source: Ramsar

STATUS AND MANAGEMENT

Current management of Senegal's protected areas is based primarily on four types of governance:

- "Conventional" management, or governance by public authorities;
- Participatory management, or shared governance;
- Communal management, or governance by local communities; and
- Private management and governance.

Conventional management by public authorities is relegated primarily to: classified forests, silvo-pastoral reserves, fauna reserves, first generation national parks to which the GoS has not conceded decision-making authority (e.g., *Parc National du Niokolo Koba, Parc National des Oiseaux du Djoudj, Parc National du Delta du Saloum, Parc National de la Langue de Barbarie, Parc National des Iles de la Madeleine, Parc National de Basse Casamance*), enclosed natural reserves (e.g., Ker Cupaam campement of Popenguine), protected marine areas, and the Ferlo Nord fauna reserve. This type of management has allowed for the classification of a number of important protected areas as a means of protecting biodiversity, much of which is threatened by pressures associated with poaching, the extension of cultivated agricultural land, and the exploitation of land for pastoral uses. One of the primary difficulties in this form of governance, however, lies in the difficulty of reconciling the need for preservation and conservation of resources and ecosystems (for the purpose of protecting biodiversity) with the legitimate needs and claims of local populations to utilize natural resources for nutritional and material needs as well as economic livelihood.

Participatory management was devised as a means of addressing the perceived weaknesses and points of contention raised by conventional management of protected areas. These issues include:

- claims by local populations of access rights to resources in classified zones;
- continued poaching for both consumption and trade;
- establishment of facilities surrounding protected areas;
- uncontrolled exploitation of natural resources; and
- drastic reduction of funds directed towards the function and management of protected areas following the adoption of structural adjustment policies.

Through stakeholder involvement, participatory management seeks to achieve the following goals:

- recognition and validation of the status of protected areas by nearby local populations;
- improved collaboration between technical service providers and local communities for more peaceful management of protected areas;
- establishment of dialogues between all relevant actors to support the collective management of protected areas;
- the possibility of fair and equal sharing of revenues earned from tourism in protected areas; and
- reduction of pressures from local populations on natural resources in protected areas.

However, the main drawback involves the risk that certain actors will leverage the principle of participation in a way that serves only their own unique interests.

Communal management was inspired by the implementation of the 1992 Rio Conventions (particularly the Conventions on Biological Diversity, Climate Change, and Desertification), and thus one of its goals was to promote sustainable equilibrium between consumption, population growth, and ecosystems' capacities for regeneration. It is in this context that the *Direction des Parcs Nationaux* (DPN) developed the concept of communal protected areas, a designation that was reinforced in 1996 by the promulgation of Act 2 of decentralization, which confers to local communities the prerogative on matters specific to the creation of protected areas. This dynamic has led to the creation of communal protected areas, including Popenguine Nature Reserve, in which a group of women is fully accountable for the management of eco-tourism

activities, as well as additional communal nature reserves in Popenguine and Somone. Based on close collaboration between locally involved actors, the primary advantages of communal management are facilitation of co-management of natural resources by the Government of Senegal and nearby communities, as well as continued support for a dynamic of sustainable development based on the conservation and responsible use of resources. Nevertheless, communal management presents the risk that certain actors will seek to claim a portion of the resources or of a community's nature reserve.

Private management was developed due to constant difficulties with the central administration and its branches in effectively and appropriately overseeing the management of protected areas. Faced with a number of social crises and demands (e.g., health, education, employment, drinking water access, etc.) in both Senegal and surrounding countries, issues pertaining to environmental protection and conservation of natural resources, biodiversity, and forest ecosystems are often given lower priority by acting agencies. Thus, this approach allows the Government of Senegal to leverage and integrate the private sector to acquire additional resources (financial, material, and human), to ensure and increase protection and conservation of natural resources and ecosystems. This type of partnership was applied in several protected areas, including the *Parc National du Delta du Saloum*, the *Parc National des Oiseaux de Djoudj*, and the Bandia and Fathala protected areas. The primary advantage of this management style is its facilitation of alternate funding opportunities. Private actors, however, often remain implicitly motivated by: (a) monetary profit, to the detriment of social and ecological benefits; (b) financial benefits that may be obtained through eco-tourism and hunting; and (c) reductions in taxes that could give rise to these sorts of partnerships.

Table 1. Protected Areas in Senegal

PROTECTED AREA	AREA (HA)
National Parks and Reserves[78]	1,521,956.90
Le Parc National du Niokolo Koba	913,000
Le Parc National du Delta du Saloum*	76,000
Le Parc National de Basse Casamance	5,000
Le Parc National des Oiseaux du Djoudj*	16,000
Les Réserves de Faune du Ferlo Nord et du Ferlo Sud	487,000
Parc National de la Langue de Barbarie	2,000
La Reserve Spéciale Botanique de Noflaye	16.9
Le Parc National des Iles de la Madeleine	45
Reserve Ornithologique de Kalissaye	16
Réserve Naturelle de Popenguine	1,009
Réserve Naturelle d'Intêret Communautaire de la Somone	700

[78] (Kane 2011)

Réserve Communautaire de Palmarin	10,450
Reserve Speciale de Faune de Gueumbeul*	720
Bassin du Ndiaël*	10,000
Marine Protected Areas	103,000
Bamboug	7,000
Saint-Louis	49,600
Kayar	17,100
Fadiouth	17,400
Abéné	11,900
Total Land Area	**1,624,956.9**

*Wetlands of International Importance (Ramsar sites) [79]

THREATENED AND ENDANGERED SPECIES

Senegal is signatory to all international biodiversity conventions, including the Convention on International Trade in Endangered Species of Wild Fauna and Flora[80], as well as the Cartagena Protocol on Biosafety to the Convention on Biological Diversity[81].

According to the International Union for Conservation of Nature (IUCN) Red List, one species in Senegal is extinct in the wild, nine are critically endangered, 26 are endangered (including chimpanzees, see Figure 6 below), 71 are vulnerable, and 54 are near threatened (see Table 2). This includes both terrestrial and marine species. The damma gazelle and giraffe were extinct, but were then reintroduced.[82] The total number of plant species listed (14) is less than one percent of total plant diversity. However, the number of animal species listed (147) is about 27 percent of all terrestrial and marine animal life known in Senegal. The full list is in Annex D.

Table 2. Threatened and Near-threatened Plant and Animal Species in Senegal by Red List Category[83]

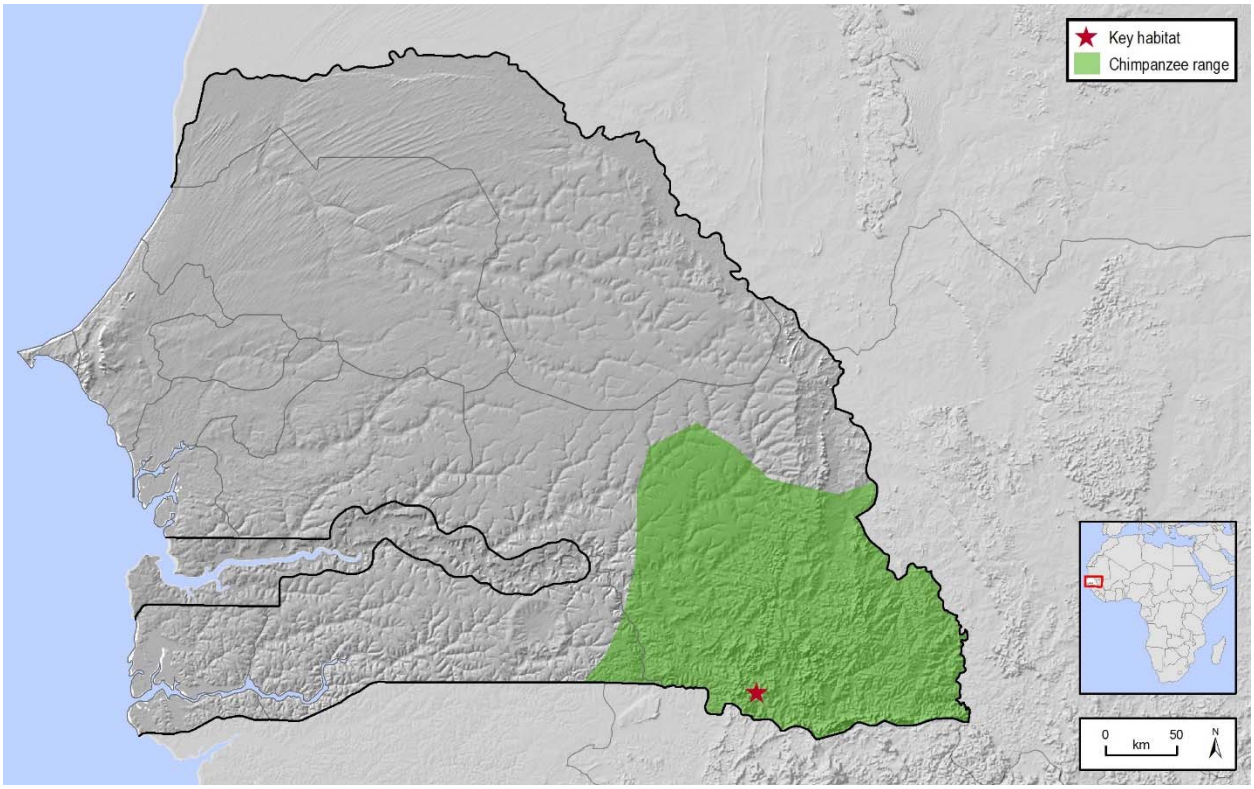
RED LIST CATEGORY	NUMBER OF SPECIES (PLANTS)	NUMBER OF SPECIES (ANIMALS)*
Extinct in the Wild	0	1 (terrestrial)
Critically Endangered	0	9 (3 terrestrial, 6 marine)
Endangered	0	26 (9 terrestrial, 3 freshwater, 19 marine)

[79] (Ramsar n.d.)
[80] (Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) n.d.)
[81] (Convention on Biological Diversity n.d.)
[82] (ECODIT 2008)
[83] (Red List n.d.)

RED LIST CATEGORY	NUMBER OF SPECIES (PLANTS)	NUMBER OF SPECIES (ANIMALS)*
Vulnerable	11	60 (22 terrestrial, 11 freshwater 41 marine)
Near Threatened	3	51 (23 terrestrial, 17 freshwater, 32 marine)
TOTAL	**14**	**147**

*Note that there is some overlap between terrestrial/freshwater/marine species, i.e., some species are classified as belonging to multiple systems.

Figure 6. Chimpanzee Range and Key Habitat



Senegal faces many challenges to preserving its biodiversity, including combatting wildlife trafficking and Illegal, unreported and unregulated (IUU) fishing (see "White House Action to Combat Wildlife Trafficking and IUU Fishing" box below). While there used to be 40,000 lions in West Africa, recent studies estimate that only 400 remain, only about 16 of which are estimated to remain in Niokolo Koba National Park. Lions are threatened not only because of grazing cattle (which eat vegetation needed to feed lion's prey) but also because of the bushmeat trade, which has decimated populations of animals that lions normally feed on. National Park authorities do not have the capacity or resources needed to combat illegal activity in such a large park.[84] Lions are also threatened by international demand for wildlife trafficking. A large international trafficking supply center is located in Dakar, responsible for the import of skins from across the continent. Thanks to undercover operations, in October 2014, about 2,600 skins and other animal parts, including the remains of 12 lions, were seized and five traffickers were arrested in Dakar.[85]

[84] (Loomis 2014)
[85] (Born Free 2014)

Senegal Parrots are another victim of international unregulated trade in wildlife. In the past 30 years, as many as three million Senegal Parrots were removed from the wild. In 2005, the Senegal Parrot was being removed from the wild at a rate of 45,000 individuals per year, making it the most traded bird on the Convention on International Trade in Endangered Species (CITES) Appendix II. Senegal parrots are also particularly sensitive to forest degradation, meaning that the exacerbated pressure of the wild-caught bird trade could be catastrophic to the population.[86]

Marine species are also at risk of unregulated catch and trade (See IUU Fishing below for more details). West African fisheries account for nearly 40 percent of the world's poached fish. Overfishing decreases biodiversity, leading to degradation of marine ecosystems and a decline in fishery productions. Senegal's Lettre de Polituque Sectorielle (Fisheries and Aquaculture Policy Letter-LPS) aims to unite various donor, government, and development partner initiatives in the fisheries sector, and includes a strategy to optimize fisheries monitoring, control and surveillance resources. [87] [88]

WHITE HOUSE ACTION TO COMBAT WILDLIFE TRAFFICKING AND IUU FISHING

The Executive Order (EO) on Combating Wildlife Trafficking, released on July 1, 2013, identifies poaching and illegal wildlife trade as an international crises due to the economic, social, and environmental impacts that result. This EO calls on executive agencies to take action within their authority to combat wildlife trafficking, and also established a Presidential Task Force on Wildlife Trafficking. For more information, see: https://www.whitehouse.gov/the-press-office/2013/07/01/executive-order-combating-wildlife-trafficking

The Presidential Memorandum to Combat IUU Fishing and Seafood Fraud states that it is in the United States' national interest to support sustainable fishing practices and combat seafood fraud and the sale of IUU fishing products around the world. The Memorandum tasks all executive agencies with coordination and implementation of relevant existing authorities, as well as improving transparency and traceability of the seafood supply chain. A Task Force was also created, of which responsibilities include identifying opportunities to address these issues at the international level. For more information, see: https://www.whitehouse.gov/the-press-office/2014/06/17/presidential-memorandum-comprehensive-framework-combat-illegal-unreporte

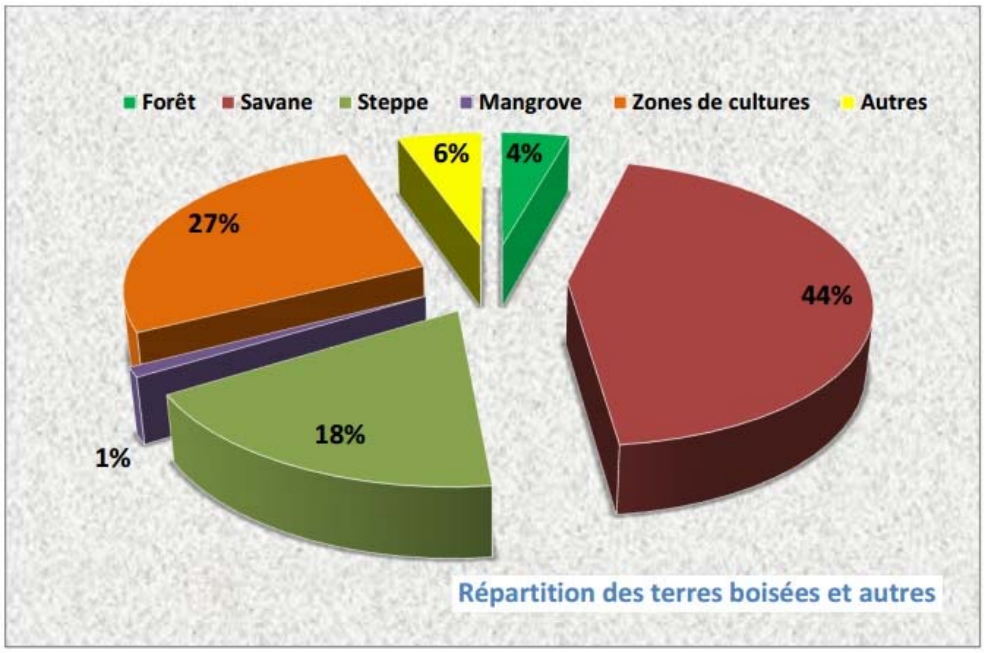
FOREST RESOURCES

STATUS OF FORESTS

Senegal Forest ecosystems are found in three phytogeographical areas following a distribution from North to South (Sahelian domain, Sudanese domain and the Guinean domain). The main vegetation types occupy an area of 679,450 hectares of which 44 percent is savanna, 27 percent crop areas, 18 percent steppe, 4 percent forests, 1 percent mangroves and 6 percent "other" (see Figure 7 on page 24).

[86] (Boyes 2012)
[87] (Eagle 2014)
[88] (USAID/Senegal n.d.)

Figure 7. Distribution of Forested Land in Senegal



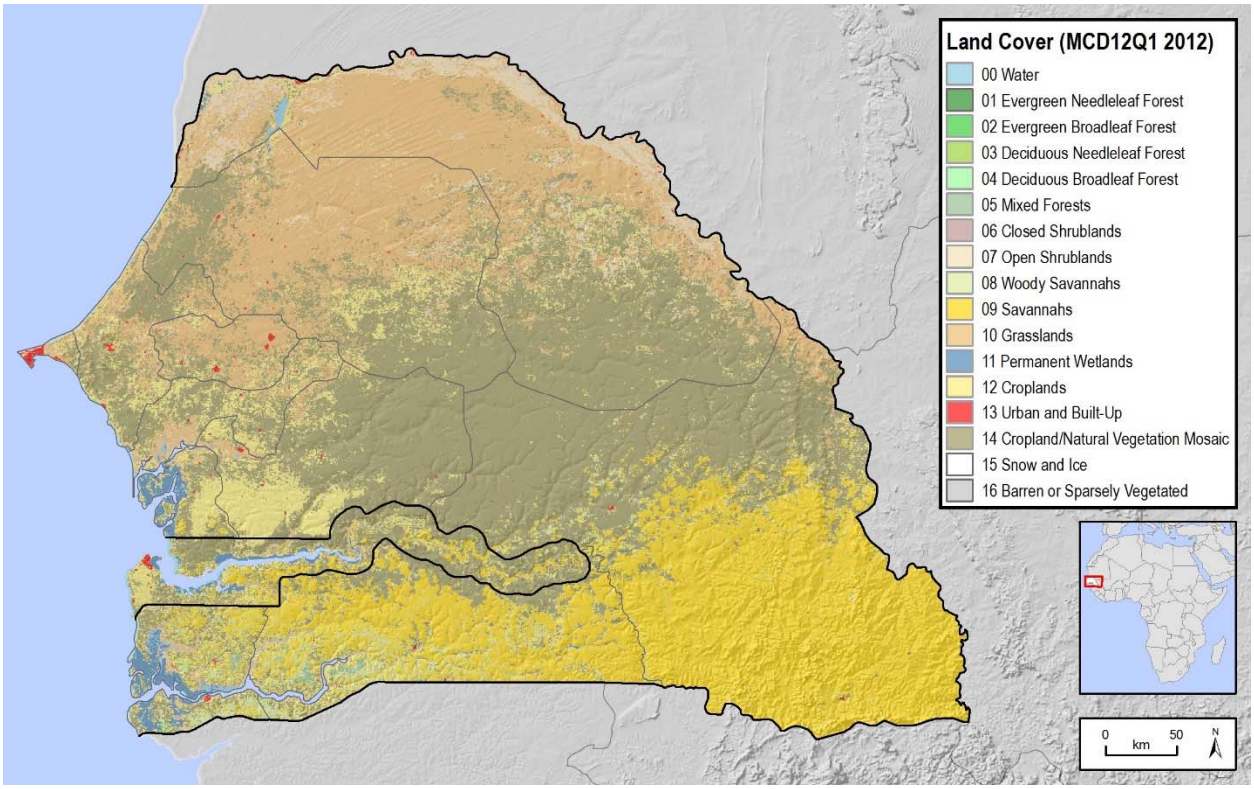
There has been a decrease in forest area particularly over the last two decades (1990-2010). Forest cover decreased from 9.7 million hectares in 2005 to 8.5 million hectares in 2010.[89] As of 2015, average annual losses amount to 40,000 ha.[90]

Furthermore, Senegalese forests are distributed as follows: 213 classified forests of 6,237,648 hectares total area, of which 20 are sylvo-pastoral reserves (1,514,000 ha), 8 are hunting (cynégétique) areas (1,976,315 ha), 6 national parks, plus 10 integral and special reserves which cover an area of 1,613,790 ha, or about 8 percent of the national territory. Figure 8 shows land coverage in Senegal since 2012.

The forest area includes classified areas (forest area of the State) and protected areas (forests in the areas of land which are the responsibility of local authorities). Management of the national forest estate is the responsibility of the Department of Water and Forests and the National Park Service. The management objective for these forests is in situ protection of biodiversity.

[89] (Diaw n.d.)
[90] (Seneweb 2015)

Figure 8. Land Cover in Senegal, 2012[91]



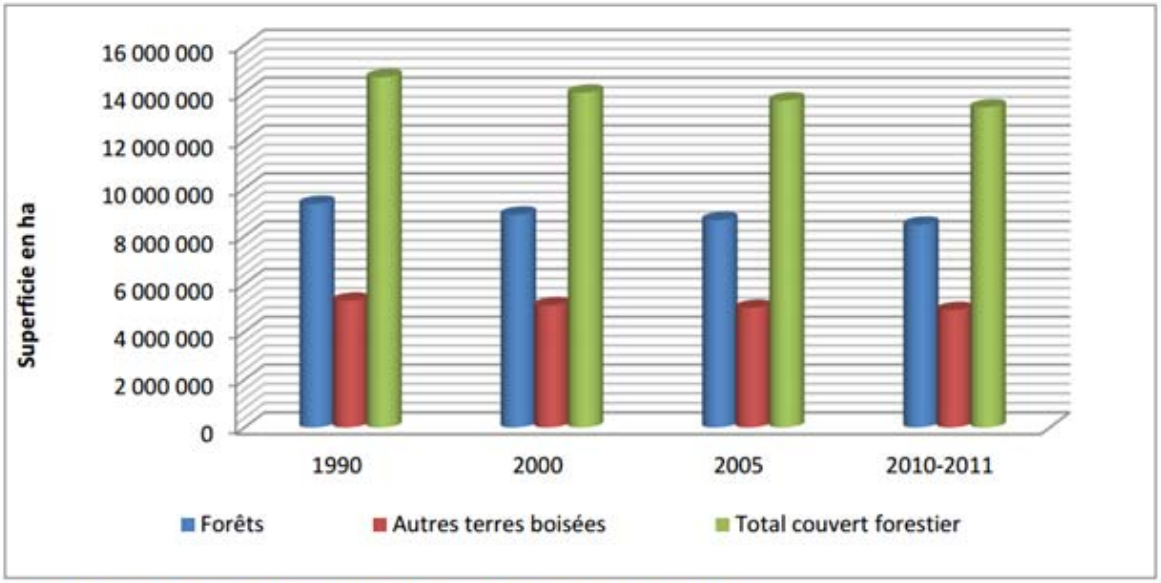
Some parks or classified forests were established as biosphere reserves (Niokolo Koba, the Sine-Saloum Delta, and classified forest of Samba Dia), or World Heritage for Humanity sites (Niokolo Koba and Djoudj Parks). The size of the classified area varies depending on the acts of classifying or declassifying forests taken in the overall context of land management. Table 1 above shows a list of the protected areas in Senegal by size. In addition to this list, there are also plantations which represent 4.2 percent of the forest cover.

In the coastal zone of the Saloum Delta, Senegal is covered by 65,000 ha of mangrove forest which is vital to this area.[92] It prevents the soil from being washed away, supplies the essential nutrients for young fish and shelters the oyster colonies. The mangrove tree also provides a stock of medicinal plants used by locals and a significant source of income for the women who farm the shellfish. However, ever lower rainfall levels and chaotic exploitation of the forests have accelerated the decline of the tree population, resulting in deterioration of the environment and dwindling resources. Together with the plants and animals, the local communities are the primary victims of the degradation of the mangrove ecosystems. The Saloum Delta region is also under threat from coastal erosion and from the salinity of the soil.

Forest cover is being steadily reduced by bush fires, conversion for agriculture, removal for charcoal, overgrazing, and pruning wood, the effects of which exacerbate climate change and, as a result, lead to longer periods of drought. Figure 9 below shows the evolution of coverage of forests and other wooded areas over time.

[91] Source: USGS Modis MCD12Q1
[92] (European Commission n.d.)

Figure 9. Evolution of Forest Cover in Senegal



Evolution du couvert forestier de 1990 à 2011 (FAO, 2010)

It is now known, from a number of scientific studies, that climate change and forests are intrinsically linked and that forests and the wood they produce trap and store carbon dioxide, playing a major role in mitigating climate change, but when burned or over-harvested, forests can instead of sequestrating, be a releaser of carbon dioxide (CO2) (greenhouse gas). In Senegal, even the general population is aware and report that temperatures are now higher than some years ago, recognizing the link to the drastic reduction of forest cover. It is also known that vegetation loss, as a result of over-grazing, over-cultivation with improper farming techniques, and natural causes such as forest and pasture fires, are the leading causes of soil erosion which has a direct connection with droughts. The two main erosional mechanisms are wind and water. Vegetation increases the permeability of soil and, as such, its ability to transmit surface and rainwater to groundwater (aquifer) systems through root systems and the organic matter in the upper soil horizons. When this vegetation is removed, the soil becomes compacted, less permeable, and hotter. If, or when, it rains, runoff is increased and the water can no longer replenish the aquifers. But soil erosion due to forest loss is not the only cause of drought in Senegal. There are also other climate change factors beyond the national boundaries of the country.[93]

In 10 years, timber's potential has decreased by 18 million m^3, corresponding to 800,000 ha of forest. Furthermore, over the past 25 years nearly 60 percent of mangrove and floodplain forests have disappeared due to the high concentrations of salt in seawater as a result of agricultural development.[94]

The areas occupied by forests, plantations and crops are distributed as follows:

- Total Land area: 19,672,000 ha
- Natural forest area: 8,473,000 ha
- Overall forest area: 13,384,000 ha
- Arable area: 3,800,000 ha
- Cultivated area: 2,200,000 ha
- Plantation area:112,000 ha

[93] (UWC Enviro Facts 2001)
[94] (Hub Rural n.d.)

A NOTE ABOUT DEFORESTATION AND DISEASE

There is a correlation between areas with high rates of forest conversion and degradation, and high malaria rates. As landscapes change, either naturally or by human intervention, the ecological balance and context of disease hosts, vectors and parasites is altered. Environmental influences on malaria include abiotic factors such as precipitation and temperature, but also biotic factors such as deforestation and agriculture, which can influence vectorial capacity. As deforestation and other land-use changes can themselves affect temperature and precipitation, these interactions are further correlated. For example, whereas forest floors tend to be shaded and covered with organic matter, cleared land is generally more sunlit and flat, and is therefore prone to the formation of puddles that can favor larvae development. Further, deforestation's effect on climate change and increasing temperatures increases the pace at which mosquitos develop into adults.

(Pattanayak, et al. 2006)

FOREST MANAGEMENT AND POLICY[95]

The forest resource conservation policy that began during the colonial period, and was maintained after independence in 1960, referred exclusively to the responsibilities of the National Forest Service created in 1935. The National Forest Service carried out activities related to forest protection, grazing bans and forestry operations in the dry zone and reforestation and enrichment in closed forests, while severely enforcing a restrictive Forest Code that greatly limited people's use of forest resources.

The 1981 Forest Development Master Plan, and the 1993 Forest Action Plan, created with the assistance of the Food and Agriculture Organization (FAO), facilitated the introduction of changes that would enable Senegal to address the issues and challenges addressed in the international conventions adopted at the 1992 United Nations Conference on Environment and Development—including deforestation, land degradation, lack of fuelwood and domestic energy and biodiversity loss.

The legal framework for forest management was revised with a new Forest Code, adopted in 1995, comprising the Forest Law and its companion regulation. It was designed to stimulate a participatory approach to natural resource management. New approaches fostering community, village and private reforestation efforts and emphasizing the training of the local population have been strongly encouraged. Furthermore, actors and institutions dealing with forestry are now more open to input from other disciplines such as economics, agriculture, livestock raising and pastoralism, and sociology and rural outreach.

These approaches have made it possible to motivate the local population to dedicate time and energy to the development, protection, and rehabilitation of forest resources. Further incentive has been provided by projects and programmes funded through bilateral and multilateral cooperation with many countries. For example, over the course of three decades of cooperation with Senegal, FAO has assisted the implementation of at least 25 forestry projects related to planning, training, forest management, forest protection, public participation, community forestry, wildlife management, and forest inventory, for example.

However, the greatest transformation has been the decentralization of forestry administration. In 1996, building on a long tradition of peace, freedom, institutional stability and democracy, and seeking good governance and transparency in State affairs, the GoS undertook a thorough institutional reform with a view toward establishing local communities as the main actors and real decision-makers. The new administrative

[95] (Diaw n.d.)

structure transferred authority to new regional and local government bodies, extending power to 11 regions, 110 municipalities, 43 districts and 320 rural communities. These decentralized bodies were given nine areas of responsibility: public land, health/population and social action, education, urbanization and habitat, youth/sport/leisure, land-use planning, culture, planning, and natural resources and environment. This reform drastically changed approaches to forest administration and management.

The National Forest Service (the Directorate of Water, Forests, Hunting and Soil Conservation) and the Directorate of National Parks, both in the Ministry of Environment and Nature Protection, manage classified forests, reforestation and rehabilitation areas, strict natural reserves, special reserves, and national parks, with decentralized structures having an important role. These areas together cover more than six million ha, or 31.7 percent of the country. Protected forests not included in the classified category are managed by local communities.

Senegal decided to revise its Forest Action Plan, which had allowed sizable investments in the forest sector, to bring it in line with the Poverty Reduction Strategy Paper, the United Nations Millennium Development Goals, the United Nations Conference on Environment and Development agreements, and the new decentralized institutional framework. The new National Forest Policy links the two themes of decentralization and poverty reduction. The policy was elaborated through a bottom-up planning process involving all stakeholders and institutions dealing with natural resource management. It includes a diagnosis of problems, defines a long-term vision, gives principles for operations, defines strategies and orientations, and lists priority projects and programs.

In the revision of the Forest Action Plan, the national forest service received essential support from the National Forest Programme Facility. The Facility signed a letter of agreement with the Directorate of Water, Forests, Hunting and Soil Conservation in April 2003 to support and consolidate Senegal's National Forest Policy. In its first phase, this partnership assisted the formulation of five regional forest action plans and provided funding for national workshops on the launching and implementation of the new forest policy and for studies on Senegalese forestry. These studies included, among other things, an analysis of public spending in the forest sector; the impact of the Forest Action Plan on wildlife; the efficacy of decentralization and transfer of powers in natural resource management; and the contribution of forest products in the Special Programme for Food Security, FAO's flagship initiative for halving the number of hungry people in the world by 2015.

The norms and standards for the management and use of forests and protected areas have not been modified since the 2008 Senegal ETOA. (See the section on this in the 2008 ETOA Report).

AGRICULTURE

Agriculture is the driving force of the economy in Senegal, as almost 80 percent of the population relies on agriculture as their main source of employment and income. Rainfed cereal crops occupy most of the cultivated land during the growing season. They are mainly intended for self-consumption, and are very sensitive to climate shocks. The main cash crops are peanuts and cotton.[96] Agronomic potential has been seriously altered by population dynamics, the practice and expansion of extensive farming with slash burning, drought, bush fires, and the disappearance of plant cover.[97]

DEVELOPMENT OF THE COTTON SECTOR

It was after independence that the cultivation of cotton was introduced in Senegal, particularly through the French Company for Textile Development (CFDT). The introduction of cotton responded to an agricultural

[96] (Toure, et al. 2010)
[97] (African Development Bank 2010)

diversification concern which was strongly influenced by the peanut culture. The creation of SODEFITEX (Textile Fibers Development Company) in 1974 contributed to the intensification of cotton cultivation in Senegal, in particular through the free distribution of inputs to cotton producers and the establishment in the early 1980s of a functional literacy policy that provided training in rural areas.

In Senegal, cotton production is mainly concentrated in the regions of Tambacounda, Kédougou, Kolda, and the southern regions of Kaolack and Fatick. Cotton currently makes up 10 percent of Senegal's exportation products. The main cotton producers are the National Federation of Cotton Producers (FNPC), which has over 20,000 family farms, and SODEFITEX, which has five ginneries at Kahone Tambacounda, Kédougou, Kolda, and Velingara. Nevertheless, cotton production has declined since 2008. The main constraints of the cotton industry in Senegal are related to the variability of rainfall, the weakness of production, price volatility of the fiber, trafficking in inputs subsidized by the State, pest pressure, and the debt overhang of cotton growers related to the 2000-2010 crisis[98]. For the 2013 campaign, production was estimated at around 32,250 tons of seed cotton, representing 13,600 tons of cotton fiber and 17,500 tons of cottonseed.

THREATS TO AGRICULTURE

Threats to agriculture in Senegal are mainly related to the following factors: a high exposure to climate change and a dependence on rainfall, lack of skills in various productions' factors, and the low level of farmers' training and skills.

The agricultural exposure to climate change and its dependence on rainfall led to a high vulnerability of agricultural production. The share of rainfed agriculture is estimated at about 95 percent of cultivated land (about 2.1 million ha of cultivated land) and about 57 percent of total arable land. A weakness was noted in both the exploitation of potential irrigable land and developed areas and infrastructure. Senegalese agriculture is subject to a phenomenon of land degradation that has increased since the droughts of the 1970s, which is a serious threat to the objectives of improving agricultural productivity, enhancing food security, and reducing the population's vulnerability. Furthermore, deficiencies in the development of rural areas and poor access to basic social services has led to a rural exodus in which the main consequence is the deficit of human capital needed for agricultural productivity.

Factors of production are not always controlled, which limits the conditions of profitability in irrigation schemes. The instability of the crop calendar due to irregular rainfall and its poor distribution strongly affect rainfed agriculture, which is still the dominant form of agriculture. The obsolescence and low availability of agricultural equipment, as well as low literacy, play a significant role in the lack of innovation and modernization of agriculture and production systems.

Climate change is also a serious threat to agriculture, in particular because of Senegal's biophysical and socio-economic (land degradation, loss of biodiversity, increased vulnerability of people and ecosystems) landscape. Climate change poses a serious threat to agriculture, especially in terms of achieving certain development goals, such as the Millennium Development Goals (MDGs), the Regional Program of Agricultural Investment, the National Agricultural Investment Programme (NAIP), and Senegal Emergent Plan (SEP).

AGRICULTURE AND ENVIRONMENT

The relationship between agriculture and the environment is complex. In Senegal, climate change affects agriculture through land degradation due in part to drought, water shortages, or flooding, which affects crops. Conversely, agriculture also affects environmental resources, namely forest and water resources. As agricultural land has declined in fertility over the years, land conversion for agriculture (i.e., deforestation) has expanded to conquer new and more fertile agricultural areas.

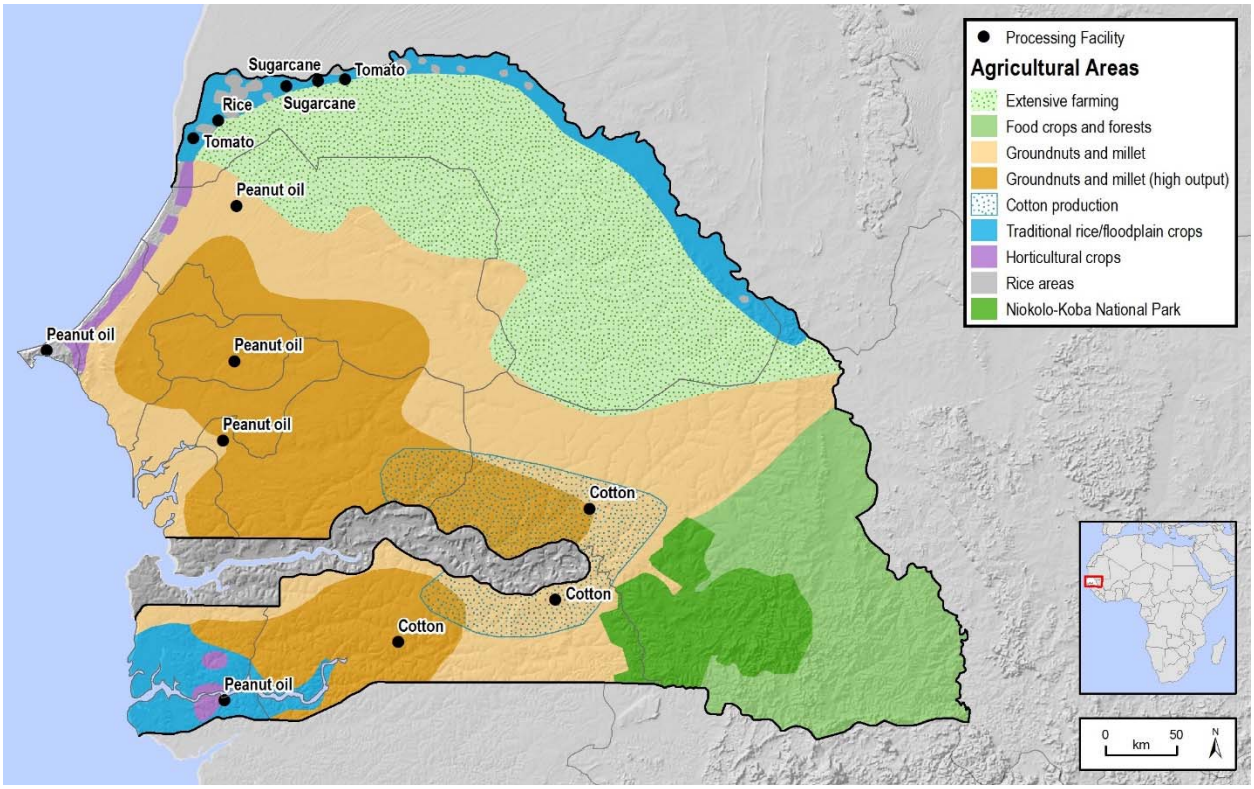
[98] (MEF 2013)

In areas of development of agro-business, such as in the Senegal River Valley, the massive use of pesticides in agriculture entail high risks of pollution concerning water resources (including rainwater, groundwater, and surface water). This pollution has led to eutrophication, which has contributed to the growth of cattails in the River Valley. Persistent Organic Pollutants (POPs) have also been observed in agricultural areas.

In addition, agriculture leads to degradation and/or fragmentation of habitats, leading to negative impacts on biodiversity. In the groundnut basin of the Senegal River Valley, the only few remaining wooded areas are located in protected areas or areas of uncultivated soil. In areas such as Diourbel and Mbacke, natural wooded areas have entirely disappeared as a result of agricultural intensification.[99]

According to the Senegal Climate Change Vulnerability Assessment and Options Analysis, about 15 billion cubic meters of unused rainwater flows to the sea from Senegal. Irrigation has been the main focus for capturing this unused flow for use in agriculture. Since the 1960's, private and public investments have focused on Senegal's rivers, including the Manatali and Diama dams on the Senegal River, which have allowed for controlled recession and irrigated farming.[100] However, generally, very little land is irrigated in Senegal. Small-scale irrigation *does* occur in the north, but the effects of this water diversion are poorly understood. Reservoirs may increase groundwater infiltration which can increase water supply locally, but it may be to the detriment of downstream water supplies.

Figure 10. Agricultural zones in Senegal in 2010[101]



[99] (Ministere de l'Environnement et du Developpement Durable 2015)
[100] (African and Latin American Resilience to Climate Change Project 2014)
[101] Source: IRD- Le FUR-AFDEC

FISHERIES

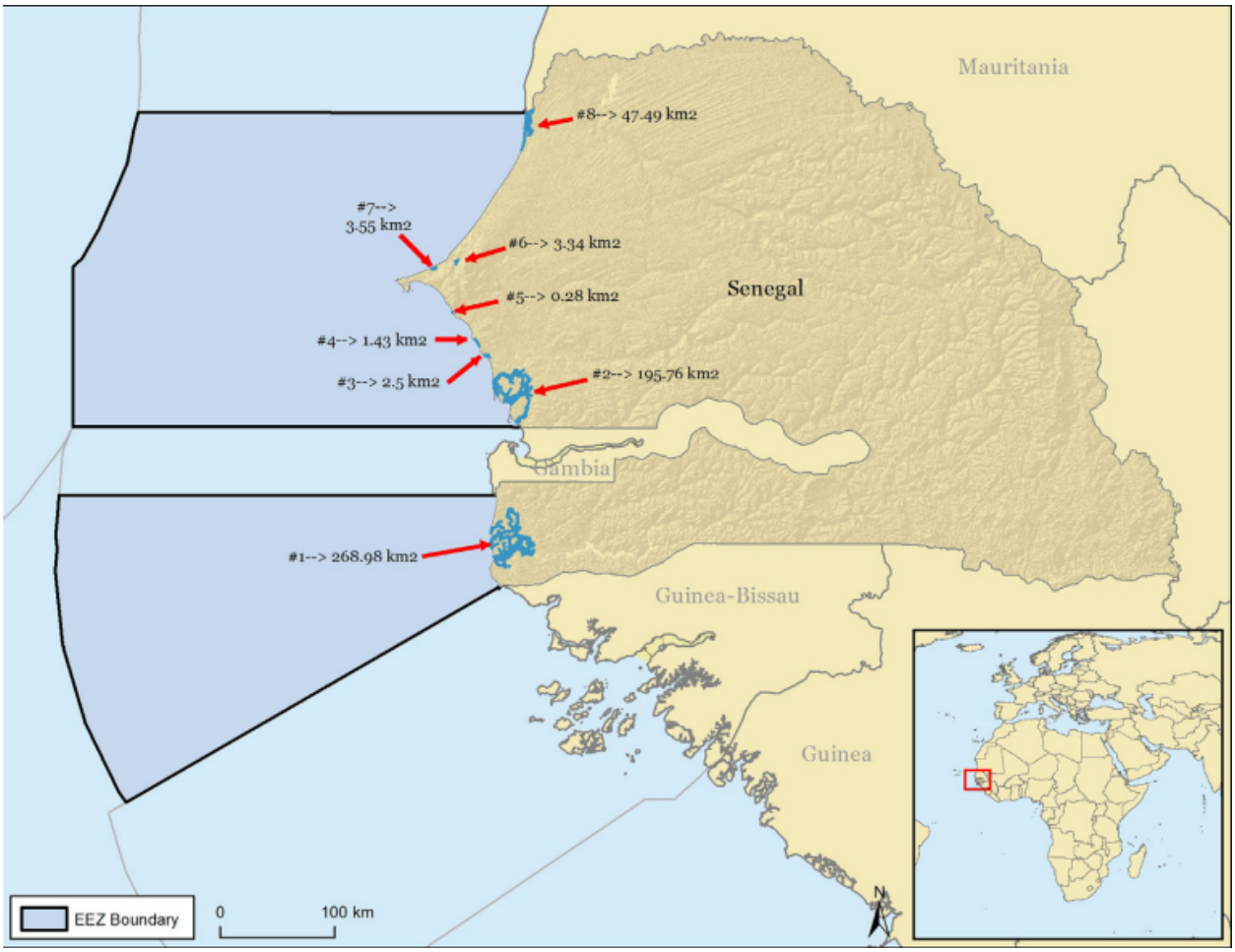
STATUS

Fisheries play an important economic role in Senegal. A University of British Colombia research paper estimates that total removals from Senegalese waters between 1960 and 2010 were 45 million tons, 15.5 million of which were caught by foreign ships in the Senegalese Exclusive Economic Zone (EEZ). Catches in 2010 totaled 895,000 tons, which is below the maximum sustainable level of 600,000 tons/year, as estimated by CRODT.[102]Fishery products make up 12.3 percent of export earnings and comprise 1.3 percent of Senegal's GDP. This does not include fish marketing, artisanal and industrial processing, inland capture, and other post-harvest activities. Fishing provides direct and indirect employment to around 600,000 people. Fisheries are also extremely important to food security, as annual per capita fish consumption is 26 kg, placing Senegal among Africa's biggest consumers of fish.[103]

Fishery resources can be divided into two groups: deep coastal demersal resources (fish, crustaceans and cephalopods) and coastal pelagic and deep water (off shore) resources that contain sardines and mackerel.[104] The major pelagic fishing zones along the coast include Saint Louis, Kayar, Dakar, Mbour, the Saloum Delta, and Ziguinchor. Some of the priority species in Senegal are Sardinella, which is the main species landed by artisanal fishermen, and Bonga, which is common in the Saloum and Casamance estuaries.[105] One of the most iconic fish in Senegal, the white grouper, or "thiof" in Wolof, is now nearly extinct as a result of increased large-scale artisanal and industrial fishing over the last few decades,[106] along with exports to Europe of this high-value commercial species.

[102] (Belhabib and Lam, Fisheries catch misreporting and its implications: The case of Senegal 2014)
[103] (USAID/COMFISH 2013- 2014)
[104] (USAID/COMFISH 2013- 2014)
[105] Ibid
[106] (The FishSite News Deck 2013)

Figure 11. Senegal's Exclusive Economic Zone and Major Subsistence Fishing Zones (red arrows)[107]



THREATS AND ISSUES

The fisheries sector in Senegal has been experiencing a severe crisis in recent years due to the overexploitation (including IUU fishing) and degradation of fisheries resources, excess capacity, poor regulation and monitoring, underfunded research, weak stakeholder consultation mechanisms, and climate change. Many wild fisheries are harvested unsustainably and the Sardinella population is at risk of collapse due to the lack of management both in Senegal and the West African region, threatening food security, livelihoods, the national economy and biodiversity.

IUU Fishing. In 2012, the Environmental Justice Foundation found that West African waters have the highest levels of illegal catch in the world, about 37 percent of the region's total. Not only does this contribute to overfishing, but it also costs Senegal $312 million a year due to foreign trawlers. Vessels that are actually caught are penalized with a fine, but fines represent a small percentage of foreign vessel's operational costs. Corruption is also an issue; vessel's crews often pay bribes to get away without a fine when caught in national waters.[108]

Inadequate Regulation and Monitoring Resulting in Overfishing. Artisanal fisheries are poorly regulated, leading to the improper use of fishing permits, poor supervision of boat registration, and

[107] (Belhabib and Lam, Fisheries catch misreporting and its implications: The case of Senegal 2014)
[108] (Fessy 2014)

inadequate enforcement of the fishing code. Stakeholders also have poor knowledge of fishing regulations. In the industrial sector, access rights are based on a fishing license system, which has no limits on fish harvesting (no quota setting instruments) and also may not specify a target fish species. Some of these issues are a result of inadequate budget allocations for fisheries administration and management, which makes it difficult for the Department of Fisheries to carry out its duties properly. Regardless, these issues lead to overfishing/overexploitation of key fish stocks, which reduces their availability, exacerbates resource conflicts (recent conflicts between fishermen from Mbao and Thiaroye were reported), and increases the distance needed to travel to fishing zones. This, in turn, reduces domestic market fish supplies and raw materials for the processing sector, negatively affecting the contribution to the national economy.[109] Further, given that an estimated 6.7 million people across 22 West African countries depend on fishing activities for food and/or livelihood, over exploitation of fisheries also has a serious impact on food security.[110]

Climate Change. Climatic factors, such as water and air temperature, wind speed, and precipitation, have a strong influence on the productivity and distribution of fish stocks. Climate change can alter the distribution and structure of the composition of species and also alter ecosystem function, among other effects. All of these threats are factors that aggravate climate change already manifested by: severe droughts, especially in the South; salinization of surface and ground water; an increase in coastal erosion; and modification of fish populations.[111]

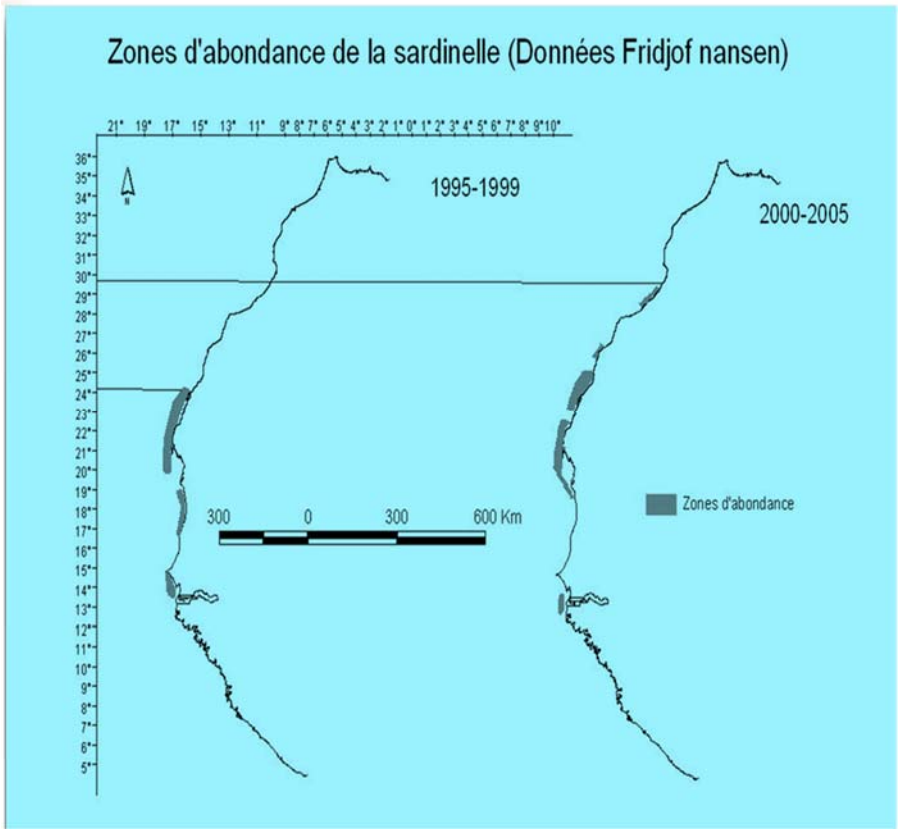
COMFISH has completed two major studies related to climate change: an analysis of coastal vulnerability and adaptation strategies in the Local Artisanal Fisheries Councils (Conseils Locaux de Peche Artisanal) of Rufisque/Bargny, Sindia and Joal/Fadiouth, and a diagnostic study of the consultation frameworks that are already in place regarding climate change, fisheries, and marine and coastal environments. Both of these documents are described in the Annotated Bibliography in Section 11.

Figure 12 (on page 34) shows the changing zones of Sardinella fish stocks (moving north) as a result of increasing water temperature. Taking into account climate change scenarios and socioeconomic trends, it is estimated that the overall level of catches and their estimated market value will decrease drastically by 2030. This trend will have many economic and social consequences, including:

- between 2020 and 2050, a cumulative loss of 68 billion Franc Communauté Financière Africaine (FCFA)
- a decrease in the consumption of fish products and, consequently, animal protein intake
- a decrease in the profitability of Artisanal Fisheries Units

[109] (USAID/COMFISH 2013- 2014)
[110] (Belhabib, Sumaila and Pauly, Feeding the poor: Contribution of West African Fisfheries to employment and food security 2015)
[111] (African Development Bank 2010)

Figure 12. Areas of Abundance of Sardinella



Marine Pollution. Marine resources are threatened by both industrial and domestic pollution, which has an acute effect on coastal ecosystems. The main sources of pollution are hydrocarbons, industrial waste, and household waste. The marine pollution issue mainly occurs in the Dakar region, which has the most concentrated industrial enterprises in Senegal (87 percent).

Hann Bay in Dakar is an example of a fishing area severely degraded by marine pollution (see Figure 13). Because of its shape and weak currents in the area, much of the contaminated water is caught here and not allowed to disperse. This pollution causes people to abandon fishing along the coast in this area, but also deters recreational beach users (tourists) and causes infectious diseases among the local population (a 1999 study by International Relief and Development Inc. (IRD) found that Hann village inhabitants had 2-3 pathogens on average in their bodies).[112]

[112] (Toure, et al. 2010)

Figure 13. Industrial Waste in Hann Bay

MINING

STATUS OF MINERAL RESOURCES

As a result of the 2003 mining code, Senegal finally began exploiting its wealth of mineral deposits, which had previously been untouched. Prior to the new code, mining in Senegal was focused on phosphates (which were a strong component of the economy since independence in 1960), industrial limestone and attapulgite. Now, the focus of mining has turned to a variety of mineral substances including gold, platinum, iron, copper, chromium, nickel, industrial phosphates, limestone, salts, barytine, zircon, titanium, and various stones and other building materials.

Several important mineral resources that have become a focus of the mining sector include industrial limestone, heavy minerals, and gold. Limestone and marno-chalky resources have been located in the west-central part of the Sedimentary basin, near the location of the first cement factory in West Africa (SOCOCIM, located in Bargny, 30 km from Dakar). Deposits have also been located between Mbour and the areas of Pout, Kirene and Bandia. These deposits haves sparked global interest, as international cement companies plan to build cement factories in the Pout and Bandia regions of Senegal. Senegal is also home to the fourth largest zircon mine in the world, located on the Grand Cote. An Australian mining company has plans for a $200 million project in the area expected to produce 85,000 tons/year of zircon, 20,000 t of rutile and 650,000 t of ilemenite. The project is expected to last 25 years, and is anticipated to provide for 25 percent of European consumption of zircon.

With new exploration of gold mines, Senegal is likely to become one of Africa's leading gold producers. The Sabodala gold mine was discovered almost 50 years ago, but has only recently contributed significantly to the economy with exploitable gold resources measured at 1.63 million ounces. Twenty pockets of mineralisation were also recently discovered in the surrounding areas with resources expected to value 2.24 million ounces. Global interest for Senegalese gold has also piqued, as 25 gold research permits have been issued, eight to foreign companies and nine to domestic companies.

Other resources with the potential for exploitation include lithium, tin and, molybdenum in Kédougou; copper and chromium in Gabou and Diabal; Nickel (copper and platinum) in Simpampou, Koulontou and Dioudiou-kongo; Marble in Nebou Bandafassi-Ibel; extra siliceous sands in Malika and Diogo; and Diatoms of Tanma Lake. [113]

The Government of Senegal considers the mining sector to be among six priority sectors selected to increase the economic growth rate to seven percent over the next 10 years. For the Government of Senegal, this sector is currently in a transition phase and could play an important role in the national economy, both in terms of export levels, as well as in diversification of the economy. The mining sector of Senegal is of growing interest among private investors and is a prominent part of the *Plan Sénégal Emergent* (PSE).

Projected 2023 objectives for the mining sector include annual production of:

- Between 15 and 20 million tons iron ore;
- 2.5 million tons of phosphates;
- 3 million tons of phosphoric acid;
- 17 tons of gold, a tripling of current production levels; and
- 90,000 tons of zircon.[114]

THE CASE OF ARTISANAL GOLD MINING[115],[116]

Artisinal gold mining is a common, traditional practice in the Kédougou region in eastern Senegal. At approximately 18 square kilometers, Kédougou borders both Guinea and Mali, boasts a population of about 70,000 people, and has an estimated 30 tons of gold reserves.

Mining in the area is predominantly conducted between November and May, though efforts are also undertaken during the rainy season (June – October) due to pressure from state and privately owned mines. Originally a practice used to supplement primary livelihoods, artisanal mining has more recently become an economic necessity for many individuals due to insufficient agricultural productivity and income or loss of agricultural land to industrial mining companies. In recent years, the Kédougou region has seen significant expansion of gold mining resulting from a combination of increased capital influx and migration. However, the unsafe practices used by artisanal miners, and resultant adverse social and economic impacts, have ultimately fostered an unsafe environment for local and migrant populations despite providing additional income.

While foreign industrial mining efforts utilize modern equipment in their extraction, artisanal miners use rudimentary tools and technologies. Further, artisanal practices often involve grueling 10 hour days to dig out 10-15 meter shafts, extract and sift through ore, and amalgamate ore with mercury to ultimately separate and release any available gold. The labor force is comprised of men, women and children with some sources indicating that as much as 30-50% of the labor are children.[117],[118]

Perhaps the greatest environmental threat posed by these practices is the use of mercury to isolate gold by mixing it with the collected ore and subsequently burning the resultant amalgam, leaving behind the gold. The use of mercury – and this process – results in release of aerial and liquid toxins with serious harmful effects. Chronic mercury exposure can lead to neurotoxicity in individuals, detrimentally impacting neurological performance with symptoms included reduced coordination and abnormal reflexes, a metallic taste in the mouth, and excessive saliva. In communities with artisanal mining practices, both the on-site

[113] (Senegal International Mining Conference and Exhibition 2014)
[114] (Diop 2014)
[115] (Daffe 2012)
[116] (Schmidt 2012)
[117] Ibid
[118] (Savornin, Niang and Diouf 2007)

handlers conducting the amalgamation, as well as area populations downstream of the artisanal mining sites, are at risk of chronic overexposure to mercury and the subsequent health impacts.

Despite these risks, the prospect of greater income attracts migrants from many regional countries, including Mali, Guinea, Gambia, Ghana, Burkina Faso, Togo, and Nigeria. The operations for a given shaft (each of which may only produce nominal amounts of gold) are typically organized by the village chief and extracted gold is sold to intermediaries. After a royalty is given to the chief, earnings are then split among the workers who typically number about 10 persons to a single shaft. Overall, the earnings ultimately exceed what the migrants can typically earn in their home countries and justify the hazardous labor.

TOWARDS A NEW MINING CODE[119]

In November 2012, President Sall determined it necessary to review all mining contracts to assess their fairness and, in those cases where the contracts were unbalanced, renegotiate the contracts accordingly. This, in turn, initiated the broader process of revising the 2003 mining code. In 2013, Sall subsequently established the "Commision de revision des contrats minier et du code miner" (Commission for the revision of mining contracts and mining codes), which sought to ensure Senegal's strategic interests were properly considered in the mining code.

At the same time, the World Bank-funded study "Diagnostic of the Legal & Fiscal Framework of the Mining Sector" was launched, and its findings and recommendations served to play a major role in informing the strategic direction of the Commission. On February 3, 2015, the Commission built from those findings and a series of meetings and consultations throughout 2014 and led a public workshop to share draft legislation meant to replace the 2003 mining code. The workshop was attended by stakeholders throughout the mining sectors, who were given opportunity to review the main innovations of the draft legislation and provide feedback. The feedback was then discussed and, as appropriate, incorporated into a revised draft of the legislation, which was then circulated among appropriate ministries for review and comment.

At time of writing (September 2015), the legislation has not yet been adopted, though it is expected that it will be enacted by the end of 2015.

ENVIRONMENTAL IMPACTS[120]

While in the previous mining code, rehabilitating mining sites post-production was only required by exploration permit holders, the draft legislation has made this duty mandatory even for research permit holders, and requires financial bonds or bank guarantees to ensure funding is available for rehabilitation.

Further, under the New Mining Code, a mining title holder must contribute annually to a local development fund, the amount of which is specified in the title holder's mining agreement. The purpose of the development fund is to promote the economic and social development of local communities living near mining areas. Other countries have started similar compulsory development components in recent years, including Guinea and Mali.

Small mine permit holders, who are not required to complete rehabilitation under the current code, will now be required to provide a guarantee as security for the cost of rehabilitating their mine site. The details of the guarantee will be determined by a joint order of the Minister for Mines and the Minister for Environment, and the amount of the guarantee will be exempt from industrial and commercial benefits tax.

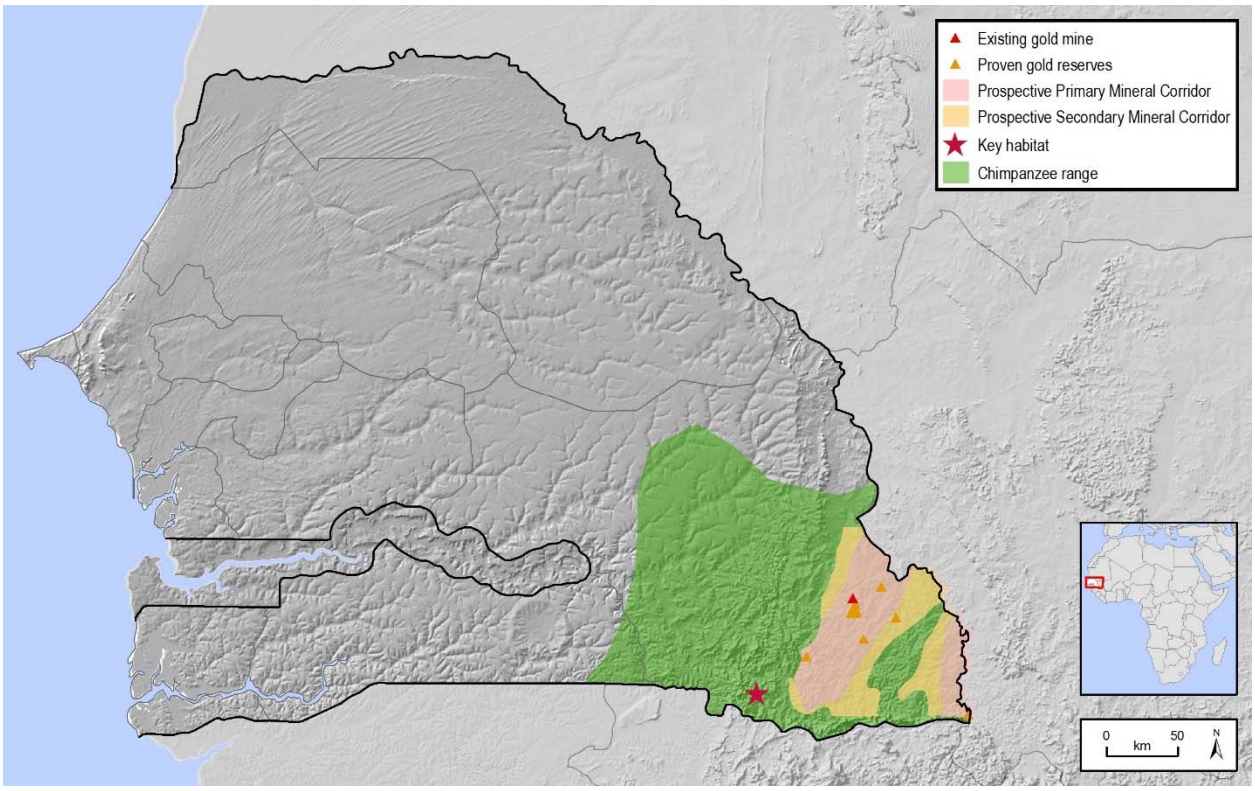
[119] (Fall n.d.)
[120] (Nancarrow and Finan 2015)

In addition to rehabilitation obligations, all mining title holders will specifically be required to:

- respect, protect and implement human rights in areas affected by mining operations;
- respect the provisions of the Forestry Code where the mining title has been granted over a "classified forest zone"; and
- respect the principles and obligations under the Extractive Industries Transparency Initiative (EITI), such as declaring all payments made to the State to the EITI authorities".

Many of the mines in Senegal are proximate to key habitats for fauna. Figure 14 below provides an example, showing the proximity of Chimpanzee habitat (an endangered species) to mines in the Kédougou region. The closeness of these mines to the Chimpanzee range puts these habitats at risk from adverse environmental impacts of mining activities.

Figure 14. Proximity of Mines to Chimpanzee Range



Local communities have expressed a number of concerns about the expanding gold mining industry in Kédougou. Central to these concerns is the movement of people off land to make way for mining and the loss of access to land and natural resources that form the basis of most people's access to livelihood and food in the region. Mining operations can therefore have an adverse impact on the right to water, either by affecting the water supply to local communities or by polluting local rivers and groundwater. Where pollution of the local rivers, groundwater and soil affects aquatic species and livestock, this can also have an adverse impact on the right to food[121]. In general, people consider the benefits towards the local communities, as well as Senegal as a whole, as minimal compared to the benefits to the mining companies.

[121] (Amnesty International 2014, Mining and human rights in Senegal: Closing the gaps In protection)

EXAMPLE OF USAID PROGRAMMING: GOLD IN COLOMBIA

Illegal gold production in western Colombia gravely impedes the region's ability to develop and lift itself out of poverty. In 2014, only 15% of gold producers were legal; the other 65% were informal producers that often did not participate in legitimate markets, fueling crime and conflict. Further, due to lack of safety equipment and regulatory oversight, informal mining puts the workers and the local environment at great risk.

On the Pacific Coast of Colombia, USAID's BIOREDD+ Projects work with the Colombian government to support small-scale gold mining transition to more socially and environmentally responsible practices. USAID directly supports small-scale miners to obtain legal rights, licenses and permits. For these small mining operations to have the resources they need to formalize their operations, USAID provides classes and workshops on socially and environmentally responsible mining, labor legislation, industrial security, and occupational health. In Segovia, USAID also established a legal office to help mine workers and their communities navigate social security paperwork, accounting, and environmental best practices.

By providing the tools these small mining operations need to become legitimate business, USAID encourages them to fulfill social and environmental regulations and standards and allows the mining organizations to become competitive businesses and increase the agency of their workers.

To help undue the existing environmental harm caused by unregulated mining, USAID is providing the equipment and infrastructure needed to clean up mining and restore the local ecosystems.

Informal mining's often low-tech approach has caused significant environmental and social damage, especially due to mercury pollution. To eliminate the use of mercury in the gold refining process, USAID is introducing new, safer technologies. Reducing the use of neurotoxic mercury will reduce air and water pollution and protect the health of nearby communities.

The BIOREDD+ Program also rehabilitates land areas that have been damaged by the mining process by planting woody plants with the hopes of recuperating the local landscape, provide alternative sources of income for the local community, and reduce fallow land in the area.

Sources:

"Antioquia." BIOREDD+, USAID.

Morales Escobar. 2014. "Mineros del Bajo Cauca le apuestan al 'cero mercurio.'" *El Tiempo*

"La Tragedia del dorado." *Los Informantes de Caracol TV.*

WATER QUALITY AND AVAILABILITY

WATER RESOURCES

Senegal has significant potential for water resources, both for surface water and groundwater. The availability of water resources is estimated at around 4,747 m^3/capita/year, which are largely located above the estimated water shortage reference value for its 1,000 m^3/capita/year.

For surface water resources, Senegal is drained by the following watersheds (see Figure 15 below):

- The Senegal River basin has a total area of 220,000 km^2 of which 60,000 km^2 is situated in the territory of Senegal. The Senegal River offers the greatest potential for surface water. Its water resources come mainly from three tributaries, the Bafing, Bakoye, and Falémé. The hydrological regime of the river is characterized by a high water season from July to October and a low water season from December to early June. Elapsed average annual volume is estimated at 20.4 billion m^3 at the Bakel station.

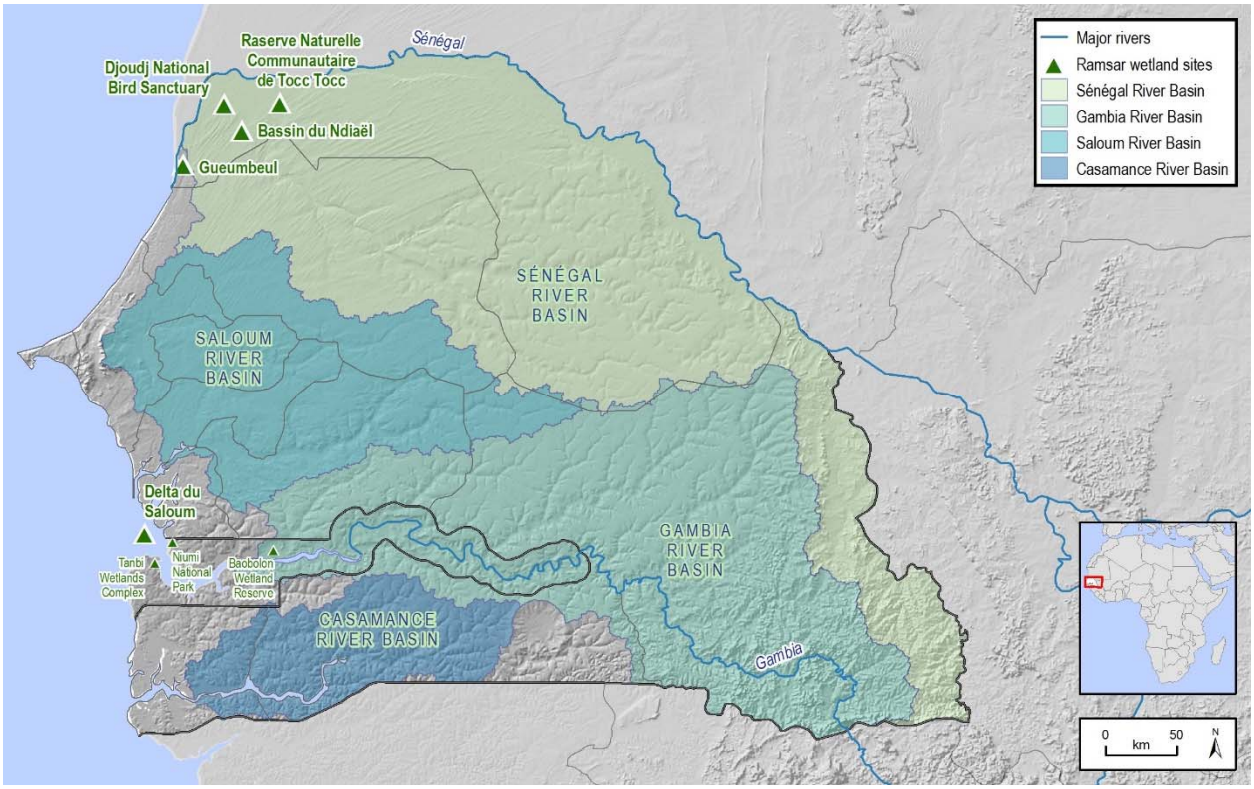
- The catchment area of the River Gambia has a total area of 77,054 km² with 54,631 km² in Senegalese territory. The hydrological regime is identical to that of the Senegal River and its past average annual volume is estimated at 3.44 billion m³ at Wassadou station.

- The catchment area of the Casamance River has an area of 20,150 km², completely in Senegalese territory. The complex hydrographic network of rivers is unique in that the tide rises along the river bed for about 200 km inland. Elapsed average annual volume is estimated at 46.4 million m³ at the Kolda station.

- The catchment area of the Kayanga river (Anambé) has an area of 2,870 km² of watershed in Senegal. The average annual flow volume at the Anambé dam site is estimated at about 102 million m³.

In addition to the surface water resources mentioned above, there are also significant groundwater resources spread over the entire territory and through different types of aquifers. The deep groundwater aquifers in sand and sandstone of the Maastrichtian layer cover four-fifths of the Senegalese territory.

Figure 15. Major River Basins and Wetlands in Senegal[122]



WATER USES AND INFRASTRUCTURE

Water is an important resource for almost all sectors. However, according to a 2009 report, there is still a very weak mobilization of water volume per year, estimated at only 10% of reserves. This presents a dual water problem: access and availability. The main constraints in terms of exploitation of the existing potential are related to the high costs of mobilization and distribution of both surface water and groundwater. Indeed, the satisfactory operation of surface water involves hydraulic works and the provision of machinery (such as motorized pumps and electric pumps), while the mobilization of groundwater requires its own means of

[122] Source: USGS HydroSHEDS, Ramsar

production. Therefore, while access to water is less problematic in areas where shallow aquifers exist; access to water in areas where groundwater is deep remains a very serious problem because of the required infrastructure costs.

An example is the area called "de socle" located in the southeastern part of Senegal including the regions of Bakel, Kedougou and Matam. This area is characterized by a scarcity of freshwater aquifers that manifest in the form of lenses. Catchments of such aquifers are often random, have relatively low production and are limited in time. Catchments made there are low flow and can only be equipped with hand pumps.

THREATS TO WATER RESOURCES

The aquatic ecosystems of river basins are shaped by natural flood regimes. Any changes to this system (duration, intensity, frequency) can have profound effects on aquatic flora and fauna, as well as the ability of local residents to benefit from these ecosystem's services. The threats to water resources affect quantity, quality, access, and mobilization of water. The main threats include climate change and the related decline in rainfall (in some cases), as well as overexploitation of resources and pollution from agricultural and industrial use.

The consequences of climate change on water resources involve the availability, accessibility, and quality. On the one hand, droughts result in a lowering of the water table. In this case, the superficial layers are most affected because they are mainly fed by rainwater. As for the combination of rising sea level and evapotranspiration, it entails the risk of salinization of freshwater, making part of the surface and ground water unfit for consumption. On the other hand, because of the lack of sanitation in rural and peri-urban areas, sources of drinking water are at risk of pollution during floods, causing the appearance or reappearance among the population of diseases such as cholera, dysentery, and typhoid. These risks of water pollution increase in some areas because of the use of pesticides, fertilizers, nitrates, and organic micro-pollutants and bacteria.

Overexploitation of water resources (particularly in the western part of the country), coupled with climate change effects, causes a significant drop in groundwater levels, but also causes salinization in the lower valley of Sine Saloum, the Casamance deltas, and the Senegal River. One of the causes of overexploitation remains the lack of control of urbanization, which sometimes results in harvest levels that lie above the replacement capacity. The various water users also come in conflict with each other over use (domestic versus agriculture and livestock), irrigation schemes (agriculture versus livestock); water projects (upstream versus downstream dams) and management of infrastructure (agriculture versus energy production).

The source of water pollution in Senegal is mainly from agriculture, industrial and domestic waste. Chemical runoff (from pesticides and fertilizers) from agriculture has led to the overgrowth of aquatic vegetation, especially in the Senegal River delta, where the proliferation of aquatic plants has been observed in most wetlands. Surface water quality has also been affected in the Cape Verde peninsula, Mbour and Fatick, as well as the area between Tambacounda and Velingara. In regards to industrial and domestic pollution, the region of Dakar is the most affected, as the principal location for industrial businesses. The majority of wastewater is discharged directly into the sea with no prior treatment, and contains inorganic and organic materials, as well as chemicals, which can be toxic to aquatic flora and fauna (lead, mercury, etc.) Most industrial facilities use either storm drains or urban waste water collectors to drain their wastewater. However, the collectors have difficulties operating due to obstruction by large solid materials.[123]

[123] (Toure, et al. 2010)

5. ENVIRONMENTAL THREATS

This section documents direct threats (i.e., primary threats) to the environment as it relates to USAID programming, biodiversity, and tropical forests. Environmental threats are defined as "threats to processes and actions that may diminish biological diversity, including conversion of natural habitats; overexploitation of valuable species; introduction of invasive species; and environmental change, such as climate change, desertification, and pollution."[124] It also documents the root causes (i.e., secondary threats or drivers) of environmental threats for the purposes of Foreign Assistance Act (FAA) 118/119 analysis. The threats and root causes were identified based on reviewed literature, stakeholder consultations, and the expertise of the Assessment Team and are intended to capture the recent, current and reasonably foreseeable issues relevant to USAID's 5-7 year planning timeline.[125] The threats and root causes include those that are ecological (e.g., climate change, fire, pests), related to human use (e.g., agriculture), or institutional (e.g., failed policy, lack of enforcement) or trans-boundary issues. The impacts of climate change on environment and biodiversity are included and incorporated as root causes, while greenhouse gas emissions contributing to climate change are categorized as a direct threat.

DIRECT THREATS

This section describes the direct threats to the environment that were most frequently cited by stakeholders and described in key literature reviewed by the Assessment Team.[126,127,128] Table 3 (below) categorizes these threats in terms of the ecosystem most affected in Senegal. These threats are associated with human, ecological, institutional, and transboundary factors. The primary environmental threats include: overexploitation of natural resources; climate change; urbanization; poverty; and legal, institutional, technical, and scientific capacities. These threats and related factors are cross-cutting, while at the same time identified as risks pertaining to the function of specific types of ecosystems—and therefore the ecosystem services yielded by those ecosystems.

Table 3. Direct Threats by Ecosystem

SYSTEM	DIRECT THREATS

Forest ecosystems	• Uncontrolled fires/bushfires
	• Expansion of low productivity agriculture (land area)
	• Illegal logging
	  o Illegal timber trade
	  o Domestic use/construction
	  o Charcoal production (i.e., carbonization)
	  o Land use change (e.g., agriculture, exploitation of mineral resources)
	• Loss of habitat for charismatic indicator/endangered species

Threats particular to protected areas	• Poaching • Uncontrolled fires/bushfires • Illegal logging • Loss of habitat for charismatic indicator/endangered species • Spread of aquatic vegetation

[124] (USAID 2015)
[125] At the time of the drafting of this Assessment USAID/Senegal was in the process of determining whether the existing CDCS would be extended to 2017, or allowed to expire in 2015.
[126] (Senegal Emergent 2014)
[127] (Kane 2011)
[128] (Ministere de l'Environnement et du Developpement Durable 2014)

SYSTEM	DIRECT THREATS
	• Overfishing and illegal fishing causing overall marine resources, especially fish, to decline or disappear • Land use change near protected areas (i.e., in buffer zones) • Disease
Agricultural and pastoral ecosystems	• Low productivity agricultural practices • Low productivity pastoralism/livestock management (including overgrazing) • Flooding • Disease
Marine and coastal ecosystems	• Overfishing • Illegal fishing • Pollution • Loss of habitat for charismatic indicator/endangered species • Coastal erosion
River and lake ecosystems	• Presence and spread of invasive species • Loss of habitat for charismatic indicator/endangered species • Implementation of irrigation schemes and associated salinization/acidification of land

Greenhouse gas emissions (causing climate change) are a direct threat in all systems.

DRIVERS

To identify the actions necessary to protect the environment and conserve natural resources, the root causes of the direct threats must be identified and addressed. Table 4 (below) defines the root causes of environmental degradation for each of the direct threats identified. This categorization of drivers is based on the overall analysis of threats, stakeholder consultations, and documents reviewed.

Table 4. Drivers of Threats to Tropical Forests and Biodiversity

PRIORITY	THREATS	DRIVERS	DRIVER CATEGORY
High	• Deforestation (particularly in the North and Anambe area of Casamance) resulting from low productivity agriculture and pastoralism/llivestock management (including overgrazing) • Salinization/acidification of soil and water from irrigation expansion due to shorter, shifting growing seasons (climate change) and increased demand for water for agriculture; sea level rise	• Limited technical, managerial and financial capacity of pastoralists and livestock managers (resulting in low productivity practices that are not resilient to climate change or irrigation practices that are not sustainable in the long run)	  

PRIORITY	THREATS	DRIVERS	DRIVER CATEGORY
High	• Overfishing and illegal fishing causing overall marine resources, especially fisheries, to decline or disappear	• Unlimited open access to fisheries resources • Inappropriate fishing practices and gear (e.g., monofilament, bottom trawling, beach seines) • Lack of human resources, technical capacity and equipment to manage the resource • Lack of access to information on the status of resource stocks	  
High	• Loss of habitat (terrestrial and marine) for charismatic indicator/endangered species (e.g., chimpanzees, dolphins, manatees, marine turtles and birds) driven by: o Land use change (e.g., agriculture, mining, large-scale energy infrastructure) o Deforestation o Climate change (shifting habitats)	• Weak national-level strategic planning for the development of natural resources and conservation of ecosystems and species of concern • Weak local governance/capacity to implement existing laws • Urban population growth • Increased demand for water, energy and food	 
Medium	• Poaching	• Lack of enforcement and incentives to comply with laws • Limited technical, managerial, and financial capacity of parks and park staff • Increased demand from international markets and local markets (bush meat, wild parrot trade)	  
Medium	• Illegal logging for illegal timber trade (especially in Casamance)	• Lack of economic opportunity in Casamance • Strong black market in Gambia for illegal export of timber	

PRIORITY	THREATS	DRIVERS	DRIVER CATEGORY
Medium	• Illegal logging for domestic use (pastoralism, construction- especially in Dakar) • Uncontrolled fires/bushfires from: o Slash and burn agriculture o Pastoralist fires • Greenhouse Gas Emissions (causing climate change) from: o Conversion of habitats (deforestation, wetlands development) o Bush/forest fires • Industry and transportation	• Competing land uses because of unclear land tenure or weak enforcement of property rights • Insufficient financing for conservation of tropical forests and classified border enforcement • Lack of enforcement and incentives to comply with laws due to inadequate funds or training • Inadequate financial incentives/price signals for forest conservation (undervalued resource) • Lack of local enabling policies to protect habitats	  
Medium	• Logging for charcoal (i.e., cooking fuel/energy)	• Demand for cooking fuel and high price of alternatives (e.g., natural gas)	  
Low	• Invasive species and spread of aquatic vegetation due to: o Introduction by foreign sources o Climate change (temperature or precipitation changes allowing for range expansion)	• Lack of access to information on non-native species introductions, population and distribution, and risk of environmental/economic risk	
Low	• Disease (causing low park attendance or damaging economic growth) from: o Poor waste management o Deforestation o Habitat degradation o Zoonosis (Ebola) o Malaria	• Lack of access to information on disease outbreaks and sources of disease	 

Table 5. Drivers of Threats to Environment

PRIORITY	THREATS	DRIVERS	DRIVER CATEGORY
High	• Pollution (i.e., inland surface, ground, and coastal water, and air) from: o Industry (e.g., mining, agribusiness, cement plants);offshore oil and gas development (prospection and exploitation) o Inadequate treatment of Human and animal waste o Inadequate solid waste management systems o Poor design and management of roads	• Urban Population Growth • Lack of enforcement and incentives to comply with laws • Lack of technology to prevent or treat pollution	
High	• Flooding, including flooding exacerbated by climate change (exposure via alteration of rainfall patterns)	• Weak (or lack of) drainage infrastructure to reduce vulnerability of floods (grey) and regulation of flows (green) • Lack of scientific equipment for surveys, monitoring, and early warning	
Low	• Coastal Erosion from extraction of marine sand and coastal construction (degrading buffering ecosystem services), climate change (sea level rise)	• Urban population growth (and resulting poorly designed and managed construction on the coast)	

6. NECESSARY ACTIONS AND OPPORTUNITIES FOR CONSERVATION AND SUSTAINABLE DEVELOPMENT

This section addresses FAAs 118(e)(1) and 119(d)(1) by describing the actions necessary to conserve tropical forests and biodiversity. For long-term, sustainable results, the root causes of the direct threats (from Section 5) must be addressed in terms of actions that:

- conserve and sustainably manage tropical forests,
- preserve biological diversity, and
- ensure sustainable management of natural resources critical to the success of USAID programming.

Tables 5 and 6 list specific actions to address each of the root causes identified. The actions were developed based on fieldwork and observations, a desk review of literature, and input from stakeholders.

Based on this this analysis, **the following eleven (11) actions were determined as necessary for addressing environmental threats in Senegal**. These are strategic recommendations intended to provide general guidance as the mission prepares its CDCS. **Action on these recommendations—by USAID, the Government of Senegal, or other parties—could significantly improve sustainable development in Senegal and, in doing so, promote the conservation of biodiversity and tropical forests**.

1. Increase agricultural productivity on existing fertile lands (especially Tambacounda) through the use of improved technologies, seed varieties, and weather/climate information systems to increase overall long-term productivity (including climate resiliency).

2. Build capacity for fisheries management.

3. (a) Conduct a strategic/programmatic environmental impact assessment for USAID agriculture activities to provide a framework/guidance for investments and prevent undesirable environmental impacts. (b) Build GoS capacity for a strategic/programmatic environmental impact assessment for the mining sector that will provide a framework/guidance for industrial-scale mine investments and prevent undesirable environmental impacts.

4. Develop application text (i.e., directives) and other resources (e.g., conservation-specific guidelines, factsheets, monitoring and evaluation tools, technical models, training programs) to support GoS's decentralization efforts and protect the environment and associated ecosystem services.

5. Support the translation of existing laws to local languages and the dissemination, enforcement, and continuous implementation of these laws at all levels.

6. Develop decentralized/distributed renewable energy supplies to expedite rural electrification and provide cost-effective alternative cooking fuel sources and innovative practices that decrease cooking time, reduce pressure on forested lands for fuel wood extraction, and improve women's health.

7. Support land use planning and capacity building needed to develop urban areas and natural resources (especially community forestry in Casamance), protect ecosystem services, and secure wildlife corridors for endangered species.

8. Ensure adequate funding for environment through the national budget, local tax revenues, and funding by natural resource-based industries, and establish mechanisms (e.g., payment of ecosystems services, conservation trust funds, carbon finance, and polluters' payment).

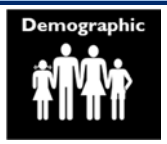
9. Support the strengthening of environmental monitoring systems and support the development of a data clearinghouse to improve access to existing information and support the exchange of information between related information sources (e.g., livestock, public health, fisheries).

10. Build the formal organizational capacity of artisans in natural resource-based small and medium enterprises and community cooperatives to implement best practices for natural resource management, forestry, and fisheries management.

11. Build capacity for integrated water resource management that will promote the long-term resiliency of water-reliant industries and ecosystems and protect drinking water sources.

Table 6. Drivers and Actions Necessary to Protect Tropical Forests and Biodiversity

PRIORITY	DRIVERS	DRIVER CATEGORY	NECESSARY ACTIONS TO ADDRESS DRIVERS
High	• Limited technical, managerial and financial capacity of pastoralists and livestock managers (resulting in low productivity practices that are not resilient to climate change or irrigation practices that are not sustainable in the long run)		1. Increase agricultural productivity on existing fertile lands (especially Tambacounda) through the use of improved technologies, seed varieties, and weather/climate information systems to increase overall long-term productivity (including climate resiliency).
High	• Unlimited open access to fisheries resources • Inappropriate fishing practices and gear (e.g., monofilament, bottom trawling, beach seines) • Lack of human resources, technical capacity and equipment to manage the resource • Lack of access to information on the status of resource stocks		2. Build Capacity for Fisheries Management.

PRIORITY	DRIVERS	DRIVER CATEGORY	NECESSARY ACTIONS TO ADDRESS DRIVERS
High	• Weak national-level strategic planning for the development of natural resources and conservation of ecosystems and species of concern • Weak local governance/capacity to implement existing laws • Urban population growth • Increased demand for water, energy and food	 	3a. Conduct a strategic/programmatic environmental impact assessment for USAID agriculture activities to provide a framework/guidance for investments and prevent undesirable environmental impacts. 3b. Build GoS capacity for a strategic/programmatic environmental impact assessment for the mining sector that will provide a framework/guidance for industrial-scale mine investments and prevent undesirable environmental impacts. 4. Develop application text (i.e., directives) and other resources (e.g., conservation-specific guidelines, factsheets, monitoring and evaluation tools, technical models, training programs) to support GoS's decentralization efforts. 5. Support the translation of existing laws to local languages and the dissemination, enforcement, and continuous implementation of these laws at all levels. 6. Develop decentralized/distributed renewable energy supplies to expedite rural electrification and provide cost-effective alternative cooking fuel sources and innovative practices that decrease cooking time, reduce pressure on forested lands for fuel wood extraction, and improve women's health. 7. Support land use planning and capacity building needed to develop urban areas and natural resources (especially community forestry in Casamance), protect ecosystem services, and secure wildlife corridors for endangered species.
Medium	• Lack of enforcement and incentives to comply with laws • Limited technical, managerial, and financial capacity of parks and park staff • Increased demand from international markets and local markets (bush meat, wild parrot trade)	 	4. Develop application text (i.e., directives) and other resources (e.g., conservation-specific guidelines, factsheets, monitoring and evaluation tools, technical models, training programs) to support GoS's decentralization efforts and protect the environment and associated ecosystem services. 8. Ensure adequate funding for environment through the national budget, local tax revenues, and funding by natural resource-based industries, and establish mechanisms (e.g., payment of ecosystems services, conservation trust funds, carbon finance, and polluters' payment).

PRIORITY	DRIVERS	DRIVER CATEGORY	NECESSARY ACTIONS TO ADDRESS DRIVERS
			
Medium	• Lack of economic opportunity in Casamance • Strong black market in Gambia for illegal export of timber		7. Support land use planning and capacity building needed to develop urban areas and natural resources (especially community forestry in Casamance), protect ecosystem services, and secure wildlife corridors for endangered species.
Medium	• Competing land uses because of unclear land tenure or weak enforcement of property rights • Insufficient financing for conservation of tropical forests and classified border enforcement • Lack of enforcement and incentives to comply with laws due to inadequate funds or training • Inadequate financial incentives/price signals for forest conservation (undervalued resource) • Lack of local enabling policies to protect habitats	  	4. Develop application text (i.e., directives) and other resources (e.g., conservation-specific guidelines, factsheets, monitoring and evaluation tools, technical models, training programs) to support GoS's decentralization efforts and protect the environment and associated ecosystem services. 7. Support land use planning and capacity building needed to develop urban areas and natural resources (especially community forestry in Casamance), protect ecosystem services, and secure wildlife corridors for endangered species. 8. Ensure adequate funding for environment through the national budget, local tax revenues, and funding by natural resource-based industries, and establish mechanisms (e.g., payment of ecosystems services, conservation trust funds, carbon finance, and polluters' payment).
Medium	• Demand for cooking fuel and high price of alternatives (e.g., natural gas)	  	6. Develop decentralized/distributed renewable energy supplies to expedite rural electrification and provide cost-effective alternative cooking fuel sources and innovative practices that decrease cooking time, reduce pressure on forested lands for fuel wood extraction, and improve women's health.

PRIORITY	DRIVERS	DRIVER CATEGORY	NECESSARY ACTIONS TO ADDRESS DRIVERS
Low	• Lack of access to information on non-native species introductions, population and distribution, and risk of environmental/economic risk		9. Support the strengthening of environmental monitoring systems and support the development of a data clearinghouse to improve access to existing information and support the exchange of information between related information sources (e.g., livestock, public health, fisheries).
Low	• Lack of access to information on disease outbreaks and sources of disease	 	9. Support the strengthening of environmental monitoring systems and support the development of a data clearinghouse to improve access to existing information and support the exchange of information between related information sources (e.g., livestock, public health, fisheries).

Table 7. Drivers and Actions Necessary to Protect the Environment

PRIORITY	DRIVERS	CATEGORY	STRATEGIC ACTIONS TO ADDRESS DRIVERS
High	• Urban Population Growth • Lack of enforcement and incentives to comply with laws • Lack of technology to prevent or treat pollution	  	3a. Conduct a strategic/programmatic environmental impact assessment for USAID agriculture activities to provide a framework/guidance for investments and prevent undesirable environmental impacts. 3b. Build GoS capacity for a strategic/programmatic environmental impact assessment for the mining sector that will provide a framework/guidance for industrial-scale mine investments and prevent undesirable environmental impacts. 4. Develop application text (i.e., directives) and other resources (e.g., conservation-specific guidelines, factsheets, monitoring and evaluation tools, technical models, training programs) to support GoS's decentralization efforts. 5. Support the translation of existing laws to local languages and the dissemination, enforcement, and continuous implementation of these laws at all levels. 6. Develop decentralized/distributed renewable energy supplies to expedite rural electrification and provide cost-effective alternative cooking fuel sources and innovative practices that decrease

			cooking time, reduce pressure on forested lands for fuel wood extraction, and improve women's health. 7. Support land use planning and capacity building needed to develop urban areas and natural resources (especially community forestry in Casamance), protect ecosystem services, and secure wildlife corridors for endangered species. -- 10. Build the formal organizational capacity of artisans in natural resource-based small and medium enterprises and community cooperatives to implement best practices for natural resource management, forestry, and fisheries management. 11. Build capacity for integrated water resource management that will promote the long-term resiliency of water-reliant industries and ecosystems and protect drinking water sources.
High	• Weak (or lack of) drainage infrastructure to reduce vulnerability of floods (grey) and regulation of flows (green) • Lack of scientific equipment for surveys, monitoring, and early warning	 	4. Develop application text (i.e., directives) and other resources (e.g., conservation-specific guidelines, factsheets, monitoring and evaluation tools, technical models, training programs) to support GoS's decentralization efforts and protect the environment and associated ecosystem services. 9. Support the strengthening of environmental monitoring systems and support the development of a data clearinghouse to improve access to existing information and support the exchange of information between related information sources (e.g., livestock, public health, fisheries).
Low	• Urban population growth (and resulting poorly designed and managed construction on the coast)	  	7. Support land use planning and capacity building needed to develop urban areas and natural resources (especially community forestry in Casamance), protect ecosystem services, and secure wildlife corridors for endangered species. 8. Ensure adequate funding for environment through the national budget, local tax revenues, and funding by natural resource-based industries, and establish mechanisms (e.g., payment of ecosystems services, conservation trust funds, carbon finance, and polluters' payment).

7. LINKAGES TO USAID STRATEGY AND PROGRAMS

This section describes the extent to which the existing programs and potential new activities meet (or do not meet) those necessary actions for conservation (sec. 118(e)/119(d) mandatory analysis), environmental management, and efforts to address climate change impacts, including analysis of new initiatives, USAID Forward, and procurement reforms. This should also include recommendations to mitigate the impacts of proposed activities, including how to better integrate environmental management across USAID/Senegal's strategic objectives.

EXTENT TO WHICH ACTIONS PROPOSED BY USAID MEET THE NEEDS

This section addresses FAAs 118(e)(2) and 119(d)(2) by describing "the extent to which the actions proposed for support by the Agency meet the needs thus identified."

Table 7 below suggests which of the current and proposed programs at USAID/Senegal (i.e., actions) are contributing, or could contribute, to the key recommendations.

Table 8. Extent to Which Necessary Actions are Supported by USAID/Senegal Programs

	O = OPPORTUNITY FOR USAID, ACTIVITIES ARE NOT CURRENTLY MEETING THE NECESSARY ACTION, BUT COULD IN FUTURE PROGRAMS + = EXISTING PROGRAMS AND POTENTIAL NEW ACTIVITIES MEET THE NECESSARY ACTION							
NECESSARY ACTIONS	Agriculture	Conflict/ Peace Building	Democracy & Governance	Education	Energy/ Power Africa	Fisheries	Public Health, Nutrition & Family Planning	Water/ Wash
1. Increase agricultural productivity on existing fertile lands (especially Tambacounda) through the use of improved technologies, seed varieties, and weather/climate information systems to increase overall long-term productivity (including climate resiliency).	+							
2. Build capacity for fisheries management.						+		
3a. Conduct a strategic/programmatic environmental impact assessment for USAID agriculture activities to provide a framework/guidance for investments and prevent undesirable environmental impacts.	O							
3b. Build GoS capacity for a strategic/programmatic environmental impact assessment for the mining sector that will provide a framework/guidance for industrial-scale mine investments and prevent undesirable environmental impacts.			O					
4. Develop application text (i.e., directives) and other resources (e.g., conservation-specific guidelines, factsheets, monitoring and evaluation tools, technical models, training programs) to support GoS's decentralization efforts and protect the environment and associated ecosystem services.		O	O					
5. Support the translation of existing laws to local languages and the dissemination, enforcement, and continuous implementation of these laws at all levels.			O	O				
6. Develop decentralized/distributed renewable energy supplies to expedite rural electrification and provide cost-effective alternative cooking fuel sources and innovative practices that decrease				O	O		O	

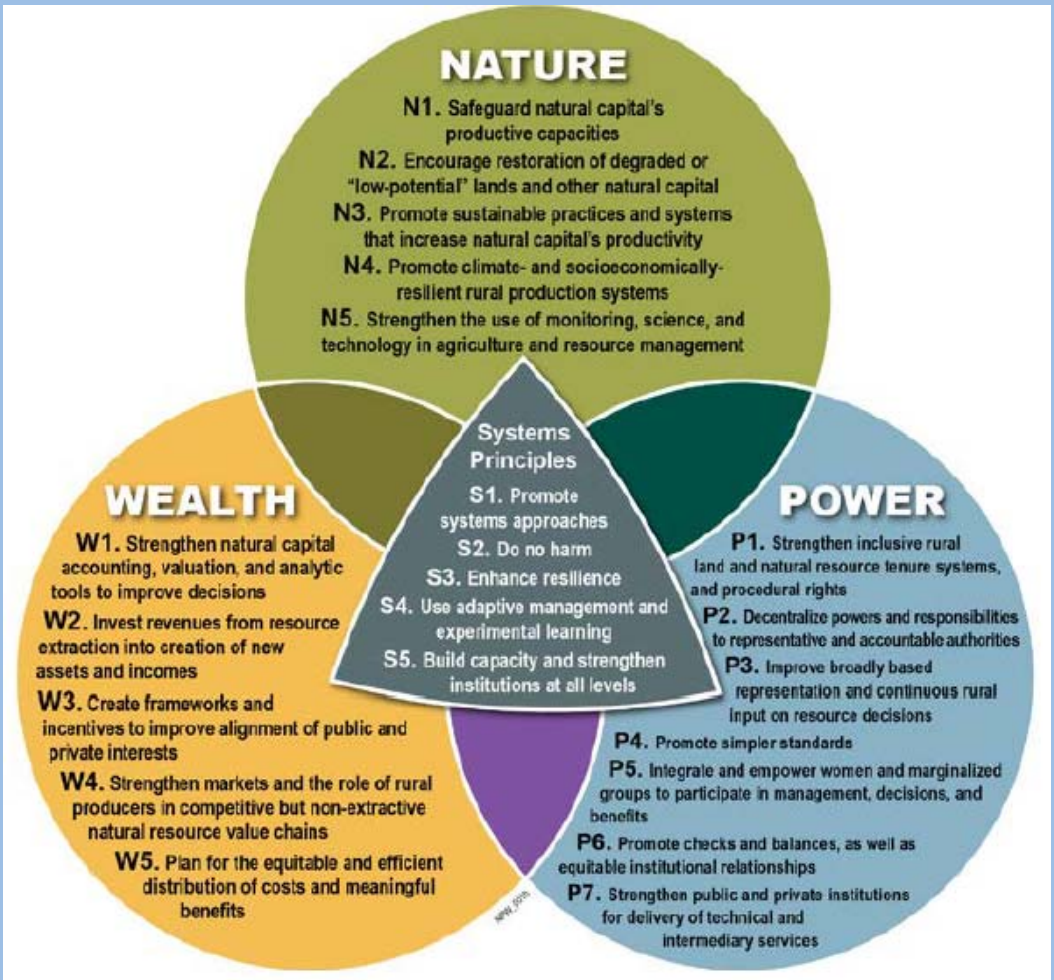
	O = OPPORTUNITY FOR USAID, ACTIVITIES ARE NOT CURRENTLY MEETING THE NECESSARY ACTION, BUT COULD IN FUTURE PROGRAMS + = EXISTING PROGRAMS AND POTENTIAL NEW ACTIVITIES MEET THE NECESSARY ACTION							
NECESSARY ACTIONS	Agriculture	Conflict/ Peace Building	Democracy & Governance	Education	Energy/ Power Africa	Fisheries	Public Health, Nutrition & Family Planning	Water/ Wash
cooking time, reduce pressure on forested lands for fuel wood extraction, and improve women's health.								
7. Support land use planning and capacity building needed to develop urban areas and natural resources (especially community forestry in Casamance), protect ecosystem services, and secure wildlife corridors for endangered species.	O		O	O				
8. Ensure adequate funding for environment through the national budget, local tax revenues, and funding by natural resource-based industries, and establish mechanisms (e.g., payment of ecosystems services, conservation trust funds, carbon finance, and polluters' payment).			O					
9. Support the strengthening of environmental monitoring systems and support the development of a data clearinghouse to improve access to existing information and support the exchange of information between related information sources (e.g., livestock, public health, fisheries).	O			O		O	O	
10. Build the formal organizational capacity of artisans in natural resource-based small and medium enterprises and community cooperatives to implement best practices for natural resource management, forestry, and fisheries management.	O			O				
11. Build capacity for integrated water resource management that will promote the long-term resiliency of water-reliant industries and ecosystems and protect drinking water sources.	O							O

USAID's NATURE, WEALTH, AND POWER FRAMEWORK – SUCCESS IN SENEGAL

In 2002, USAID published the "Nature, Wealth and Power" framework that presented principles and action steps that consolidated lessons learned from more than 20 years of natural resources-based development in Africa. Since its publication, the NWP document catalyzed implementation and discussion of integrated NRM programs in Africa and in other regions across the world. This has been especially true and effective in Senegal through the USAID/Senegal Wula Nafaa project. These successes are summarized in the document "Synergies of Nature, Wealth, And Power: Lessons From USAID Natural Resource Management

Investments In Senegal"

In 2013, USAID published "Nature, Wealth, and Power 2.0: Leveraging Natural and Social Capital for Resilient Development (NWP2)" which updates, strengthens, and attempts to be more comprehensive than NWP1. The recommendations in this ETOA are lined to this framework through the principles shown below.

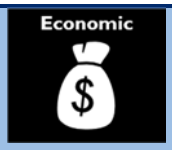


Principles of Nature, Wealth, and Power[2.0]

OPPORTUNITIES FOR USAID

Each of the necessary actions—regardless of the current status of USAID engagement—will support sustainable development, conserve natural capital upon which fisheries and food security in Senegal depend on, as well as improve climate change resilience and greenhouse gas emission reductions. Implementation of these actions will reduce environmental risks to USAID projects and, therefore, improve the outcomes of US Government interventions.

1. Increase agricultural productivity on existing fertile lands (especially Tambacounda) through the use of improved technologies, seed varieties, and weather/climate information systems to increase overall long-term productivity (including climate resiliency).

Anticipated Outcome	 Reduction in per capita land area used/cleared to achieve existing/ future food needs.	 Reduction in poverty and economic instability driving rent/land seeking behavior.	 Reduction in use of low-tech and low-productivity agricultural practices that result in the inefficient use of human and natural capital.
Links to USAID Nature, Wealth, and Power Principles:	N1. Safeguard natural capital's productive capacities N3. Promote sustainable practices and systems that increase natural capital's productivity N4. Promote climate- and socioeconomically-resilient rural production systems W1. Strengthen natural capital accounting, valuation, and analytic tools to improve decisions		

While farmers across Senegal are steadily increasing production, major gains are needed to meet domestic food security needs and increase exports of peanuts, cotton, and other commodity crops. To protect the integrity of intact forested areas (important for water and climate-regulating ecosystem services) and maintain areas for livestock and other economic activities, increases in agricultural production must be achieved on fertile lands already under cultivation, instead of continued production on low-productivity agricultural lands. The opportunity is greatest in southern Senegal (e.g., Kedougou, Tambacounda) where soils are most fertile and water resources are more plentiful (and likely to be less affected by climate change).

Good agricultural practices (e.g., crop diversification and rotation) are already being implemented and should be reinforced. Efforts to support information-sharing on best practices on managing climate variability must also be implemented. Programs that bring together farmers from different regions to share best practices and cultivation methods can help build resilience to climate change. For example, agroforestry is being promoted in the north of Senegal after agro-ecosystems changed and water retention/regulation ecosystem services were lost after too many trees were cut down. Now, efforts are underway to replant trees and promote agroforestry in the north. However, due to a greater abundance of trees and water, agroforestry is not formally prioritized in the south.

Maintaining the genetic diversity of crops through additional/improved seed varieties is a necessary action for increasing agricultural productivity and adapting to climate change. The Government of Senegal currently limits the number of foundations that can develop seeds and new hybrids. This may limit the efficiency of farming, leading to more widespread low-productivity agriculture that competes with other land uses (e.g., livestock pasture, conservation). Additional seed banks should be developed to ensure that the right varieties of seeds are available for farmers.

While seed banks exist and farmers are interested in utilizing improved varieties, climate-smart decisions must also be informed by actionable, timely, and time-bound information (i.e., annual forecast that help farmers select and time the planting of specific varieties, or hedge by diversifying crops planted). Weather/climate information systems can help farmers adjust practices on their existing lands instead of migrating to new areas within the region or moving to other regions, a current practice that results in low productivity agriculture over a broader land area without increasing yields. Stakeholders consulted indicated that inter-region migration, driven in part by climate changes in the north (of Senegal or in other Sahel countries) is taking place to a limited extent. Improved weather and climate information systems will also support the nascent

market for crop insurance. Crop insurance has been adopted relatively slowly by farmers who are skeptical about insurance systems and lack information on payment methods and schedules of these systems.

Finally, increasing intensity on existing lands will require some infrastructure investments to manage on-farm water—specifically rainwater harvesting systems to manage drought conditions and drainage systems to manage flood conditions. These existing threats to farm productivity are likely to be exacerbated by climate change. Already, intra-region and intra-community migration is particularly common after crop failures. For example, farmers cultivate wetland areas in dry years, which experience damaging floods in wet years. These annual crop failures drive risky behaviors, including migration, which could be avoided with modest on-farm water control investments.

In terms of USAID programming, the implementation of this recommendation would directly complement existing USAID efforts, create opportunities for USAID to work with successful organizations like SODEFITEX, PROGEDE 2, and others to expand programs with positive impacts and outcomes.

2. Build capacity for sustainable fisheries management.

Anticipated Outcome	 Demographic	Management of fish supply to point of sustainable yield	 Political/ Institutional	Improved government capacity and community capacity to manage stocks	 Scientific/ Technological	Improved technology for monitoring and oversight, and communications
Links to USAID Nature, Wealth, and Power Principles:	N1. Safeguard natural capital's productive capacities N3. Promote sustainable practices and systems that increase natural capital's productivity N4. Promote climate- and socioeconomically-resilient rural production systems W1. Strengthen natural capital accounting, valuation, and analytic tools to improve decisions					

Fishing is the largest extractive use of wildlife in Senegal. The main threat to fisheries biodiversity in Senegal is overfishing provoked by national, but mainly foreign industrial fleets, and exacerbated by open access to the resource and a number of illegal practices, including the use of prohibited fishing techniques/tools. The situation is worsening because the legal framework for fisheries management is weak; even existing few texts are not properly implemented and enforced. There is a strong need to move away from open access towards managed access, in order to avoid the collapse of Sardinella, a main stay of the fisheries in Senegal and West Africa.

USAID can help GoS establish a Steering Committee (SCA, DEEC, USAID, DPM, COMFISH) to strengthen coordination among high-level partners and project monitoring. USAID can also help establish MOUs which provide framework for contractual implementation with key collaborating institutions (e.g. FENAGIE, APTE, DEEC, ANACIM, Alliance, CSE).[129] This is critical for implementing and enforcing existing national fishing regulation.

At the local level, USAID should support and expand programs that have demonstrated success (e.g., COMFISH). This type of effort builds capacity for local fishing organizations. For example, As the enforcers of the "local conventions" which govern fisheries at the local level to support the Fisheries and Aquaculture Sector Policy letter, Local Councils of Artisanal Fishers (Conseil Local de la Pêche Artisanale or CLPA) should receive technical assistance to create revenue streams that allow for their continued operation (e.g., membership dues, organizing income-generating activities). Adequate financing will support CLPA-level investments in communication and information systems needed to monitor and oversee resources.

Community organizations not only serve as an entry point to promote education and sensitization on good management of the resources to preserve biodiversity, but also serve as a mechanism for strengthened civil society. A robust civil society in the marine sector is needed to provide input on proposed projects, such as

[129] Consistent with the recommendations of the March 2015 Mid-Term Performance Evaluation of the USAID/COMFISH project in Senegal

offshore oil and gas industries, like the one starting extraction in the Marine Protected Area of the Saloum Delta that may threaten marine ecosystems and biodiversity and the local economies dependent on those resources.

3a. Conduct a strategic/programmatic environmental impact assessment for USAID agriculture activities to provide a framework/guidance for investments and prevent undesirable environmental impacts.

3b. Build GoS capacity for a strategic/programmatic environmental impact assessment for the mining sector that will provide a framework/guidance for industrial-scale mine investments and prevent undesirable environmental impacts.

Anticipated Outcome	 Reduction in demographic drivers related to loss of habitat and pollution	 Reduction in weak government capacity for comprehensive ESIAs and lack of guidance on ESIAs	 Reduction in economic and technology drivers related to flooding.
Links to USAID Nature, Wealth, and Power Principles:	N1. Safeguard natural capital's productive capacities N3. Promote sustainable practices and systems that increase natural capital's productivity N4. Promote climate- and socioeconomically-resilient rural production systems W3. Create frameworks and incentives to improve alignment of public and private interests P2. Decentralize powers and responsibilities to representative and accountable authorities		

Done well, the environmental and social impact assessment (ESIA) process identifies, predicts, evaluates, avoids, and mitigates the adverse biophysical, social, and other relevant effects of development proposals prior to major decisions and financial commitments.[130] Strategic or programmatic ESIAs evaluate a class of similar actions in a sector or geographic region and can provide a framework for expediting and improving the quality of project-specific assessments required by Senegalese law. Strategic ESIAs are often tiered to policies in relevant sectors and regions and decision making.[131] This is particularly important for the mining sector in light of the mining reform regulation and for the agriculture sector where USAID is engaged on multiple fronts.

The impact assessment process in Senegal is well-established and ESIAs are routinely carried out for large-scale projects. Strategic ESIAs for the mining and agricultural sectors will complement required project-specific assessments by identifying environmental risks and establishing general best practices to avoid and mitigate the potential adverse environmental and social impacts. This is particularly important, as stakeholders noted that some parts of the mining production/refinement chain are outside current ESIA requirements. Therefore, some EIAs do not cover all pollution sources. A strategic ESIA for the mining sector will help close these gaps and establish means for civil society to engage early on for large-scale mining projects. The strategic assessment could also establish finance/funds management for the implementation of mitigation measures (e.g., forest restoration) in a way that meets the concerns of both the private sector and civil society, an issue that was raised by stakeholders.

By identifying key aspects of mining and agriculture projects that need to be prioritized to avoid or mitigate adverse environmental impacts, strategic ESIAs for mining and agriculture can help guide efforts to build financial and technical capacity for ESIAs at the regional level, where ESIAs are currently performed (further decentralization of the ESIA process is not recommended). Strategic assessments will also support and guide efforts to strengthen ESIA review capabilities at the national level. ESIAs conducted and first reviewed at the regional level are reviewed at the national level prior to approval—primarily with an eye towards identifying gaps in analysis. The strategic assessment can help support this gap analysis and ensure the quality of project-specific analyses. Furthermore, these strategic assessments can identify specific intervention points where

[130] Adapted from http://www.iaia.org/publicdocuments/special-publications/Principles%20of%20IA_web.pdf
[131] See http://www.iaia.org/publicdocuments/special-publications/sp1.pdf

climate change information can help improve decision-making and ensure that climate change is consistently considered in project design and in the design and implementation of mitigation measures.

In terms of USAID programming, the implementation of this recommendation will help mitigate adverse environmental impacts associated with mining (e.g., water pollution affecting drinking water supplies and public health, community relocation affecting social stability). It will also provide USAID and its implementing partners with concrete actions for mitigating the adverse cumulative impacts of agricultural programming (e.g., land use change affecting water availability) and mitigating the effects of climate change on agricultural systems.

4. Develop application text (i.e., directives) and other resources (e.g., conservation-specific guidelines, factsheets, monitoring and evaluation tools, technical models, training programs) to support GoS's decentralization efforts and protect the environment and associated ecosystem services.

Anticipated Outcome		Increased local governance/ capacity to implement existing laws and national-level strategic plans for the development of natural resources and conservation of ecosystems and species of concern
Links to USAID Nature, Wealth, and Power Principles:	N1. Safeguard natural capital's productive capacities P1. Strengthen inclusive rural land and natural resource tenure systems, and procedural rights P2. Decentralize powers and responsibilities to representative and accountable authorities	

With the third decentralization reform in 2013, environmental and natural resource management authority, as well as taxation and land use planning responsibilities, was transferred to the regional and community level. While the existing national laws are necessary for environmental protection, the lack of an implementation framework and application text (i.e., directives) that can be used at the community level is a barrier to empowerment of local officials and creation of funding options to ensure implementation. As a result, decisions over land use and resource management are based primarily on short-term economic development pressures and opportunities (e.g., mining rushes). These pressures are often at odds with sustainable development goals (SDGs) consistent with national plans. For example, the Assessment Team visited a small area of protected land in Dindefelo that had recently been deforested to make space for a water tower. Despite efforts by local conservationists to maintain the integrity of the protected area, a local strongman was able to push forward the proposal. The site had been regularly used by chimpanzees.

The effective implementation of environmental laws means that the Protected Areas will receive the full intended level of protection and that the areas surrounding, or adjacent to, Protected Areas will be developed with environmental considerations in mind. This is especially important for Senegal's small but developing ecotourism market, especially near coastal areas where tourists already visit beaches or see chimpanzees (Senegal is the closest country with a chimpanzee habitat to European markets).

Stakeholders and interview participants noted these types of regulatory constraints as a limiting factor in conservation efforts, citing both insufficient legal texts and authority, as well as weak implementation and enforcement of existing laws. Given the short-term economic gain of natural resource exploitation, comprehensive, enforceable laws and policies can help establish a framework for effective environmental protection and stable economic growth.

In terms of USAID programming, the implementation of this recommendation will support other democracy and governance efforts. In broad terms, application of directives will empower local officials and park guards to fulfill national mandates, and will provide legal certainty for individuals, businesses, and NGOs pursuing economic development opportunities, investing in infrastructure, or expanding operations.

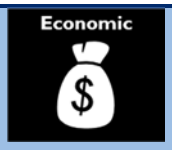
5. Support the translation of existing laws to local languages and the dissemination, enforcement, and continuous implementation of these laws at all levels.

Anticipated Outcome		Increased access to legal frameworks and protection for all segments of society		Increased local governance/ capacity to implement existing laws and national-level strategic plans for the development of natural resources and conservation of ecosystems and species of concern
Link to USAID Nature, Wealth, and Power Principle:	P2. Decentralize powers and responsibilities to representative and accountable authorities			

While French is the official language of Senegal, it is used by a minority of educated Senegalese peoples. Most people speak their own ethnic language (e.g., Wolof) and French is a second language. Therefore, translating existing laws into local languages will support dissemination and application of these laws. Individuals and communities cannot be reasonably expected to follow a law they do not understand or hold others accountable to rule of law, and without knowledge of the laws and legal framework, civil society is limited in its ability to hold firms and politicians accountable.

In terms of USAID programming, the implementation of this recommendation will support democracy and governance efforts by improving the understanding necessary for citizens to participate in Senegal's political processes.

6. Develop decentralized/distributed renewable energy supplies to expedite rural electrification and provide cost-effective alternative cooking fuel sources and innovative practices that decrease cooking time, reduce pressure on forested lands for fuel wood extraction, and improve women's health.

Anticipated Outcome		Reduction in pressures on forests because of the availability alternative sources of energy/fuel		Reduction in financial and labor costs associated with cooking and energy		Increased availability and use of high-efficiency cooking and energy production technologies
Links to USAID Nature, Wealth, and Power Principles:	W3. Create frameworks and incentives to improve alignment of public and private interests W4. Strengthen markets and the role of rural producers in competitive but non-extractive natural resource value chains					

Senegal has substantial needs for energy development and distribution to increase economic growth and reduce reliance on existing inefficient fuel sources (e.g., charcoal for cooking). This has a disproportionate effect on women in terms of time needed to secure fuel wood/charcoal for cooking and effects on health from breathing in particulates from charcoal-based cooking. Opportunities to develop distributed energy sources across the country should be identified and developed as a means to provide energy to households and provide a potential alternative to wood-based charcoal cooking, if electricity-based cooking methods (e.g., induction stovetops) are available. Innovative cooking techniques that decrease cooking time should also be researched and promoted. This will reduce the health risk for those tasked with cooking in households by reducing the time they are exposed to gas and heat produced by fuel sources.

Energy projects designed to meet base load requirements—especially in Dakar—are necessary and may come from renewable resources like hydropower. While there are often substantive environmental and social impacts associated with hydropower, projects in the south may help with flood regulation and create opportunities for irrigation if they are designed well.

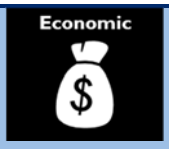
While Senegal has oil and natural gas reserves that can be exploited, natural gas has not been a cost-effective alternative source of energy for cooking due to high prices driven by the need for substantive distribution

networks. Further, decreasing natural gas prices will require significant additional market interventions. Development of small- and medium-scale renewable resources—particularly solar power sources, including those on rooftops in cities—can help meet electricity demand quickly.

The Assessment Team does not recommend further biogas promotion. Senegal has limited arable land and growing bio matter to fuel biogas facilities will compete for land with agriculture and biodiversity priorities. Specifically, biogas operations tend to favor fast-growing monocultures and often use non-native species that diminish, instead of enhance, local biodiversity. Recent biogas efforts in the Tambacounda area failed due to lack of technical capacity to operate the facilities. In Senegal, other renewable options such as solar power are simpler and more realistic.

In terms of USAID programming, the implementation of this recommendation will increase adaptive capacity by increasing access to electricity, and providing opportunities to manage extreme temperatures (e.g., air conditioning) and improve phytosanitary food processing (e.g., refrigeration in food processing).

7. Support land use planning and capacity building needed to develop urban areas and natural resources (especially community forestry in Casamance), protect ecosystem services, and secure wildlife corridors for endangered species.

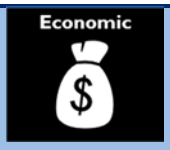
Anticipated Outcome					
		Reduction in pressures from urban population growth and demand for natural resources		Enabling economic growth because land uses/tenure is secure		Increased local governance/ capacity to implement existing laws
Links to USAID Nature, Wealth, and Power Principles:	N1. Safeguard natural capital's productive capacities W3. Create frameworks and incentives to improve alignment of public and private interests P1. Strengthen inclusive rural land and natural resource tenure systems, and procedural rights P2. Decentralize powers and responsibilities to representative and accountable authorities				

Senegal is in a unique position for the management of many charismatic endangered species that migrate across borders and within the country itself. Considering the need for economic development, land use planning needs to be prioritized to create certainty over land tenure and set aside areas for conservation and ecosystem services. This is particularly important in the south where there is a need to strengthen the cross-border park partnership with Guinea to conserve migratory corridors for elephants, chimpanzees, and other threatened or endangered species by identifying options to support transboundary protected areas.

In the Casamance region, there is substantial need for economic development to promote social stability. Considering the natural resources and biodiversity in the region, USAID should work with Casamance regional and local officials to identify conservation and ecotourism priorities to build off of the existing (strong) tourism industry and elevate the Casamance as a destination and integral part of Senegal's economic and environmental future.

In terms of USAID programming, this recommendation will help ensure that endangered species are protected from habitat degradation and therefore have a better chance of recovery, and will also reduce the potential for existing political and social strife while contributing to the development of the economy in the Casamance region in particular.

8. Ensure adequate funding for environment through the national budget, local tax revenues, and funding by natural resource-based industries, and establish mechanisms (e.g., payment of ecosystems services, conservation trust funds, carbon finance, and polluters' payment).

Anticipated Outcome	 Reduction in pressures from urban population growth (and resulting poorly designed and managed construction on the coast)	 Increased financing for conservation of tropical forests and classified border enforcement and stronger financial incentives/price signals for forest conservation	 Increased technical, managerial, and financial capacity of parks and park staff
Links to USAID Nature, Wealth, and Power Principles:	N1. Safeguard natural capital's productive capacities W2. Invest revenues from resource extraction into creation of new assets and incomes P2. Decentralize powers and responsibilities to representative and accountable authorities		

Inadequate financial resources constrain the protection of conservation area, limiting availability and technical and managerial skills of staff to enforce conservation. Management of Protected Areas is often compromised due to the inability of staff to police against illegal activities such as poaching, illegal hunting and fishing, and exploitation of forest resources. Therefore, increased authority of and resources for agencies overseeing environmental conservation and increased funding for environmental protection programs in the Senegalese national budget can support conservation efforts in Senegal.

Beyond central funding, more can be done to establish decentralized funding sources to improve local environmental performance. Several stakeholders remarked that the decentralization reform allows for local taxation and decentralized revenue streams, but this transition has not yet been fully realized due to a lack of financial and human resources.

One specific mechanism to support decentralized funding is the establishment of trust funds for protected areas and environmental programs paid into by the industries reliant on those areas' ecosystem services or effecting the ecosystem services in a particular geographic area (e.g., fisheries and agriculture industries paying to conserve and manage specific watersheds, or extractive industries disrupting ecosystem structure and function to access sub-surface resources). An increasing number of African countries are following this model (e.g., Guinea).

Currently, the environmental performance of the mining industry is supported by a trust fund or environmental bond program where each mine operator holds funds in-trust to ensure that environmental and social mitigation measures are implemented. However, community stakeholders have no means for checking that funds are being deposited, and they do not have any recourse available to them if the funds are not used to implement mitigation measures. Private companies should disclose to the Government regulator the availability of funds, and communities should be able to seek recourse and intervention by the regulator in the case of abandonment by the firm.

Financial accountability should be a priority in considering expansion of the mining sector. With appropriate financial resources, GoS agencies and institutions can adequately oversee mining activities (that are being promoted by GoS) and assure that miners/mining companies are held financially responsible if they fail to address post-closure restoration. The establishment of independently held (e.g., third-party bank) trust funds can help support the polluter-pays-principle at specific project sites, and could be utilized more broadly to support the management of key ecosystem services or habitats for species of concern (e.g., chimpanzees) outside of Protected Areas. These types of financial responsibility mechanisms are well-established means for environmental financing, and the establishment of these types of mechanisms can be supported by USAID- or NGO-enacted legislation or on a voluntary/negotiated basis with the private sector.

Financial mechanisms also need to be established for other renewable natural-resource based industries (e.g., timber and fisheries). Systems for permitting, permitting feeds, and taxation need to be fully implemented and enforced to ensure adequate funding for the sustainable management of these renewable resources.

In terms of USAID programming, the implementation of this recommendation will assure that the technical capacity building efforts directed at the agricultural and fisheries sectors in particular are complemented by adequate financing. The implementation of this recommendation will also ensure that investments in improved access to drinking water are not undermined by pollution or hazards from the mining industry.

9. Support the strengthening of environmental monitoring systems and support the development of a data clearinghouse to improve access to existing information and support the exchange of information between related information sources (e.g., livestock, public health, fisheries).

Anticipated Outcome	Political/ Institutional 	Improved information on enviornment, natural resources stocks and flows, and to information on non-native species introductions, population and distribution, and risk of environmental/economic risk. Increased access to information on disease outbreaks and sources of disease	Scientific/ Technological 	Availability of centralized information
Links to USAID Nature, Wealth, and Power Principles:	N5. Strengthen the use of monitoring, science, and technology in agriculture and resource management W1. Strengthen natural capital accounting, valuation, and analytic tools to improve decisions			

A number of the stakeholders consulted noted that there is a need for more detailed and readily available information in particular sectors (e.g. data on fish stocks, livestock numbers) that would support management decisions. For example, a better knowledge base on marine biological resources would help strengthen evidence-based decision-making in the sector. In agricultural and livestock systems, the Government of Senegal prioritizes measures that prevent the introduction of new pests (e.g., avian influenza which resulted in a ban on U.S. poultry). However, realization of this objective depends not just on the adoption of appropriate policies and availability of science-based solutions to pests, but on monitoring and information systems.

While in some cases data need to be collected, in many cases data have been collected but are not readily available or can be difficult to find. This information may also be important to decision-making in other sectors, or at the national level, and rapid response depends on adequate environmental surveillance systems and timely access to information.

In terms of USAID programming, the implementation of this recommendation will support efforts to promote early detection of invasive species, and increased surveillance for antibiotic-resistant zoonotic and animal pathogens.

Detection and management of invasive species can also ensure ecosystem composition (structure) is not disrupted and that changes to the provisioning of ecosystem services are prevented. Individuals working at borders, in agriculture, and in protected areas must be aware of invasive species. This requires development of awareness campaigns and the promotion of systems for early detection and ultimately the management or eradication of invasive species.

10. Build the formal organizational capacity of artisans in natural resource-based small and medium enterprises and community cooperatives to implement best practices for natural resource management, forestry, and fisheries management.

Anticipated Outcome		Reduction in pressure on natural resources from population growth		Understanding of laws, including incentives to comply with laws		Improved understanding of, and access to technology to prevent or treat pollution and protect public health
Links to USAID Nature, Wealth, and Power Principles:	N3. Promote sustainable practices and systems that increase natural capital's productivity N4. Promote climate- and socioeconomically-resilient rural production systems W2. Invest revenues from resource extraction into creation of new assets and incomes P3. Improve broadly based representation and continuous rural input on resource decisions P5. Integrate and empower women and marginalized groups to participate in management, decisions, and benefits					

In extractive industries like gold mining there are substantial scale economies to be achieved compared to artisanal-scale production. Not only are there economic advantages, but environmental and social impacts are easier to identify, mitigate, and monitor. Specifically, formalizing artisanal miners is a strategic means to improving environmental performance and reducing social problems (i.e., public health) associated with poorly governed artisanal mining.

Miners are attracted to formalization because of the existing incentives for forming cooperatives or small production companies (e.g., legal permit/right to operate, higher price for gold in formal market vs. black market). These incentives should be more clearly and broadly articulated.

In terms of USAID programming, the implementation of this recommendation will enhance civil society and organized labor. It will also reduce the risk of pollution contamination of water supplies and of fish in streams.

11. Build capacity for integrated water resource management that will promote the long-term resiliency of water-reliant industries and ecosystems and protect drinking water sources.

Anticipated Outcome		Reduction in pressures of water management from population growth		Increased government capacity at the local/ regional level to manage water resources		Specified infrastructure / technology and ecosystem services needs to manage water availability and quality
Links to USAID Nature, Wealth, and Power Principles:	N1. Safeguard natural capital's productive capacities N3. Promote sustainable practices and systems that increase natural capital's productivity W1. Strengthen natural capital accounting, valuation, and analytic tools to improve decisions W3. Create frameworks and incentives to improve alignment of public and private interests P2. Decentralize powers and responsibilities to representative and accountable authorities					

Water availability is a constant concern and constraint to growth in Senegal—particularly in the agricultural sector. Because water availability varies greatly within the year and across years and is predicted to become more variable as a result of climate change, water should be managed at the basin level with detailed planning for competing uses (e.g., human, agricultural, livestock use). Water resource management plans should focus on, and identify, geographic areas that are critical for water purification, flow regulation, and retention.

Drinking water access is improving across Senegal, but in many cases water is still not safe to drink from the tap. Ultimately, community water systems need the technical, managerial, and financial capacity to provide safe drinking water to communities and maintain treatment and distribution systems. By working towards the establishment of price signals, USAID is supporting the development of self-sustaining and self-financing water systems that will not be dependent on foreign donors. These efforts should continue to be supported.

As a part of integrated water resource management, source water protection should be incorporated into water management to ensure the sustainability and lowest cost options for treatment (i.e., avoiding the need for more and more treatment by avoiding the contamination of drinking water sources). Forested areas and grasslands in source water areas provide water retention/flow and purification ecosystems services, and protection of these areas will help avoid additional stress to drinking water purification systems and higher purification costs.

In terms of USAID programming, the implementation of this recommendation will help ensure the sustainability of agricultural and drinking water systems, and will increase the adaptive capacity of communities, particularly those with the greatest current climate vulnerability (i.e., rural populations and populations in the north).

Figure 16. Road Runoff into Grasslands near Dindefelo

8. GOVERNMENT, NGO AND OTHER DONOR PROGRAM ACTIVITIES

[See Annex C for Government, NGO and other Donor Program Activities]

In Senegal, biodiversity and tropical forests conservation, environmental protection, and climate change adaptation and mitigation are all supported by different categories of actors in the context of government action and bilateral or multilateral cooperation.

GoS support is mainly provided by financial participation in various conservation projects and programs and by improving resources (financial, technical, material and human) available to environment-based Ministries. For example, in addition to increasing financial resources allocated to the environmental sector by the State between 2003 and 2010, GoS is expected to allocate 13.7 billion CFA for the conservation of biodiversity and management of wetlands through the Sector Expenditure Framework Medium-term (MTEF) - 2010-2012[132].

In the bilateral and multilateral framework, several major agencies and international institutions have contributed in recent years to financing conservation, biodiversity, and environmental protection activities:

- Global Environment Fund (GEF)
- United Nations Development Programme (UNDP)
- World Bank (WB)

[132] (Ministere de L'Environnement et de la Protection de la Nature 2010)

- International Fund for Agricultural Development (IFAD)
- The Netherlands (Dutch Cooperation)
- GTZ (German Technical Cooperation)
- The Italian Cooperation,
- Canadian International Development Agency (CIDA)
- The US Agency for International Development (USAID)
- The Japan International Cooperation Agency (JICA)
- West African Development Bank (WADB)
- European Development Fund (EDF)
- French Development Agency (AFD)
- BMZ
- European Union (EU)
- DGIS (Directorate General of International Cooperation of the Netherlands)
- United Nations Environment Programme (UNEP)
- African Development Fund (ADF).

Specific programs funded and the amounts awarded by GoS partners are listed in Appendix C of this document. The following list includes particularly successful conservation and biodiversity protection projects:

- The Integrated Ecosystem Management Project in Senegal (PGIES)
- Project and Participatory Sustainable Management of traditional and alternative energy (PROGEDE)
- The Resources and Coastal Integrated Management project (GIRMaC)
- The Great Green Wall (GMV), the Mangrove Initiative in West Africa (MAOI)
- The COMFISH project
- Sustainable Management of Endemic Ruminant Livestock Project in West Africa (PROGEBE)

9. DISCUSSION OF KEY RECOMMENDATIONS AND ANTICIPATED OUTCOMES

The recommendations made by the ETOA team will have positive outcomes for the environment and, therefore, will support economic development by addressing the root causes of environmental degradation. Table 9 below shows how the key recommendations can be measured in terms of specific development outcomes pertinent to USAID programming. Some recommendations link directly to existing Interim Results from the 2012-2016 CDCS, while others are forward-thinking, anticipating the new CDCS and future potential USAID programming in these areas.

Table 9. Key Recommendations and Anticipated Outcomes

KEY RECOMMENDATION	USAID PROGRAM LINKAGE	ANTICIPATED OUTCOMES	
		Existing Results/ Indicators	[Additional] Proposed Result/Indicator
1. Increase agricultural productivity on existing fertile lands (especially Tambacounda) through the use of improved technologies, seed varieties,	Agriculture	Result (IR 1.1) Inclusive Agriculture Sector Growth	

KEY RECOMMENDATION	USAID PROGRAM LINKAGE	ANTICIPATED OUTCOMES	
		Existing Results/ Indicators	[Additional] Proposed Result/Indicator
and weather/climate information systems to increase overall long-term productivity (including climate resiliency).		Indicators: Percent growth in agricultural GDP; Expenditure of rural households increased; # of farmers and others who have applied new technologies or management practices as a result of USG assistance	
2. Build capacity for fisheries management.	Agriculture/ Fisheries	Result (IR 1.3): Improved management of natural resources	Result: Implemented fisheries management plans Indicator: # of fishing organizations operating under improved Natural Resource Management as a result of USAID assistance
3a. Conduct a strategic/programmatic environmental impact assessment for USAID agriculture activities to provide a framework/guidance for investments and prevent undesirable environmental impacts.	Agriculture	Result (IR 1.1): Inclusive Agriculture Sector Growth Indicators: Percent growth in agricultural GDP; Expenditure of rural households increased; # of farmers and others who have applied new technologies or management practices as a result of USG assistance	Result: Adverse environmental impacts of mining/large scale agriculture avoided or mitigated Indicators: One strategic ESIA completed for mining sector; One strategic ESIA completed for southern agricultural sector; Project-specific ESIAs reference the strategic ESIA and, at a minimum, cover all of the key issues identified
3b. Build GoS capacity for a strategic/programmatic environmental impact assessment for the mining sector that will provide a framework/guidance for industrial-scale mine investments and prevent	Democracy and Governance	Result (IR 1.1): Inclusive Agriculture Sector Growth Indicators: Percent growth in agricultural GDP; Expenditure of rural households increased; # of farmers	Result: Adverse environmental impacts of mining/large scale agriculture avoided or mitigated Indicators: One strategic ESIA completed for mining

KEY RECOMMENDATION	USAID PROGRAM LINKAGE	ANTICIPATED OUTCOMES	
		Existing Results/ Indicators	[Additional] Proposed Result/Indicator
undesirable environmental impacts.		and others who have applied new technologies or management practices as a result of USG assistance	sector; One strategic ESIA completed for southern agricultural sector; Project-specific ESIAs reference the strategic ESIA and, at a minimum, cover all of the key issues identified
4. Develop application text (i.e., directives) and other resources (e.g., conservation-specific guidelines, factsheets, monitoring and evaluation tools, technical models, training programs) to support GoS's decentralization efforts and protect the environment and associated ecosystem services.	Democracy & Governance, Conflict/Peace Building	Result (IR 3.2): Strengthened Democratic Governance	Indicators: Percent of Government officials at the District level that say they have reliable resources to explain laws to community members; project proponents increases
5. Support the translation of existing laws to local languages and the dissemination, enforcement, and continuous implementation of these laws at all levels.	Democracy & Governance, Education	IR 3.2: Strengthened Democratic Governance	Results: Strengthened civil society, conservation and land use planning improved through effective governance Indicators: At the district level, laws are available in French plus one other language
6. Develop decentralized/ distributed renewable energy supplies to expedite rural electrification and provide cost-effective alternative cooking fuel sources and innovative practices that decrease cooking time, reduce pressure on forested lands for fuel wood extraction, and improve women's health.	Education, Energy/ Power Africa, Public Health, Nutrition & Family Planning		Results: Sustainable electricity sources developed; deforestation reduced; electricity demands met (economic growth increased) Indicators: XXX MW of new, cleaner electricity generation capacity; Increasing electricity access by XX million connections; price of energy reduced (in terms of CFA per kilowatt or time savings)

KEY RECOMMENDATION	USAID PROGRAM LINKAGE	ANTICIPATED OUTCOMES	
		Existing Results/ Indicators	[Additional] Proposed Result/Indicator
7. Support land use planning and capacity building needed to develop urban areas and natural resources (especially community forestry in Casamance), protect ecosystem services, and secure wildlife corridors for endangered species.	Agriculture, Democracy and Governance, Education		Results: Conservation and land use planning improved through effective governance; status of endangered species improved Indicators: Reduced incidence of human wildlife conflict (especially lions); targeted wildlife #s increased; # of corridors secured
8. Ensure adequate funding for environment through the national budget, local tax revenues, and funding by natural resource-based industries, and establish mechanisms (e.g., payment of ecosystems services, conservation trust funds, carbon finance, and polluters' payment)	Democracy and Governance	IR 1.1 Inclusive Agriculture Sector Growth Indicators: Percent growth in agricultural GDP; Expenditure of rural households increased; # of farmers and others who have applied new technologies or management practices as a result of USG assistance	Results: Conservation improved; national park management improved Indicators: Funding increased for environment; park infrastructure and management improved
9. Support the strengthening of environmental monitoring systems and support the development of a data clearinghouse to improve access to existing information and support the exchange of information between related information sources (e.g., livestock, public health, fisheries)	Public Health, Nutrition & Family Planning, Education, Agriculture, Fisheries		Results: Improved governance/ management of fisheries, agriculture, public health (increased economic growth) Indicators: # of reports/studies sent through clearinghouse; data are available from all fishing zones in one location; agricultural production data and land use (area) data are available in one place; country-wide data are

KEY RECOMMENDATION	USAID PROGRAM LINKAGE	ANTICIPATED OUTCOMES	
		Existing Results/ Indicators	[Additional] Proposed Result/Indicator
			available within two years of collection
10. Build the formal organizational capacity of artisans in natural resource-based small and medium enterprises and community cooperatives to implement best practices for natural resource management, forestry, and fisheries management.	Agriculture, Education	IR 1.3 Improved Management of Natural Resources Indicators: # of hectares under improved Natural Resource Management as a result of USAID assistance	
11. Build capacity for integrated water resource management that will promote the long-term resiliency of water-reliant industries and ecosystems and protect drinking water sources.	Agriculture, Water/WASH	IR 1.3 Improved Management of Natural Resources Indicators: # of hectares under improved Natural Resource Management as a result of USAID assistance IR 1.1 Inclusive Agriculture Sector Growth Indicators: Percent growth in agricultural GDP; Expenditure of rural households increased; # of farmers and others who have applied new technologies or management practices as a result of USG assistance DO 2: Improved health status of Senegalese population (IR 2.2 Improved health-seeking and healthy behaviors)	Results: Improved status of water resources; public health improved; ecosystem services protected Indicators: Number of improved water points; health (quality and quantity) of water resources improved; health status improved

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  Summary. This assessment focused on Eastern Senegal (in the Sahel region) based on the high level of food insecurity and lack of climate change projects in the area. The assessment aimed to identify the causes of climate change vulnerability at the household level in the targeted geographic zone, and to identify options for remedies through USAID programming. The assessment identified rainfall and temperature as the major factors leading to vulnerability, and identified USAID programming options including strengthening national climate and early warning information systems, promotion of livestock raising integration in crop agriculture systems, and the promotion of small and micro irrigation.

- African Development Bank. 2010. "Republic of Senegal: Country Strategy Paper 2010 – 2015 " African Development Fund.

  Summary. This document is an analysis of recent political, economic, and social trends; the development challenges and opportunities facing Senegal; and the Bank's assistance strategy. The document is comprised of four parts: 1) Introduction; 2) Country context and prospects; 3) Bank group's country strategy; and 4) Conclusions and recommendations.

- Agence Nationale de la Statistique et de la Demographie (ANSD). 2015. Senegal: Enquete Demographique et de Sante Continue (EDS-Continue). Rockville, Maryland: The DHS Program, IFC International.

  Summary. This report presents the results of the second year of the Demographic and Health Survey in Senegal Continue (Continue EDS-2014), performed by the National Agency of Statistics and Demography (ANSD). The EDS-2014 Continuing has been realized with support from GoS, USAID, UNICEF, UNFPA, Micronutrient Initiative and the Global program of Demographic and Health Surveys (Demographic and Health Surveys - The DHS Program) - ICF International.

  The report is structured as follows: Chapter 1 presents the country and context of the Second Demographic and Health Survey Continue (Continue EDS-2014), Chapter 2 presents the socio-economic characteristics of women and children covered by EDS continues in 2014 as well as the environmental conditions in which they live, Chapter 3 outlines the situation of children in Senegal, Chapter 4 discusses fertility and child mortality, Chapter 5 is concerned with contraception and women's fertility preferences, Chapter 6 provides information about mother and child health, Chapter 7 presents results concerning the feeding practices and the nutritional status of children under 5 years old, Chapter 8 discusses malaria, Chapter 9 provides information on excision of the interviewed women and girls under 15 years old and finally, Chapter 10 presents chronic diseases in Senegal.

- Akoh, B., Bizikova, L., Parry, J., Creech, H., Karami, J., Echeverria, D., Hammil, A., Gass, P., 2011. Africa Transformation-Ready: The Strategic Application of Information and Communication Technologies to Climate Change Adaptation in Africa. International Institute for Sustainable Development (IISD). http://siteresources.worldbank.org/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/282822-1346223280837/ClimateChange_Fullreport.pdf

  Summary. This report is about exploring the transformative potential of ICTs in addressing the major economic, environmental and social challenges facing the African continent due to the impacts of climate change. The objectives are to undertake the sectoral study and to identify positive and potentially replicable practices in the use of ICTs for climate change adaptation, drawing on case studies in three countries- Senegal, Uganda and Malawi.

  The report is structured as follows: 1) Climate Change around the World and in Africa: Current Trends, 2) Landscape Analysis of Climate Change Adaptation Action in Africa, 3) ICTs and Adaptation: Challenges and Opportunities, 4) Country Case Studies Uganda, Malawi and Senegal, and 5) Conclusions and recommendations that have emerged from the scan and landscape analysis.

- André, D. 2014. Cadre d'Analyse de la Gouvernance Fonciere au Senegal : Module sur la Gouvernance Forestiere. Initiative Prospective Agricole et Rurale (IPAR). http://www.hubrural.org/Cadre-d-analyse-de-la-gouvernance.html?lang=fr&id=28

Summary. This note on forest governance serves as support for the collective assessment exercise dimensions of IGF involving the expert panel to be convened by the Agricultural and Rural Prospective Initiative (IPAR). These services were contracted by the Rights and Resources Initiative (RRI) under framework to improve land tenure governance developed by the World Bank.

Through this study, the objective is to support GoS initiatives on land tenure reform as dictated by the National Commission. After an Introduction, the report shows a preliminary analysis of the state of forestry governance in Senegal, a discussion on sustainable resource management issues and challenges in forestry governance, and the analytical framework of forestry governance: community and forest land rights and the regulation of use of rural land.

- Centre de Suivi Ecologique (CSE). 2000. Annuaire sur l'environnement et les ressources naturelles au Sénégal. Ministère de L'Environnement et de la Protection de la Nature. http://www.cse.sn/IMG/pdf/annuaire_2000.pdf

  Summary. CSE was given the mandate to coordinate and execute this work by The Ministry of Environment in collaboration with technical departments and research institutes possessing or analyzing environmental data such as the Direction de l'Environnement, de la direction de l'Aménagement du Territoire, de la Direction des Mines et de la Géologie et de l'Institut des Sciences de l'Environnement, etc.

  The Ministry of Environment has consequently initialized the elaboration of this document with two objectives: to evaluate the environmental constraints, and to obtain a consensus on baseline data and subsequently make this data available for all current environmental studies and research.

  This report is composed of four parts. After the foreword and the executive summary, the first part is devoted to Senegal's context; the second part deals with the principal natural resources related to: hydrology, soils, forest, fisheries, mining and fossil energy. The third part is devoted to socio-demographic status, health, housing, and the removal of refuse. The fourth part discusses the socioeconomic aspects of agriculture, industry, transport, and tourism.

- Centre de Suivi Ecologique (CSE). 2010. Evaluation des Conditions et Tendances des Ecosystèmes Forestiers et de leurs Services au Sénégal. Ministère de L'Environnement et de la Protection de la Nature. http://www.unep.org/regionalseas/Rapport%20Final%20PASEF%20_%20CSE.pdf

  Summary. This report prepared by CSE is a continuation of activities under the Small - Scale Funding Agreement Protocol (SSFA) signed between the CSE and the United Nations Environment Programme (UNEP). The protocol is to assess the conditions and trends of Senegal's forest ecosystems and their services in order to finalize a sub -global assessment (SGA).

  The report is structured as follows: 1) conditions and trends of ecosystems in Senegal, and 2) local assessment at site level.

- Diaw, O. n.d. The national forest programme in Senegal: developing decentralized planning and management capacities. ftp://ftp.fao.org/docrep/fao/009/a0970e/a0970e12.pdf

  Summary. This article describes the process of decentralization in the forest sector, the distribution of authority for natural resource management, and the achievements and ongoing activities of the national forest program – with support from the National Forest Program Facility – in pursuit of sustainable forest management for the whole country. After a background section, the author presents the evolving strategies and approaches to forest management, the decentralization of forest management, the role of

the national forest service in strengthening capacities, the new national forest policy, and Senegal's national forest program.

- Direction de l'Environnement et des Etablissements Classés (DEEC). 2010. Deuxième Communication Nationale du Sénégal : Convention Cadre des Nations-Unies sur les Changements Climatiques. http://unfccc.int/files/national_reports/non-annex_i_natcom/submitted_natcom/application/pdf/rapport_final_2010.pdf

  Summary. The Second National Communication of Senegal was prepared with the support of the Global Environment Fund (GEF). The present national report concerns status of greenhouse gas (GHG) emissions, adaptation actions to address climate change impacts, and mitigation of GHG emissions.

  The study focused on five (5) areas recommended by the IPCC Guidelines Revised in 1996, namely: Energy, Industrial Processes, Agriculture, Land Allocation and Assignment of Land Use Change, and Forestry and Waste. This communication includes five chapters: 1- National circumstances of the country, 2- Stock of the main GHGs, 3- Mitigation measures proposed to reduce GHG emissions in the sectors, 4- Strategy to manage negative impacts of Climate change and 5- Other relevant information that contributes to achieving the objectives of the Convention.

- ECODIT. 2008. *Senegal Biodiversity and Tropical Forests Assessment.* USAID.

  Summary. This is the required report of a Section 118/119 assessment on biodiversity and tropical forestry concerning Senegal's five year Strategic Plan (2006 – 2011) for USAID/Senegal's overall Bilateral Assistance Program.

  Furthermore, this assessment is a report on the status of biodiversity and tropical forest conservation efforts in Senegal and potential implications for USAID and other donor programming which define actions and opportunities necessary for conservation.

  The report is divided into 9 parts: 1. Introduction, 2. Program context; 3. Legal and Institutional framework for Biodiversity and forests; 4. Status and management of protected areas; 5. Status and protection of ecosystems, endangered, or threatened species; 6. Threats to biodiversity and tropical forest and their causes; 7. Scope and effectiveness of conservation efforts; 8. Private sector conservation activities; and 9. Assessment of current program and recommendations.

- Government of Sénégal. Stratégie Nationale pour les Aires Marines Protégées du Sénégal. 2013. http://www.rampao.org/IMG/pdf/strat_amp_definitive.pdf

  Summary. The National Strategy for Protected Marine Areas in Senegal identified three strategic areas of intervention:
  - Institutional strengthening, creation, and management of PMAs;
  - Contribution of PMAs to the sustainable management of fisheries resources, the conservation of marine and coastal biodiversity, and the improvement of local communities' conditions and livelihoods; and
  - Development of scientific research for PMAs.

  The strategy is comprised of 4 parts: 1) Context, 2) PMAs and PMA's network concepts, 3) The National Strategy and 4) Guidelines

- Government of Senegal. February 2014. Plan Senegal Emergent. http://www.gouv.sn/IMG/pdf/PSE.pdf

Summary. Senegal has decided to adopt a new development model to accelerate its progress toward emerging market status. This strategy, entitled the Emerging Senegal Plan (ESP), now constitutes the reference for economic and social policy in the medium- and long-term. This objective is summarized in, "An emerging Senegal in 2035 with social solidarity and the rule of law."

The report is divided into 6 chapters: Chapter I: Economic and social diagnosis, Chapter II: Vision and strategic orientations, Chapter III: Emergence strategy, Chapter IV: Emergence Fundament, Chapter V: Priority action plans and macroeconomic framework, and Chapter VI: Strategy's implementation, monitoring and evaluation.

- International Renewable Energy Agency. 2012. Senegal Renewables Readiness Assessment. http://www.irena.org/DocumentDownloads/Publications/IRENA%20Senegal%20RRA.pdf

Summary. This first assessment is an important milestone for IRENA, whose mission is to promote the widespread and increased adoption and sustainable use of all forms of renewable energy. This will allow IRENA to identify and provide support and advice to Senegal. More broadly, it will also generate knowledge of good practices and cooperation between countries, which are essential to increasing deployment.

This report aims to foster understanding and debate around the renewable energy sector in Senegal and provide an introduction to the issues facing the country. It also offers a broad summary of the experiences of energy market development and the deployment of renewables. The key objectives for this report are: 1. To assess the energy issues facing Senegal and review the current status of energy policy, specifically regarding renewable energy, at regional and national levels; 2. To critically review employed and planned approaches to developing institutional structures for renewables; 3. To review the framework for providing access to modern energy services using renewable energy as well as the current status of technology and infrastructure to deliver it; 4. To critically assess the opportunities and barriers for developing viable business models for renewable energy projects; and 5. To suggest a set of actions to address the identified barriers.

This report aims to conclude the pilot stage of the RRA process for Senegal and to highlight an action framework that would enhance the deployment of renewable energy. The analysis presented here is intended to put the issues and proposed actions in the context of regional and international experience.

- Kane, Ousmane. 2011. Programme de Travail des Aires Protegees du Senegal (POWPA). Ministere de l'Environnement et de la Protection de la Nature. https://www.cbd.int/doc/world/sn/sn-nbsap-powpa-fr.pdf

Summary. This report concerns the action plan for implementing the Programme of Work on Protected Area (PoWPA). The document is composed of 4 parts: 1. A brief presentation of protected areas in Senegal; 2. Mission and organization of National Parks Directorate; 3. National Strategy and framework for biodiversity conservation; and 4. Threats to biodiversity and conservation efforts.

- Ministère de l'Environnement et du Développement Durable. 2014. "5ème Rapport National sur la Mise en Œuvre de la Convention Internationale sur la Diversité Biologique."

Summary. This document is the fifth national report under Article 26 of the CBD which aims to provide information on progress towards achieving implementation of the Strategic Plan, the Aichi Biodiversity Targets, and the Millennium Development Goals (MDGs).

The document is composed as follows: Part 1) Status and trends of biodiversity, threats to and impacts on human well-being; Part 2) Strategy and national action plan for biodiversity, implementation and integration of biological diversity into national policies; and Part 3) Progress towards achieving the Aichi Biodiversity targets and contributions towards the 2015 MDGs.

- Ndiaye, D S, and A Toure. 2009. Gouvernance Locale et Gestion Décentralisée des Ressources Naturelles. Dakar: Centre de Suivi Ecologique (CSE). http://www.cse.sn/IMG/pdf/Gouvernance_Locale_Gestion_decentralisee_des_Ressources_Naturelles.pdf

  Summary. This document was produced with the financial support of the Centre de Recherche pour le Développement International (CRDI). This document concerns the management of environmental issues at the local level, the contribution of natural resources to improving local communities and authorities' incomes, land-use issues and the decentralization process ("institution - building"/"capacity -building"), adequacy of the modern legal context compared to traditional institutions and their regulatory framework (local customs and practices), citizen control of public action, public/private partnerships, the mechanisms of decision making, and the practices of policy evaluation.

  The document has three parts: Part 1: Natural Resources, Environment and Local Development; Part 2: The land in the context of decentralization and reform issues; and Part 3: The decentralization policies for the management of natural resources

- Touré, A., Ndioné, J., Dieye, A.M., Mbaye, P.A., Niang Diouf, T.C. 2010. Rapport sur L'Etat de l'Environnement au Sénégal. Centre de Suivi Ecologique (CSE). Ministère de L'Environnement et de la Protection de la Nature. http://www.cse.sn/spip.php?rubrique30

  Summary: This report is generated every five years by the Ministry of the Environment and Protection of Nature to provide accurate information and indicators on the evolution of Senegal's ecosystems in the context of dynamic social and economic systems. The report also helps support strategic planning for the sustainable use of natural resources. The report is comprised of ten chapters: 1) Socio-economic profile of Senegal; 2) Climate vulnerability; 3) Water resources; 4) Coastal environment; 5) Fishery resources; 6) Land; 7) Forest resources; 8) Biodiversity; 9) Human settlements and living environment; and 10) Environmental planning.

- USAID/COMFISH. « Analyse de la vulnérabilité des communautés côtières et stratégies d'adaptation au changement climatique dans les CLPA de Rufisque/Bargny, Sindia et Joal/Fadiouth »

  Summary. This study was made possible by the support of USAID. The overall objective of this report is to study the climate change vulnerability assessments of Joal/Fadiouth, Sindia, Rufisque/Bargny, identify sustainable adaptation strategies, and develop action plans.

  Specifically, the report aims to: a) study the vulnerability of three CLPA (Conseils Locaux de Pêche Artisanale) zones to address climate change; b) characterize the impacts of climate change on the environment of different study sites; c) define, with local populations, sustainable adaptation strategies; and d) develop action plans for the three study sites.

  This study includes 12 parts: 1. Definition of concepts, 2. Introduction, 3. Global Framework for the management of fisheries and coastal areas in Senegal in the context of climate change, 4. Physical Framework, 5. Human Framework, 6. Methodology, 7. Results, 8. Dynamics of the environment of the study area, 9. Impacts of environmental change and populations perception , 10. Adaptation strategies implemented in Joal/Fadiouth, Sindia and Rufisque/Bargny, 11. Conclusion, 12. Action Plan.

- USAID/COMFISH. 2014. « Etude diagnostique des cadres de concertation deja mis en place sur les Changements climatiques, la peche et l'environnement marin et cotier »

  Summary. This study was initiated by the Ministry of Marine Economy, the Coastal Resources Center, DEEC, CSE, and USAID.

  The overall objective of this study is to assess existing consultation frameworks affecting fisheries and the marine and coastal environment to identify weaknesses.

  Specifically the report:

  - Identifies/lists all consultation frameworks on fisheries, the marine and coastal environment, and climate change;
  - Describes the development of these frameworks;
  - Identifies strengths and weaknesses of the frameworks (composition, functioning, sustainability, etc.);
  - Synthesizes the status of consultations pertaining to the effect of climate change on the fishing industry and marine and coastal environments; and
  - Develops a framework document defining the necessary prerequisites for conducting an efficient dialogue.

  The study is divided into four chapters: Chapter I: Inventory of existing frameworks for consultation on fishing and climate change; Chapter II: Consultation's findings and the degree of support for climate change in the fisheries sector: Chapter III: Diagnostic Summary; and Chapter IV: Recommendations of the necessary preconditions for efficient cooperation: Towards a change process called evolution.

  • USAID/Tetra Tech ARD 2012. «Regional Climate Change Vulnerability Assessment for West Africa».

  Summary. This background paper provides desk research and analysis for a regional climate change vulnerability assessment for the USAID/West Africa Regional Mission. It addresses climate change impacts and vulnerabilities across multiple sectors and also covers regional vulnerabilities around conflict and migration.

  The paper begins with a brief overview of the regional geography. This is followed by an overview of the regional climate, discussing the observed climate and its variability, climate projections, and current climate risk management institutions and activities. The paper then presents climate change vulnerabilities by sector and issue covering the following topics: agriculture, pastoralism, rivers and water resources, inland and coastal wetlands, sea-level rise, forests and woodlands, fisheries, and human health. Next, the section on regional and local challenges addresses conflict and migration in the context of climate change. The last section offers a set of guidelines drawn from a recent report of the Intergovernmental Panel on Climate Change (IPCC, 2012) followed by recommendations presented by sector and sub region.

  • USAID/ Tetra Tech ARD 2013. «The Status and possible evolution of Climate projections in West Africa».

Summary. This report presents the findings from an assessment of the status and possible evolution of climate projections for the region. It highlights both the strengths and limitations of such data for building a picture of climate change in West Africa. Furthermore, this report shows that climate modeling is a complicated task in West Africa, with many challenges linked to limitations within models, availability of observed data, and the unique and complex climate dynamics of the region.

This report focuses on current understanding of climate projections, their utility, and potential improvements in that utility. It addresses how future climate projections are made, from the need for observations on the ground to dealing with uncertainty.

After an introduction, the layout of this report is as follows: Section 2 provides an in-depth account of the sources of climate data, including how they are created or collected, and their individual strengths and limitations. The aim is to provide the reader with background on the science behind climate projections. Section 3 covers rainfall production in West Africa, from historical observations, current simulation and projected future changes.

- USAID/Tetra Tech ARD 2014. «Climate Change and Water resources in West Africa: Coastal biophysical and institutional analysis».

Summary. This document is part of a series of studies produced by the African and Latin American Resilience to Climate Change (ARCC) project that address adaptation to climate change in West Africa. Within the ARCC West Africa studies, this document falls in the subseries on Climate Change and Water Resources in West Africa.

This document addresses the potential impacts of climate change on groundwater management in West Africa. Its general focus is sustainability of rural groundwater resources, because most rural populations heavily depend on groundwater.

After a brief introduction, the Chapter 2 looks at key elements of groundwater hydrology. Climate change is addressed in Chapter 3, which describes how anticipated changes in both rainfall and temperature may affect natural renewal of groundwater resources and the way in which people may affect groundwater resources by modifying their behavior in response to those changes in climate. The Chapter 4 looks at current technologies for exploiting groundwater in rural areas as well as the opportunities and threats associated with change and innovation in water-lifting technology. Then, Chapter 5 addresses governance issues for sustainable groundwater use. And finally, Chapter 6 focuses on potential opportunities for intervention, specifically from the perspective of USAID and its programmed support for rural populations in West Africa in the context of IWRM. The Appendices present some suggestions for action to support these opportunities.

12. ANNEXES

ANNEX A: STAKEHOLDERS CONSULTED

Monday, 17 August 2015 – Washington, DC

- Diane Russell (USAID Forestry and Biodiversity Office, Senior Social Scientist)
- Richard Volk (USAID Water Office)
- Hadas Kushnir (USAID Forestry and Biodiversity Office, Biodiversity and Natural Resources Specialist)

Tuesday, 18 August 2015 – Washington, DC

- Teresa Bernhard (USAID Acting Agency Environmental Coordinator, E3 Bureau Environmental Officer)

Wednesday, 19 August 2015- Washington, DC

- Liliana Caetano Bachelder (USDA Foreign Agricultural Service, Program Analyst for West and North Africa)

Monday, 24 August 2015 (In-briefing with USAID team)- Dakar, Senegal

- Khadidjatou AW (USAID/Senegal, Health)
- Agathe SECTOR (USAID/Senegal, EGO)
- Anne WILLIAMS (USAID/Senegal, EGO)
- Elizabeth CALLENDER (USAID/Senegal, PRM)
- Kalim HANNA (USAID/Senegal, SRO)
- Michelle BARNETT (USAID/Senegal, GDO)
- Megan KYLES (USAID/Senegal, EGO-Ag/Nut.)
- Abdourahamane NDIAYE (USAID/Senegal, SRO)

Tuesday, 25 August 2015- Dakar, Senegal

- Bryn Sakagawa (USAID/Senegal Health Office Director)
- Kady ____ (USAID/Senegal Health Office)

Stakeholder Workshop - Dakar

List of Participants

- DIEYE Moctar (Directeur Technique, Centre de Suivi Ecologique)
- DJIRE Abderhamane (Directeur Adjoint USAID, Yaajeende)
- THIAW Fatou (USAID/COMFISH, Climate Change Officer)
- FAYE Mamadou (Chef de Division Pêche artisanale, DPM)
- DIALLO Sokhna Sy (Planification Suivi Evaluation, DEEC, MEDD)

- GUEYE Aissatou Fall ndoye (Chef BCCPP, PF Environnement, DPM, MPEM)
- Agathe SECTOR (USAID/Senegal, Environment Cluster Lead)
- Anne WILLIAMS (USAID/Senegal, EGO)
- HANNA Kalim (USAID, Environment Officer)
- GUEYE Moussa Mbaye (Directeur Exécutif, ENDA LEAD)
- COLY Bachir (DIREL, MEPA)

Saint Louis, Senegal

- THIAM Amadou (SAED/Directeur du Développement et de l'Appui aux Collectivités Locales)

Thursday, 27 August 2015

Tambacounda, Senegal

- DEME Babacar (Chargé de la Division Forestière et Reboisement, Inspection Régionale des Eaux et Forêts)
- GUEYE Goulé (DGA Bamtaare service, SODEFITEX)
- AMAR Amar (Responsable du Management Intégré, SODEFITEX)
- KHOUMA Oumar (Directeur Service Agro Industriel, SODEFITEX)
- NDOUR Abdoulaye (Chef de Département Sécurisation des Approvisionnements en Produits Agricoles, SODEFITEX)
- BA Salif (Directeur de la DREEC)
- GUEYE Malé (Conservateur du PNHN)
- TANDIA Abdoul Aziz (Directeur Agence Régionale de Développement Tambacounda)
- THIAM Mamadou Mustapha (Inspecteur à la DR Elevage)

Saint-Louis, Senegal

- Mr LY Sada (Direction Régionale du Développement Rural -DRDR)
- DIA El Hadj Boubacar (Chef de Division-Direction Régionale de l'Environnement de Saint Louis)
- Commandant DIOP Moussa (IREF-Inspection Régionale des Eaux et Forêts de Saint Louis)
- COMFISH/CPLA
    - DIALLO Amadou Hady
    - SARR Oumar
    - KOULIBALY Mamadou
    - FALL Yally
    - M'BAYE Alioune
    - NDIAYE Mame Latyr
    - GAYE Saer (pêcheur)
    - DIALLO Marigueye Diaw
    - SENE Abdoulaye
    - DIAW Abdoulaye

- SALL Malick
- DIAW Mariema
- SENE Fara
- MBAYE Moulaye
- SECK Gnania
- DIEYE Yame
- CISSOKO Moussa

Friday, 28 August 2015

Tambacounda, Senegal

- NDIAYE Mamadou (Médecin Chef de District)
- TALL Samba Ndao (Directeur Régional Développement Rural)
- DIONE Ibrahima (Chef du Laboratoire d'Analyse et des Semences de la Région de Tambacounda)
- THIAW Agnès Daba (Directrice PROGEDE2)
- CISSE Chérif (Expert en Organisation des Acteurs Locaux et Genre, PROGEDE2)

Saint-Louis, Senegal

- Commandant Moussa FALL (Conservateur- Parc National Langue de Barbarie)
- Lieutenant Abdoulaye FAYE (Parc National Langue de Barbarie)
- Sergent-Chef Ousmane KA (Parc National des Oiseaux du Doudj)

Saturday, 29 August 2015

- SEYDI Chérif (Garde Forestier - Niokolo Koba National Park)

Sunday, 30 August 2015

Kedougou, Senegal

- NDIAYE Aissatou (Groupement d'Intérêt Economique de KOBA CLUB)
- GUALLAR Ferran (Technical Director of the RNC Dindefelo, Jane Goodall Institute)

Toubakouta, Senegal

- SARR Fatoumata (Union Locale des Femmes Transformatrices des produits de pêche – GIE Disso)
- DIATTA Dienaba (Union Locale des Femmes Transformatrices des produits de pêche – GIE And Jëf)
- DIOP Khady (Union Locale des Femmes Transformatrices des produits de pêche – GIE Ibrahima Niass)
- NDOUR Astou (Union Locale des Femmes Transformatrices des produits de pêche – GIE Mbar Kolon)

Monday, 31 August 2015

Kedougou, Senegal

- DIEYE Pathé (Directeur de la DREEC)

- MALANG Kidiera (Inspecteur Régional des Eaux et Forêts)
- NDIAYE Malick (Inspecteur Régional Adjoint des Eaux et Forêts)
- DIOUF Mignane (Chef de Service Départemental de l'Agriculture)
- TANDIAN Dialiba(Coordinateur Kédougou Encadrement Orientation pour le Développement Humain –KEOH)
- TRAORE Elhadji (Vice Président KEOH)
- CAMARA Bacari (Chargé de Programmes KEOH)
- DIABY Kanio (KEOH)
- DIALLO Moussa (KEOH)
- KEITA Binta (KEOH)
- KHOUMA Mor (Association pour la Promotion des Droits et du Développement Local)
- MONEKHATA Aliou (Mouvement Citoyen pour la Défense des Intérêts de Kédougou)
- DIALLO Amadou Diouldé (Coalition Nationale des Associations et ONG en Faveur de l'Enfant)
- SADIAKHOU Mamadou (Forum Social Local)
- CISSOKHO Tabara (Présidente Comité Genre Equité et Développement)
- BA Djibril (Conseil Consultatif des Enfants et des Jeunes)
- KEITA Abdoul Karim (Président ONG Solidarité Action et Développement - SADEV)
- GUEYE Papa Gorgui (Coordinateur ONG–SADEV)
- TOURE Maroufou (Assistant Coordinateur, ONG SADEV)

Toubakouta, Senegal

- Commandant Marius (Conservateur, Parc National du Delta du Saloum)
- Capitaine Abdou Diouf (Conservateur Adjoint, Parc National du Delta du Saloum)
- Lieutenant Nicolas Dominique - Parc National du Delta du Saloum
- Major Sagna Yacouba (Chef Brigade Forestière)
- Capitaine Alioune Badara Guèye (Conservateur sortant - AMP de Bamboun)

Tuesday, 1 September 2015

Kédougou, Senegal

- TOURE Cheick Tidiane (Spécialiste Gestion des Ressources Naturelles, Coordinateur USAID/Yaajeende)
- NDIONE Basile (Monitoring and Evaluation, USAID/Yaajeende)
- DIAWARA Aliou (Superviseur Agriculture, USAID/Yaajeende)
- NDIAYE Momar (Livestock trainer, USAID/Yaajeende)
- KALY Boubane (Chef de Service du Département de l'Elevage)

- SARR Abdou (Monitoring and Evaluation, Agence Rurale de Développement)
- DOUCOURE Khadidjatou (Présidente du Réseau des Femmes pour le Développement de Kédougou)
- DRAME Mad (Volontaire CECI, REFDEV)
- CISSE Kassa (Président GIE Foukhaba de Bantanko)
- KEITA Jean Pathé (Animateur Communautaire SADEV)

Wednesday, 2 September 2015

Dakar, Senegal

CSE

- Colonel DIEME Samuel, Direction Nationale des Parcs Nationaux
- Commandant KANE Mamadou, Direction des Parcs Nationaux
- Commandant YOUM Babacar Ngor, Direction des Parcs Nationaux
- Commandant KANE Abdoul Salam, Direction des Parcs Nationaux
- Commandant NDIAYE Bocar (Directeur Adjoint Aires Marines Protégées)
- Commandant SOW Momar (Direction Nationale des AMPs)
- KANE Racine (Représentant IUCN/Senegal)
- Dr. SENHOURY Ahmed (Directeur du PRCM)

FINAL FIELD AGENDA

The following field agenda reflects the site visits and meetings undertaken. (Updated from the Work Plan, following the in-brief with USAID)

Table 7. Final Field Agenda

DATE	TIME	MEETING / ACTION	OBJECTIVES
Monday, 24 August	10 AM	Logistics/field coordination meeting with USAID staff	• Overview of ETOA field work schedule and objectives • Confirm roles and responsibilities • Logistics finalization
	11 AM	In-brief with USAID Office Directors/staff	• Detailed review of field program and objectives • Discuss priorities and action items • Introduce GEMS team and highlight nature and objectives of ETOA field work • Review stakeholder consultation process and key individuals, institutions, and/or entities • Solicit input on priorities for data collection and analysis; address questions/concerns
	PM	Meetings with Economic Growth Staff, REA and MEO	• Understand USAID programing, solicit input on the ETOA

Tuesday, 25 August	AM	Prepare for stakeholder workshop	
		Meeting with Health Office staff	• Understand USAID programing, solicit input on the ETOA
	PM	GEMS-facilitated stakeholder workshop	• Gather stakeholder input and perspectives in group setting • Undertake small-group exercises to focus participant feedback and priorities • Facilitate dialogue with USAID and development partners on environment-related objectives and programming
Wednesday, 26 August	Team 1	Travel to St. Louis	Field-based Stakeholder Consultations / Analysis / Writing
	Team 2	Travel to Tamba	
Thursday, 27 August	Team 1	Meetings in St. Louis	
	Team 2	Meetings in Tamba	
Friday, 28 August	Team 1	Meetings in St. Louis, return to Dakar in evening	
	Team 2	Meetings in Tamba Travel to Niokolo Koba	
Saturday, 29 August	Team 1	Off (Dakar) / Writing	
	Team 2	Niokolo Koba National Park	
Sunday, 30 August	Team 1	AM: Depart to Toubakouta PM : Meetings in Toubakouta	
	Team 2	Kedougou	
Monday, 31 August	Team 1	Toubakouta	
	Team 2	Kedougou	
Tuesday, 1 September	Team 1	Toubakouta	
	Team 2	Kedougou	
Wednesday, 2 September	Team 1	AM: Return to Dakar PM: Meetings in Dakar	
	Team 2	Return to Dakar (all day drive)	
Thursday, 3 September	AM	Final meetings in Dakar	Stakeholder Consultations / Analysis / Writing
	PM	Prep for de-brief	Finalization of draft recommendations
Friday, 4 September	AM	GEMS de-brief with USAID/Senegal	Formal conclusion of field mission High-level overview of findings to-date and next steps Thank USAID/Senegal for time, resources, and support
	PM	GEMS team next steps planning – departure	

STAKEHOLDER WORKSHOP AGENDA

Table 8. Stakeholder Workshop Agenda

SCHEDULE	UNIT/MODULE	OBJECTIVES/CONTENT	PRESENTER/FACILITATOR
1 :40 p.m.- 2 :00 p.m.	Participants arrive		
2 :00 p.m.- 2 :05 p.m.	Welcome and overview of work	Outline the importance of the workshop and the expected outcomes	USAID representative
2 :05 p.m.- 2 :20 p.m.	Introduction of participants	Ice-breakers: Self-introductions of participants and facilitators; Review of expectations and pertinent information	GEMS/ETOA team
2 :20 p.m.- 2 :25 p.m.	Overview of ETOA process and USAID five-year strategic planning	Understand the ETOA process and its role in the CDCS strategic planning process	USAID representative
2 :25 p.m.- 2 :45 p.m.	Summary presentation of four areas related to environmental threats in Senegal	Introduce the participants to the areas as they relate to environmental threats	GEMS/ETOA team
2 :45 p.m.- 3 :00 p.m.	Group work prep	Form small groups and introduce the participative/collaborative approach of the exercise to be conducted on presented issues	Facilitator: GEMS/ETOA team
3 :00 p.m.- 3 :45 p.m.	Group work	Group discussion on themes and development of a small group report	Team of consultants and participants
3 :45 p.m.- 4 :00 p.m.	Coffee break		
4 :00 p.m.- 4 :45 p.m.	Presentation of group reports and discussion	Consensus-building and sharing of perspective, identification of priority problems, and recommendations	Team of consultants and participants
4 :45 p.m.- 5 :00 p.m.	Conclusion of workshop	Thank the participants and conclude the work	USAID representative

NOTES FROM STAKEHOLDER WORKSHOP

Table 9. Notes from Stakeholder Workshop

ENVIRONMENTAL ISSUE/FOCUS	THREATS AND OPPORTUNITIES	RECOMMENDATIONS/ OPPORTUNITIES
Tropical Forests	• Climate change • Waste discharges • Declassification of forests in favor of urbanization • Illegal logging • Weak governance of forests • Lack of knowledge regarding ecosystem services provided by forests and forest products • Appropriation of forested land • Lack of institutional communication and coordination • Problematic implementation of land use and infrastructure projects • Ineffective implementation of EIES • Human migration and incursion on National Park lands • Salinization • Urbanization/Related infrastructures • Drought	• Development of the pharmacopoeia • Reforestation policy—promotion of carbon sequestration projects • Capacity-building of Water and Forest Ministries and nearby communities • Revision of regulatory texts and policies • Forest inventory—improve the reference framework • Capitalization/development of program and project results • Development of pastures • Integration of external actors in forest management • Strengthen forest governance • Favor sustainable land management practices: enclosure, reforestation, shields • Supporting research (adapted species resilience, etc.) • Development of PNFL • Carbon sequestration through peri-urban reforestation policy
Biodiversity	• Proliferation of invasive species • Climate change • Insufficient/lack of implementation of sustainable technologies • Poor use of agricultural chemical inputs • Lack of knowledge regarding data • Non-application of EIES or of measures included in the PGES • Extrajudicial appropriation and conversion of land • Non-application of Nagoya protocol • Illegal trade of flora and fauna • Effects of pesticides on biodiversity (habitats, ecosystems, etc.) • Mineral and petroleum exploitation • Marine pollution (domestic and industrial chemicals, etc.)	• Strengthened conservation of threatened species • Capacity-building for environmental agencies • Pilot sites for the implementation of SN on wetlands • Cartographic study of key biodiversity sites • Improvement of green technologies • Awareness of biodiversity conservation • Promotion of ecosystem services • Leverage the private sector in the management and conservation of natural resources • Mapping and inventory of biodiversity • Acknowledge value of traditional knowledge
Aquatic resources	• Poor fishing practices • Illegal/non-regulated fishing • Proliferation of fish flour processing plants • Lack of fishery management plans	• Marine and coastal inventories • Strategic and programmatic evaluations • Application of research • Improve coastal protection solutions • Adapt regulations (fisheries, extraction, exploitation, organizational)

	• Lack of human resources in the fisheries sector • Maritime infrastructures without EIES • Petroleum production • Extrajudicial occupation of the coast	• Strengthening of coastal and marine management law • Application of polluter-pays-principle • Establishment of a monitoring system for coastal pollution • Strengthening of governance • Rehabilitation (artificial reefs, ZPP) • Mapping and inventory of natural resources • Sub-regional co-management approach • Improvement of the ZPP and development of marine aquaculture • Control of cross-border flows of fisheries products
Climate	• Unsustainable production and consumption practices • Population knowledge • Poor sylvo-pastoral techniques • Weak management and governance • Lack of cohesion among various regulatory texts • Air pollution	• Incentives in favor of sustainable consumption • Promotion of biogas • Promotion of energy efficiency (encouraged by private sector) • CDM/REDD projects • Promotion of sustainable green cities • Awareness of issues by actors (decision-makers, collectives, populations/communities) • Research and promotion of innovation technologies and practices as adaptation to climate change

STAKEHOLDER CONSULTATION QUESTIONNAIRE

NOTE: The questions are not sequential, but should be used to help guide a semi-structured interview and information gathering process.

TROPICAL FORESTS

1. Are tropical forests under threat in Senegal?
2. In your opinion, are tropical forests increasing or decreasing? Please explain.
3. In (2), above, if forests are decreasing, what are some of the factors leading to their decline (in order of priority)?
4. What are some of the locations/areas where tropical forests are affected?
5. What can be done to stop/prevent the decline of tropical forests (please respond according to each of the factors identified in (3) above)?

BIODIVERSITY (Species & Ecosystems)

1. Are biodiversity resources (species and ecosystems) under threat in Senegal?
2. In your opinion, are biodiversity resources increasing or decreasing?

3. In (2), above, if biodiversity resources are decreasing, what are some of the factors leading to their decline? Please list in order of priority.

4. What are some of the species/ecosystems affected?

5. What can be done to stop/prevent the decline of biodiversity resources (please respond according to each of the factors identified in (3) above)?

AQUATIC RESOURCES

1. Are aquatic resources (species and ecosystems) under threat in Senegal?

2. In your opinion, are aquatic biodiversity resources increasing or decreasing?

3. In (2), if aquatic resources are decreasing, what are some of the factors leading to their decline (in order of priority)?

4. What are some of the resources (species and ecosystems) affected and their locations?

5. What can be done to stop/prevent the decline of aquatic resources (please respond according to each of the factors identified in (3) above)?

CLIMATE CHANGE

1. Is climate change affecting Senegal? How?

2. What are some causes of CC in Senegal?

3. What is proposed to address CC?

List of organizations working on climate change adaptation and mitigation, and the conservation and management of tropical forests and biodiversity in Senegal *(Please provide details in the table below*) -

Name of donor	**Project/Program/ Activity being funded**	**Organization implementing program/activity**	**Locations/Areas where program activity is being implemented**	**Objectives**

LINKS TO USAID PROGRAMMING

1. What is the link between environment and:

    a. Agriculture

    b. Conflict / Peace Building

c. Democracy and Governance
d. Disaster Assistance
e. Education
f. Energy
g. Fisheries
h. Nutrition and Family Planning
i. Public Health (Including HIV/AIDs and Malaria)
j. Water, Sanitation, and Hygiene

2. What are the opportunities for environmental protection in these types of activities?

ANNEX B. LEGISLATION AND GOVERNMENT INSTITUTIONS

LEGISLATION

Senegal has had a Ministry of the Environment since 1981, and an Environmental Act since 1983 (Code de l'Environnement). Senegal's new constitution, adopted in 2001, includes an article related to the environment. The article states: "The Republic of Senegal guarantees all citizens basic individual freedoms, economic and social rights and collective rights. These rights and freedoms including the right to a healthy environment is carried out according to the conditions provided by law." [133]

The "Code de l'Environnement" was updated in 2000 to account for new dimensions of environmental issues (Stockholm Convention, Rio Conferences, etc.). The new code includes strategic planning instruments such as the National Action Plan for the Environment, the National Action Plan to Combat Desertification, the Forestry Action Plan, the National Strategy for Implementing the Framework Convention on Climate Change, the Action Program for Biological Diversity, the Action Plan for the Protection of the Ozone Layer, and the Management Plan for Hazardous Waste. The code also highlighted the importance of impact assessments as a part of environmental decision-making.[134]

The Environmental Impact Assessment (EIA), a requirement per Chapter 5, Article L 48 of the Code de l'Environnement[135], pertains to any development or activity likely to affect the environment, including policies, plans, programs, and regional or sector work. EIA approval is required prior to authorization of the project. A technical committee, working under the Ministry of the Environment and dictated by the Directorate of Environment and Classified Establishments (DEEC), administers the process. The committee is responsible for managing the EIA process, including public participation, review of EIA reports, and approval or rejection of the project.[136]

Senegal environment and natural resource management policies include[137]:

- Land management policy
- Agricultural policy
- Hunting and wildlife protection policies
- Fishing policies
- Urban and housing policies
- Tourism policies
- Energy and mining policies
- Forest policies

Senegal has ratified most of the major international environmental conventions, including the Ramsar Convention, Paris Convention of 1972, Washington Convention of 1973 (CITES), Bonn Convention relative to the protection of migratory species, United Nations Law of the Sea, Biodiversity Convention, Desertification Convention, African Convention of Algiers, and Convention of Abidjan concerning the protection of marine species.[138]

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[133] (Sow n.d.)
[134] (Government of Senegal n.d.)
[135] Article L 48 states, "Every development project or activity that might affect the environment, including policies, programs, and regional and sectoral studies, are subject to complete an environmental evaluation."
[136] (Senegal, l'Evaluation des Impacts sur l'Environnement n.d.)
[137] For more information on these policies, see the USAID/Senegal Biodiversity and Tropical Forests Assessment of 2008, found at: http://www.usaidgems.org/Documents/FAA&Regs/FAA118119/Senegal2008.pdf
[138] (ECODIT 2008)

The main frameworks concerning tropical forests and biodiversity in Senegal are established by the Environmental Code, The Hunting and Wildlife code, the Mining Code and the Forestry Code. Legislation passed prior to 2008, as stated in the 2008 USAID Senegal 118/119 report, are noted with a [*] throughout this section.

Table 10 Major Environmental Legislation in Senegal

LEGISLATION	DATE ENACTED	LEGISLATION DETAILS
Law N° 93-06*	February 04, 1993	Its enforcement decree 95-357 of 11 April 1995 places the protection of forests under the authority of DEFCCS. The Department of Water and Forests (DEF) has principal responsibility for forest conservation and management. With one exception, the law does not transfer any responsibility for forest conservation to local communities. This one exception is the "*terroir* lands" where management of the forest is the responsibility of a local community on the basis of a management plan approved by the DEF. Water and Forest agents "are responsible for the protection, conservation, and development of both national plant and animal forest resources" (Article L. 56 of the Forest Code). They must approve any measures that are likely to alter forest resources. Thus, any excavation that affects soil and/or forests is normally prohibited in forest reserves. If such work is done outside classified forest zones, the authorization of the Regional Council President is necessary after consultation with the concerned rural council. To ensure protection of this area, the authorization to start operations can only be granted after submission of a case that includes an EIA. (Article L. 44 of the Forest Code)
Law no. 96-07*	March 22, 1996	This code transferred authority for nine sectors concerning environment and natural resource management to local communities. (These nine sectors include Environment and Management of Natural Resources; Health, Population and Social Action; Youth; Sports and Leisure; Education; Planning; Territory Management; Urbanism; and Habitat.) The law distributed authority to different levels of the local communities (regions, municipalities and rural communities).
Law N ° 2013-10 Art. 305	December 28, 2013	Authority transferred to "communes" in terms of environment and natural resource management. These responsibilities are: • management of *forêts de terroirs*; • management of natural sites of local interest; • creation and management of community forests and protected areas; • creation of artificial ponds and small dams, particularly for agricultural purposes ; • reforestation operations;

		• development of municipal plans of action for the environment; • waste management and public health risk mitigation; and • enclosure.
Law N ° 2013-10, Art. 304	December 28, 2013	Authority transferred to "communes" in terms of environment and natural resource management. These responsibilities are: • creation and management of forests, protected areas, and natural sites of county interest; • Issuing of authorization for hunting, after consulting the council; • management of inland waters (except rivers of national or international status); • development and implementation of departmental action plans for the environment, emergency response, and risk reduction; • establishment of firewalls and early firing as part of the fight against bush fires; • development and implementation of local action plans for the environment; • protection of groundwater and surface water; • distribution of logging quotas between municipalities; • fight against fires and protection of nature; • permission to clear the advice of the municipal council; and • licensing, cutting, and felling.
Law No. 2001-01	January 15, 2001	This law places the protection of environment under the authority of the Ministry of Environment. It states that environmental and social assessments for projects, programs, development plans, and policies is mandatory. It establishes a mandate to complete prior or post environmental and social assessments: "Any project or activity that may affect the environment, as well as policies, plans, programs, and regional and sectorial studies will be subject to an environmental assessment" (Article L 48, Loi 2001-01, 2001).[139]
Decree n° 2014-880	July 22, 2014	The Ministry of Environment and Sustainable Development (MESD) is responsible for natural resource management activities (forests, wildlife) and environmental protection in all sectors of activity (pollution and nuisance control, ecosystem preservation, etc.).
Law No. 86-04*	January 24, 1986	Its adoption was necessary due to acceleration of poaching and destruction of forests and savannah. New elements introduced in the code include the strict

[139] (Diagne 2014)

		enforcement of penalties when a violation is committed in a protected area. Trade of animal species is controlled in accordance with commitments under the CITES Framework Convention. Consequently, Decree No. 80-445 of 29 April 1980 prohibits the importation of fully protected living animals, and prohibits the importation of certain animals, corpses, or trophies in Senegal except in the case it is for the interest of the public following a decision taken by the Ministry of Nature Conservation. Since 1983, a Water, Forests and Hunting control office was created at Léopold Sédar Senghor Airport in Dakar in order to control the import and export of animals and wildlife. In 1985, a similar office was set up at the port of Dakar. Decree No. 96-1134 of 27 December 1996, which provides for the implementation of Law No. 96-07 of March 22, 1996 with respect to natural resources, gives the responsibility for wildlife protection to local authorities, particularly the authority to create natural animal reserves.
Law No. 2003-36*	February 6, 2003	Supersedes the law No. 88-06 of 26 August 1986 and its enforcement decree No. 89-907 dated 5 August 1989, which established the Mining Code. This new law, which regulates exploration and mining conditions, as well as the mode of operation of quarries, ensures the protection of mineral resources. In addition, any operation licensee must participate in the rehabilitation of mine sites by opening a fiduciary account to cover the implementation costs of the rehabilitation program. Similarly, any mining activity that is carried out in classified forests is required to comply with the provisions of the Forest Code.
Law n° 98-32	April 14, 1998	The fishing code is part of the new fisheries policy to ensure protection of national fisheries resources. The Code establishes the principle of biological rest to ensure sustainable management of fishery resources.

GOVERNMENT INSTITUTIONS

The Ministry of the Environment and Sustainable Development (MESD) is responsible for environment and natural resource management. MESD prepares and implements the environment and natural resource management policies. Thus, MESD is directly responsible for the fight against desertification; the protection and regeneration of soils, forests and other wooded areas; sustainable use of forest resources; and protection of animal species and plants. MESD also prepares and enforces laws and regulations in the forestry sector.[140]

[140] (Andre 2014)

The Ministry includes four directorates that are responsible for the implementation of environmental policy; the Directorate of National Parks (DPN), DEEC, the Directorate of Water, Forests, Hunting and Soil Conservation (DEFCCS), and the Directorate of Water Retention Basins and Artificial Lakes (DBRLA).[141]

Under the authority of MESD, DEEC is responsible for implementing the government's environmental policies. To that extent, its mission is to prevent pollution, monitor the actions of various parties and organizations involved in the environment, and develop legal texts concerning the environment. DEEC is also responsible for developing EIAs. DEEC validates the terms of reference for EIAs, monitors the implementation of Environmental Management Plans, provides technical opinion on projects submitted and prepares a decision on environmental compliance for the minister of the environment. [142]

The interdisciplinary nature of environmental policy has prompted the creation of CONSERE (High Commission for Natural Resources and the Environment) by Decree No. 93-885 of 4 August 1993. CONSERE provides a framework for responsibility, under the chairmanship of the Prime Minister, to direct the action of the various departments involved in the management of natural resources and the environment. Thus, the establishment of CONSERE, which led the participatory process of developing the NEAP in 1997, harmonized the legal and institutional framework with the approaches of the various categories of stakeholders, while also taking into account the environmental dimension in planning for economic and social development.

The National Sustainable Development Committee (CNDD) was created as a result of the World Summit of Rio in 1992 by Decree No. 5161 of May 26, 1995. It was developed to reflect the integrated and participatory approach established by the National Sustainable Development Strategy (NSSD) with an integrated and participatory approach. The CNDD includes, in addition to the State, various actors from the private sector, NGOs, local communities, the scientific community, women's organizations, youth movements, unions, and parliamentarians. The CNDD is chaired by the Ministry of Foreign Affairs.

ANNEX C: STAKEHOLDER ACTIVITIES

This is an annotated list of activities by donor organizations that support biodiversity, tropical forestry conservation, environmental protection, and climate change adoption and mitigation. It identifies multilateral organizations, NGOs, universities, and other local organizations involved in conservation.

Table 11. Development Projects in Senegal by Donor

PROJECTS/ PROGRAMS	FUNDS	DONORS
Integrated Ecosystem Management in Senegal Project	*7,329,000 US$*	GEF, UNDP, GoS
Integrated Coastal and Marine Resources Management Program	*7 500 000 000 FCFA*	WB, GoS
Participatory and Sustainable Management of Traditional Substitute Energies Project	*2 950 000 000 FCFA*	IFAD, WB, UNDP, GoS
Degraded Land Management in the Groundnut Basin Project	*1 924 200 000 FCFA*	UNDP, GEF, GoS

[141] (ECODIT 2008)
[142] (Direction de l'Environnement et des Etablissements Classes n.d.)

Integrated Management of Invasive Aquatic Weeds in West Africa	*2000 000 000 FCFA*	African Development Bank (ADB), GoS
Support Program for Forestry Development	*8 600 000 000 FCFA*	Netherlands, GoS
Biodiversity conservation through participatory rehabilitation of degraded soils in arid and semi-arid borders of Mauritania and Senegal Project	*12,760,360 US$*	GEF, Netherlands, GoS GTZ
Operation acacia - Support for food security and poverty alleviation, and prevention of land degradation in gum and resin producing countries	*230 000 000 FCFA*	Italian Cooperation, GoS
Agriculture and Natural Resource Management Program (Wula Nafa)	*15,000,000 US$*	USAID
Forests and rural spaces rehabilitation project	*218 380 000 FCFA*	CIDA, GoS
Strengthening sustainable mangrove management in Saloum Delta	*996 000 000 FCFA*	JICA, GoS
Self-Promotion and Management of Natural Resources in Sine Salom	*5 700 000 €*	GTZ, GmbH
Integrated Community Forestry Development	*1 875 000 000 FCFA*	JICA
Community Management of Natural Resources Project	*17 800 000 000 FCFA*	USAID
Agro Forestry for combating desertification	*5,850,000 US$*	IFAD, WADB, GoS
Project to support forestry entrepreneurship in Kolda	*200 000 000 FCFA*	CIDA, GoS
Services Improvement and Valuation of Forest Ecosystems in Senegal	*4,000,000 US$*	Spain, GoS
National forest seeds program	*201,705 US$*	Netherlands

Forestry development and support program	*8 600 000 000 FCFA*	Netherlands
Senegal River Valley Rehabilitation Project	*12,760,360 US$*	UNDP, GEF
Integrated Management of Natural Resources in the Niger and Gambia Basins Support Program	*1 200 000 €*	European Development Fund
Institutional Support to the Environment Sector Institutional Support to the Environment Sector/DPN	*1 219 500 €* *1 219 500 €*	French Cooperation
Protection and Sustainable Management of the Djoudj National Park Border	*2 560 000 €*	BMZ
Support and Organization of Grassroots Communities for the Sustainable Management of the Paylmyra Palm outside of NKNP	*1 155 172 €*	EU, GoS
Implementation of the RBDS Management Plan	*2 706 540 Francs Suisses*	DGIS
National biosafety framework development project	*288,000 US$*	UNEP, GEF
Coastal Reforestation Project	*6 600 000 000 FCFA*	Japan
Project to Support Small-scale Local Irrigation	*10 900 000 000 FCFA*	ADF, GoS
Implementation of the Management Plan for the Biosphere Reserve of the Saloum Delta Project	*2 706 540 Francs Suisses*	DGIS, Netherlands Cooperation
PNOD Implementation Management Plan	*1 200 000 000 FCFA*	Netherlands, FES, GTZ, Nord-Pas Region of Calais
Biodiversity Conservation Project through participatory rehabilitation of degraded lands in arid and semi-arid borders of Mauritania and Senegal	*2 900 000 0000 FCFA*	GEF, UNDP, UNEP, GoS

Table 12. USDA Activities in Senegal (as of July 2015)

ACTIVITY NAME	ACTIVITY DESCRIPTION	USDA AGENCIES	INITIAL FISCAL YEAR	FINAL FISCAL YEAR	FUNDING SOURCE
Product and Market Information					
ERS Food Security Assessment	Senegal is one of the countries analyzed in this annual report.	ERS		Ongoing	USDA
Policy and Regulatory Capacity Building					
Sanitary and Phytosanitary (SPS) Program	Capacity building for animal health, plant health, and food safety (SPS) agencies to strengthen SPS systems and improve consistency with the WTO and international standard-setting bodies (OIE, IPPC, Codex Alimentarius). The USAID SPS Advisor for West Africa was based in Dakar, Senegal and provided technical advice on sanitary and phytosanitary (SPS) systems in the West Africa region. The position has been filled and moved to Accra in 2015. The Advisor leads the implementation of plant health, animal health, and food safety programs managed by USDA and USAID. Under a USAID Participating Agency Program Agreement (PAPA) with USDA, capacity building activities were undertaken focusing on strengthening the plant health and food safety regulatory structure and industry practices to improve trade opportunities and food security. The APHIS Attaché for West Africa is based in Pretoria, South Africa. July 2014- Rift Valley Fever Stakeholder's Meeting in Dakar, Senegal	FAS APHIS	2008	Ongoing	USAID USDA
Assess Agricultural Data	NASS and ERS are conducting an assessment of the data and statistics systems. This is part of a multi-year strategy under FtF which has seen	ERS NASS	2014	2014	USDA

ACTIVITY NAME	ACTIVITY DESCRIPTION	USDA AGENCIES	INITIAL FISCAL YEAR	FINAL FISCAL YEAR	FUNDING SOURCE
and Statistics in Senegal	assessments conducted in six FtF countries through FY2013, with three more planned for 2014. Depending on the outcomes of these assessments, they may lead to follow-on technical assistance and/or capacity building activities in the targeted countries. These activities support the FAS strategic goal to enhance partner countries' capacity for agricultural development and participation in international trade.				
English Translation of FAO-ECTAD-Bamako Website	Funded the translation of the website from French into English to make the information accessible to more countries in West and Central Africa	APHIS	2010	2010	USDA
African Codex Delegates Colloquium	In August 2010, Codex delegates from countries throughout Africa were hosted in **Pretoria, South Africa**, to meet on Residues of Veterinary Drugs in Foods (CCRVDF); Processed Fruits and Vegetables (CCPFV); and Food Hygiene (CCFH). USDA also hosted a workshop on CODEX.	FAS	2010	2010	US Codex Office USDA
Codex Bilateral Workshop	From June 1-3, 2010, 25 Senegalese officials participated in a bilateral Codex Workshop, building capacity for effective participation in Codex. This event brought together Codex delegates from countries throughout Africa for three specific committees to discuss issues and generate heightened collaboration within the region prior to the worldwide Codex meetings later this year.	FAS	2010	2010	US Codex Office
African Codex Delegates Colloquium	The 19th Session of CCAfrica met in Accra, February 1-4, under the chairmanship of Ghana, the regional coordinator. Highlights of the meeting included two issues referred by the 33rd Commission: (1) Considering the Impact of Private Standards - the Committee requested that the Commission establish a working group to provide a forum for countries to discuss the implications of private standards directly with private	FAS	2011	2011	US Codex Office

ACTIVITY NAME	ACTIVITY DESCRIPTION	USDA AGENCIES	INITIAL FISCAL YEAR	FINAL FISCAL YEAR	FUNDING SOURCE
	standard-setting organizations; and (2) The Necessity and Scope of a draft proposed standard for Processed Cheese.				
Codex Outreach	In May 2011, two officials each from Cameroon, Ethiopia, Ghana, Kenya, Mozambique, Nigeria, Senegal, South Africa, and Zambia visited the U.S. to meet with government officials who work with Codex Alimentarius in different capacities. This program strives to educate the delegates on the organizational structure and jurisdictional divisions of Codex within the U.S, how to coordinate internal Codex offices, as well as how to solicit input on national positions from stakeholders in the public and private sectors.	FSIS FAS	2011	2011	FAS USDA
African Codex Delegates Colloquium	The U.S. Codex Office hosted its 4th African Codex Delegates Colloquium in Addis Ababa, Ethiopia, from September 13-15. The colloquium featured presentations from the U.S. Codex Office and U.S. Food and Drug Administration on preserving the science basis of Codex; the risk management role of Codex; and the relationship between Codex and the World Trade Organization. Roundtable discussions among U.S. and African Codex delegates were conducted on the following upcoming committee sessions: Food Import and Export Certification and Inspection Systems (CCFICS), Nutrition & Foods for Special Dietary Uses (CCNFSDU), and Food Hygiene (CCFH). Approximately 70 African government officials from 24 countries attended the colloquium.	FAS	2011	2011	US Codex Office and FAS EMP
Codex Coordinating Committee for Africa	CCAFRICA Codex SPS Workshop held in Senegal, February 2012. Meeting of Codex Committees on: General Principles (CCGP); Residues of Veterinary Drugs in Foods (CCRVDF); Food Additives (CCFA).	FAS	2012	2012	US Codex Office and FAS EMP

ACTIVITY NAME	ACTIVITY DESCRIPTION	USDA AGENCIES	INITIAL FISCAL YEAR	FINAL FISCAL YEAR	FUNDING SOURCE
Aflatoxin mitigation through biocontrol - Aflasafe	USDA/FAS is partnering with USDA/Agricultural Research Service and the International Institute of Tropical Agriculture to mitigate aflatoxin contamination in maize and groundnut, through the development of a biocontrol product called Aflasafe. The process to develop country-specific products takes several years. To date, the following efforts have been completed in this process: • National stakeholder consultation • Aflatoxin prevalence, characterization, and sample collection • Technical capacity-building of national teams • Field efficacy trials of promising strains • Product development The following are efforts planned for the next several years: • Product registration Manufacturing and distribution	FAS	2012	Ongoing	USDA USAID
Tuta absoluta mitigation in tomatoes	The workshop brought together NPPOs, entomologists, and researchers from 19 West and Central African countries. Representatives of CORAF/WECARD (West and Central African Council for Agricultural Research and Development), USAID, APHIS, Virginia Tech, and IPM/CRSP (Integrated Pest Management Collaborative Research Support Program) attended the meeting, which was co-funded by USAID West Africa and CORAF/WECARD. Key topics were presented and discussed, including: biology and damages caused by Tuta absoluta; detection; monitoring and control methods; American experience on Tuta absoluta mitigation; and USDA new regulation on tomato export from ECOWAS (Economic Community of West African States to two tomato orchards was organized, during which, infestations due to Tuta absoluta were observed.	FAS APHIS	2013	2013	USAID

ACTIVITY NAME	ACTIVITY DESCRIPTION	USDA AGENCIES	INITIAL FISCAL YEAR	FINAL FISCAL YEAR	FUNDING SOURCE
Oversight of Irrigation Activity Utah State University	Provided implementation support and oversight responsibilities for irrigation projects in countries such as Moldova, Mali, Burkina Faso, Ghana, Senegal, and Morocco. Assisted MCC by reviewing and providing comments on key implementation deliverables, processes, and actual performance during the start-up and full implementation of Compact activities. Guided MCC and MCA entities to resolve strategic and technical decisions.	FAS	2010	2013	MCC
Agricultural Production, Processing, and Storage					
Sanitary and Phytosanitary Program	FAS sponsored research between USDA scientists and West African scientists to help assess the vulnerability of sorghum cultivars, hybrids, and land races from the U.S. and West Africa to long smut and grain mold fungi.	FAS	2005	2010	USDA
Sanitary and Phytosanitary Program	In March 2010, a USDA fruit fly expert advised NPPO on activities to be carried out for the eventual establishment of area-wide integrated fruit fly suppression program in mango production areas in Senegal. From September 26-October 2, 2010, a Senegalese government official attended the International Symposium on Fruit Flies of Economic Importance. The conference gave the official the opportunity to meet with other professionals in the field to share their research results and build contacts for future collaboration.	FAS APHIS	2010	2010	USDA
Sanitary and Phytosanitary Program	In 2010, two Senegalese representatives traveled to Guadalajara, Mexico to visit mango producers and facilities that utilize hot water treatment for the mango export market.	FAS APHIS	2010	2010	USAID

ACTIVITY NAME	ACTIVITY DESCRIPTION	USDA AGENCIES	INITIAL FISCAL YEAR	FINAL FISCAL YEAR	FUNDING SOURCE
Sanitary and Phytosanitary Program	In May USAID/Senegal provided USDA/FAS with additional funding to support fruit fly control efforts and U.S.-based technical training. Three Senegalese officials traveled to the International Center for Insect Physiology and Ecology (ICIPE) in Nairobi, Kenya.	FAS APHIS	2010	2010	USDA USAID
Sanitary and Phytosanitary Program	From March 15-16 and 21-25, 2011, USDA supported plant disease and pest control trainings for small mango producers in Dakar and Bambilor, Senegal. From August 1-6, 2011, USDA supported plant disease and pest control trainings of small mango producers in Fimela and Sokona, Senegal. Training was provided by DPV staff who previously received training on these topics from USDA.	FAS APHIS	2011	2011	USDA USAID
Sanitary and Phytosanitary Program	Sponsored Senegal DPV Participation in International Fruit Fly Meeting. The Chief Entomologist from DPV (Crop Protection Directorate) in Senegal participated in this international meeting.	FAS	2012	2012	USAID
Surveillance and control of Contagious Bovine Pleuropneumonia (CBPP)	Provided the forum for Senegalese and Gambian vet services officials to commit to prioritizing the prevention and control of CBPP in both countries and developing a coordinated and cooperative surveillance, diagnostic, prevention, and control program.	FAS APHIS	2012	2012	USAID
Promoting The Incorporation Of Soybean Into Poultry Feed University of Cape Coast	This project aims at promoting the incorporation of soybean cake into poultry feed. The intervention will be organized within the context of agro-industrial settings whereby small-scale soybean processors and poultry farmers will be provided with training in improved methods of handling and processing of soybean cake and its utilization in poultry feed.	FAS	2014	2016	FAS

ACTIVITY NAME	ACTIVITY DESCRIPTION	USDA AGENCIES	INITIAL FISCAL YEAR	FINAL FISCAL YEAR	FUNDING SOURCE
Information Exchange between West Africa and South Africa on Fruit Fly Management	Seven National Plant Protection Officials and Leaders of Fruit Tree Production & Industry Grower's Associations from Burkina Faso (2), Ghana (2), Senegal (1), and Benin (2) participated to the Study Tour organized by USAID-USDA SPS Advisor for West Africa in collaboration with APHIS Dakar and Pretoria. The tour aimed at enforcing West African capacities to monitor and control fruit flies, including Bactocera invadens. Meetings were held with the National Plant Protection Officials (NPPO) and the Agricultural Research Council-Institute for Tropical and Subtropical Crops (ARC-ITSC) and Citrus Research International (CRI).Various places in northern South Africa (Nelspruit and Hoedspruit) were visited to meet citrus and mango growers and visit orchards as well as fruit processing plants.	FAS APHIS	2013	2013	USAID
Research, Extension and Education					
Ecology and Management of Grasshoppers and Other Insect Pests in the Northern Great Plains	USAID funded project to conduct very large scale field trials of the locustpathogenic fungus Metarhizium anisopliae var. acridum (Green MuscleTM) in Senegal.	ARS APHIS	2005	2010	USAID
Impact Analysis and Decision Strategies for Agricultural Research	NIFA supported Virginia Polytechnic Institute for a project to assess the economic impacts of new agricultural technologies such as alternative pest management practices, biotechnologies, and bio-fuels. As a test area, this project completed an economic evaluation of tomato integrated pest management strategies in Mali and Senegal.	NIFA	2006	2011	USDA
Agricultural and Emerging Chemicals: Fate, Effect and Exposure	NIFA supported Oregon State University for a project called, "Agricultural and Emerging Chemicals: Fate, Effect and Exposure." The ultimate goal of the program was to	NIFA	2007	2011	USDA

ACTIVITY NAME	ACTIVITY DESCRIPTION	USDA AGENCIES	INITIAL FISCAL YEAR	FINAL FISCAL YEAR	FUNDING SOURCE
	inform the public and policy makers about risks and benefits of agricultural and emerging chemical uses. Investigators studied the ecotoxicology of pesticides in the U.S., and assessing the feasibility of adapting pesticide environmental assessment systems (PEAS) to the West African context.				
Sorghum Fungal Pathogen Biology and Disease Resistance	Collaboration with scientists at the Centre National de la Recherche Agronomique, Senegal, West Africa, resulted in identification of potential resistant sources to long smut (Sporisorium ehrenbergii Vanky) disease. Work to screen a wide spectrum of sorghum hybrids/lines under varied environmental conditions continues.	ARS FAS	2007	2012	USDA
West Africa Training in Laboratory Quality Control	Short Course upgraded lab management/quality control ensuring accurate and timely information from the labs.	APHIS	2010	2010	USDA
GPS/GIS Transboundary Animal Disease Information Training Workshop	To train counterparts on the use of data bases for epidemiology methods, surveillance, and transboundary diseases.	APHIS	2010	2010	USDA
Veterinary services Program: Transboundary Animal Disease Information	As part of SPS capacity building efforts in West Africa, USAID and USDA have worked collaboratively to organize a cross-border meeting on Rift Valley Fever to strengthen communication between the animal health officials of Mauritania, Mali, and Senegal and to discuss reactivating the surveillance networks for RVF in Mauritania, Senegal, and Mali.	FAS APHIS	2012	2012	USAID
Sustainable Management of Forest Resources Under Climate Change	NIFA is providing support to Michigan State University for a project called, "Sustainable Management of Forest Resources Under Climate Change. "The goal of this project is to use the linkages between fire history and climate history to project the	NIFA	2009	2014	USDA

ACTIVITY NAME	ACTIVITY DESCRIPTION	USDA AGENCIES	INITIAL FISCAL YEAR	FINAL FISCAL YEAR	FUNDING SOURCE
	frequency and intensity of fire under future climate scenarios. Tropical tree species and carbon dynamics in West African savannas were both observed in Senegal for this project.				
Scientific Cooperation Research Program	Multiyear program that supports research, extension, and education projects that generate and strengthen scientific and trade capacity building synergies between domestic and international agricultural professionals. Three Fellows have been trained since 2010. Training topics included artificial insemination, agronomy, and integrated pest management. The University of Missouri is leading an applied agricultural research project to construct low-cost biodigesters (primarily to replace toxic sources of fuel used for cooking) in rural Senegal. This project is intended to also be implemented in Mali.	FAS	2010	2013	USDA
Faculty Exchange Program	Semester long agricultural science technical training for university instructors to improve teaching skills and develop new courses for their universities. Two instructors from Senegal have participated in the Faculty Exchange Program since 2007.	FAS	2007	2010	USDA
Cochran Fellowship Program	108 fellows from Senegal have been trained since 1997 in a variety of topics including food safety, agricultural statistics, specialty food development, aflatoxin and biological control, biosafety, cotton production and processing, and livestock herd management. In 2015, topics will include biofuels and cotton classification and grading.	FAS	1997	Ongoing	USDA
Borlaug Fellowship Program	Ten Fellows have been trained since 2005. Training topics included SPS plant health initiatives, food security management, natural resource management, and soil fertility. Senegal is an eligible country for FY2016.	FAS	2005	Ongoing	USDA

ACTIVITY NAME	ACTIVITY DESCRIPTION	USDA AGENCIES	INITIAL FISCAL YEAR	FINAL FISCAL YEAR	FUNDING SOURCE
Nutrition and Social Safety Nets					
Food for Progress	In June 2009, Africare received a $7.8 million 3-year grant from USDA to implement a project to strengthen the resilience of targeted households. The project aims to increase agricultural productivity and diversification, and promote agribusinesses markets by establishing a guarantee fund in a financial institution. This project greatly exceeded its stated goals. Prices for the crops sold by the smallholder farmers involved in the project increased by 8.7 percent on average. Africare also established a credit guarantee fund with two banks that provided 328 local business plans with funding through loans totaling approximately $290,000. The repayment rate was 98 percent. Over 4,500 households have benefited through this project.	FAS	2009	Inactive	USDA
Food for Progress	USDA funded NCBA to develop a millet value chain project at a program value of $9.5 million. The project components included: 1) Increase agricultural productivity of the millet value chain by developing processing systems; building capacity of producers to improve production and quality; training producers and processors in improved production techniques, post-harvest handling, marketing, and seed production; and providing grants and loans for equipment and inputs. 2) Expand trade of millet by developing public-private relationships, facilitating trade relationships, researching export opportunities, building agricultural extension capacity, and promoting food safety issues and requirements.	FAS	2009	Active	USDA
Food for Progress	USDA awarded International Relief & Development (IRD) with a $3.6 million program that trained over 10,000 cashew producers and processors in	FAS	2009	2012	USDA

ACTIVITY NAME	ACTIVITY DESCRIPTION	USDA AGENCIES	INITIAL FISCAL YEAR	FINAL FISCAL YEAR	FUNDING SOURCE
	selected cashew growing zones in Senegal between 2008 and 2012.				
Food for Progress	USDA awarded International Relief & Development (IRD) with a $9.3 million Food for Progress grant to implement the Cashew Enhancement Program (CEP II), which follows up CEP I. This is a regional program that covers Gambia, and southern Senegal. Goals are: 1) Improve agricultural productivity by identifying and promoting improved varieties of cashew, establishing seed farms and nurseries, training agricultural producers in improved practices and farming as a business, disseminating best practices information, and promoting live (plant) fencing. 2) Expand trade of agricultural products by training processors on the use of improved processing equipment, supporting cashew apple processing, supplying kernel processing centers with upgraded equipment, researching technology for the transformation of cashew apples and shells, developing a market information system, strengthening entrepreneurial capacity of processors, organizing annual consultative meetings, and facilitating participation in industry events.	FAS	2012	Active	USDA
Food for Progress	USDA funded an $8.2 million dollar program to construct and restore feeder roads and drainage systems in the Casamance region of Senegal. This 3-year program, implemented by Shelter for Life (SFL), is rebuilding 130 km of roads and constructing 260 km of drainage systems. The feeder roads link agricultural production zones to a major highway, the RN6, which is currently being rebuilt with funding from the Millennium Challenge Corporation. The project will employ up to 900 local laborers over a 3-year period, and the improved infrastructure will link farmers to additional markets and additional revenue for their	FAS	2012	Active	USDA

ACTIVITY NAME	ACTIVITY DESCRIPTION	USDA AGENCIES	INITIAL FISCAL YEAR	FINAL FISCAL YEAR	FUNDING SOURCE
	products. In addition, SFL will conduct market impact assessments to evaluate the effect of these feeder roads on local markets.				
McGovern-Dole Food for Education	Counterpart International is currently implementing a 3-year school feeding program valued at $9 million in the Matam region of Senegal. Activities include health & nutrition education, school rehabilitation, school gardens, and take-home rations.	FAS	2011	Active	USDA
McGovern-Dole Food for Education	USDA is implementing a school feeding program through Counterpart International valued at $11.2 million to be implemented in the St. Louis region of Senegal. Activities include health and nutrition education, school infrastructure, school gardens, teacher training, and curriculum development.	FAS	2013	Active	USDA
Food for Progress	USDA has awarded a follow-on project from 2009 project by NCBA CLUSA at a program value of $9.5 million that will focus on the processing and post-harvesting aspect of the millet value chain. Targets are: 1) Increase agricultural productivity of the millet value chain by developing processing systems; building capacity of producers to improve production and quality; training producers and processors in improved production techniques, post-harvest handling, marketing, and seed production; and providing grants and loans for equipment and inputs. 2) Expand trade of millet by developing public-private relationships, facilitating trade relationships, researching export opportunities, building agricultural extension capacity, and promoting food safety issues and requirements.	FAS	2014	Active	USDA

ANNEX D: THREATENED AND ENDANGERED SPECIES

Table 13. Threatened and Endangered Species

KINGDOM	SCIENTIFIC NAME	COMMON NAMES(S)	RED LIST STATUS[1]	YEAR ASSESSED	TREND (I, D, U, S)[2]
Animalia	*Acinonyx jubatus*	Cheetah, Hunting Leopard	VU	2008	D
Animalia	*Acrocephalus paludicola*	Aquatic Warbler	VU	2013	D
Animalia	*Aetobatus narinari*	Spotted Eagle Ray, Maylan, Bonnetray	NT	2006	D
Plantae	*Afzelia africana*	Afzelia	VU	1998	U
Plantae	*Albizia ferruginea*	Albizia	VU	1998	U
Animalia	*Alopias superciliosus*	Bigeye Thresher Shark, False Thresher	VU	2009	D
Animalia	*Alopias vulpinus*	Common Thresher Shark	VU	2009	D
Plantae	*Ansellia africana*	Leopard Orchid, Monkey Sugarcane, African Ansellia, Mopane Orchid, Tree Orchid	VU	2013	D
Animalia	*Aonyx capensis*	African Clawless Otter, Cape Clawless Otter	NT	2015	D
Animalia	*Ardeotis arabs*	Arabian Bustard	NT	2012	D
Animalia	*Aythya nyroca*	Ferruginous Duck, White-eyed Pochard, Ferruginous Pochard	NT	2012	D
Animalia	*Balaenoptera musculus*	Blue Whale, Sibbold's Rorqual, Sulphur-bottom Whale, Pygmy Blue Whale	EN	2008	I
Animalia	*Balearica pavonina*	Black Crowned-crane, Black Crowned-Crane, Black Crowned Crane, Northern Crowned Crane	VU	2012	D
Animalia	*Balistes vetula*	Queen Triggerfish, Old Wife, Triggerfish, Turbot, Ol'wife	VU	1996	U
Plantae	*Baphia heudelotiana*		VU	1998	U
Animalia	*Barbus dialonensis*		VU	2010	U
Animalia	*Barbus niokoloensis*		VU	2010	U

KINGDOM	SCIENTIFIC NAME	COMMON NAMES(S)	RED LIST STATUS[1]	YEAR ASSESSED	TREND (I, D, U, S)[2]
Plantae	*Bolboschoenus grandispicus*		VU	2010	D
Animalia	*Carcharhinus brevipinna*	Spinner Shark	NT	2009	U
Animalia	*Carcharhinus falciformis*	Silky Shark	NT	2009	D
Animalia	*Carcharhinus leucas*	Bull Shark	NT	2009	U
Animalia	*Carcharhinus limbatus*	Blacktip Shark	NT	2009	U
Animalia	*Carcharhinus longimanus*	Oceanic Whitetip Shark, Whitetip Shark, White-tipped Shark, Whitetip Oceanic Shark	VU	2006	D
Animalia	*Carcharhinus obscurus*	Dusky Shark	VU	2009	D
Animalia	*Carcharhinus plumbeus*	Sandbar Shark	VU	2009	D
Animalia	*Carcharhinus signatus*	Night Shark	VU	2006	D
Animalia	*Carcharias taurus*	Sand Tiger Shark, Spotted Ragged-tooth Shark, Grey Nurse Shark, Sand Tiger Shark, Grey Nurse Shark, Spotted Raggedtooth Shark	VU	2009	U
Animalia	*Caretta caretta*	Loggerhead	EN	1996	U
Animalia	*Centrochelys sulcata*	African Spurred Tortoise, Grooved Tortoise	VU	1996	U
Animalia	*Centrophorus lusitanicus*	Lowfin Gulper Shark	VU	2009	U
Animalia	*Centrophorus squamosus*	Leafscale Gulper Shark, Nilson's Deepsea Dogfish, Deepwater Spiny Dogfish	VU	2003	D
Animalia	*Centroscymnus coelolepis*	Portuguese Dogfish	NT	2003	U
Animalia	*Ceratogymna elata*	Yellow-casqued Hornbill, Yellow-casqued Wattled Hornbill	VU	2012	D
Animalia	*Cercocebus atys*	Sooty/white-naped Mangabey, Sooty Mangabey, Red-capped Monkey	VU	2008	D

KINGDOM	SCIENTIFIC NAME	COMMON NAMES(S)	RED LIST STATUS[1]	YEAR ASSESSED	TREND (I, D, U, S)[2]
Plantae	*Ceropegia rhynchantha*		VU	2014	D
Animalia	*Cetorhinus maximus*	Basking Shark	VU	2005	D
Animalia	*Chalcides armitagei*	Armitage's Cylindrical Skink	NT	2013	U
Animalia	*Chelonia mydas*	Green Turtle	EN	2004	D
Animalia	*Circaetus beaudouini*	Beaudouin's Snake-eagle, Beaudouin's Snake Eagle	VU	2014	D
Animalia	*Circus macrourus*	Pallid Harrier, Pale Harrier	NT	2013	D
Animalia	*Conus belairensis*		EN	2012	D
Animalia	*Conus bruguieresi*		EN	2012	D
Animalia	*Conus cacao*		VU	2013	D
Animalia	*Conus cloveri*		EN	2012	S
Animalia	*Conus dorotheae*		NT	2012	U
Animalia	*Conus echinophilus*		EN	2012	D
Animalia	*Conus guinaicus*		VU	2012	U
Animalia	*Conus hybridus*		EN	2012	D
Animalia	*Conus mercator*		EN	2012	U
Animalia	*Conus tacomae*		VU	2012	U
Animalia	*Conus taslei*		NT	2012	U
Animalia	*Conus trencarti*		NT	2012	U
Animalia	*Conus unifasciatus*		EN	2012	U
Animalia	*Coracias garrulus*	European Roller, Roller	NT	2012	D
Animalia	*Cyclanorbis senegalensis*	Senegal Flapshell Turtle	LR/nt	1996	U
Plantae	*Cyperus lateriticus*		VU	2010	U
Animalia	*Dalatias licha*	Kitefin Shark	NT	2009	U
Plantae	*Dalbergia melanoxylon*	African Blackwood, Mozambique Ebony	LR/nt	1998	U
Animalia	*Dasyatis geijskesi*	Sharpsnout Stingray, Wingfin Stingray	NT	2006	U
Animalia	*Dasyatis margarita*		EN	2009	D
Animalia	*Dentex angolensis*	Angola Dentex	NT	2014	U

KINGDOM	SCIENTIFIC NAME	COMMON NAMES(S)	RED LIST STATUS[1]	YEAR ASSESSED	TREND (I, D, U, S)[2]
Animalia	*Dermochelys coriacea*	Leatherback, Leatherback Sea Turtle, Leathery Turtle, Luth, Trunkback Turtle, Trunk Turtle, Coffin-back	VU	2013	D
Animalia	*Eidolon helvum*	African Straw-coloured Fruit-bat, Pale Xantharpy, Staw-coloured Flying Fox, Straw-coloured Fruit Bat	NT	2008	D
Animalia	*Elattoneura pluotae*		CR	2010	U
Animalia	*Epinephelus aeneus*	White Grouper	NT	2008	D
Animalia	*Epinephelus itajara*	Atlantic Goliath Grouper, Jewfish, Goliath Grouper	CR	2011	U
Animalia	*Epinephelus marginatus*	Dusky Grouper	EN	2004	D
Animalia	*Eudorcas rufifrons*	Red-fronted Gazelle	VU	2008	D
Animalia	*Falco vespertinus*	Red-footed Falcon, Western Red-footed Falcon	NT	2013	D
Animalia	*Galeocerdo cuvier*	Tiger Shark	NT	2009	U
Animalia	*Galeorhinus galeus*	Tope, Oil Shark, Penny Dog, Rig, School Shark, Snapper Shark, Soupfin, Soupie, Southern Tope, Sweet William, Tiburon, Liver-oil Shark, Toper, Tope Shark, Vitamin Shark, Whithound, Miller's Dog	VU	2006	D
Animalia	*Gallinago media*	Great Snipe	NT	2012	D
Animalia	*Gazella dorcas*	Dorcas Gazelle	VU	2008	D
Animalia	*Geronticus eremita*	Northern Bald Ibis, Waldrapp, Bald Ibis, Hermit Ibis	CR	2013	D
Animalia	*Glaucostegus cemiculus*	Blackchin Guitarfish	EN	2007	D
Animalia	*Gymnura altavela*	Spiny Butterfly Ray	VU	2007	D
Animalia	*Gyps africanus*	White-backed Vulture	EN	2012	D

KINGDOM	SCIENTIFIC NAME	COMMON NAMES(S)	RED LIST STATUS[1]	YEAR ASSESSED	TREND (I, D, U, S)[2]
Animalia	*Gyps rueppelli*	Rüppell's Vulture, Ruppell's Vulture, Rüppell's Griffon Vulture, Rueppell's Griffon	EN	2014	D
Animalia	*Heptranchias perlo*	Sharpnose Sevengill Shark, One-finned Shark, Sevengill Cow Shark, Perlon Shark, Sharpsnouted Sevengill, Slender Sevengill	NT	2003	U
Animalia	*Hippocampus algiricus*	West African Seahorse	VU	2012	U
Animalia	*Hippopotamus amphibius*	Hippopotamus, Large Hippo, Common Hippopotamus	VU	2008	D
Animalia	*Hyaena hyaena*	Striped Hyaena	NT	2015	D
Animalia	*Hydrolagus mirabilis*	Large-eyed Rabbitfish	NT	2007	D
Animalia	*Ichthyborus quadrilineatus*		NT	2010	U
Plantae	*Irvingia gabonensis*		LR/nt	1998	U
Animalia	*Isurus oxyrinchus*	Shortfin Mako	VU	2009	D
Plantae	*Justicia niokolo-kobae*		NT	2011	U
Animalia	*Kajikia albida*	White Marlin, Marlin, Skilligalee	VU	2011	D
Plantae	*Khaya senegalensis*	African Mahogany, Benin Mahogany, Dry Zone Mahogany, Senegal Mahogany	VU	1998	
Animalia	*Larus audouinii*	Audouin's Gull	NT	2012	S
Animalia	*Lepidochelys olivacea*	Olive Ridley, Pacific Ridley	VU	2008	D
Animalia	*Leptocharias smithii*	Barbeled Houndshark, Barbeled Houndshark	NT	2005	U
Animalia	*Limosa limosa*	Black-tailed Godwit	NT	2012	D
Animalia	*Loxodonta africana*	African Elephant	VU	2008	I
Animalia	*Lycaon pictus*	African Wild Dog, Painted Hunting Dog, Cape Hunting Dog	EN	2012	D
Animalia	*Makaira nigricans*	Blue Marlin	VU	2011	D

KINGDOM	SCIENTIFIC NAME	COMMON NAMES(S)	RED LIST STATUS[1]	YEAR ASSESSED	TREND (I, D, U, S)[2]
Animalia	*Manta alfredi*	Reef Manta Ray, Prince Alfred's Ray, Inshore Manta Ray, Coastal Manta Ray, Resident Manta Ray	VU	2011	D
Animalia	*Manta birostris*	Giant Manta Ray, Oceanic Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Chevron Manta Ray	VU	2011	D
Animalia	*Marmaronetta angustirostris*	Marbled Teal, Marbled Duck	VU	2012	D
Animalia	*Mecistops cataphractus*	Slender-snouted Crocodile, African Slender-snouted Crocodile	CR	2014	D
Animalia	*Megalops atlanticus*	Tarpon	VU	2012	D
Animalia	*Mesocnemis dupuyi*	Gambia Riverjack	NT	2010	U
Plantae	*Milicia regia*		VU	1998	U
Plantae	*Mitragyna stipulosa*		VU	1998	U
Animalia	*Mobula rochebrunei*	Lesser Guinean Devil Ray	VU	2009	U
Animalia	*Mobula thurstoni*	Bentfin Devil Ray, Smoothtail Devil Ray, Smoothtail Mobula, Thurton's Devil Ray, Lesser Devil Ray	NT	2006	U
Animalia	*Mustelus mustelus*	Common Smoothhound	VU	2009	D
Animalia	*Nanger dama*	Dama Gazelle, Addra Gazelle	CR	2008	D
Animalia	*Necrosyrtes monachus*	Hooded Vulture	EN	2012	D
Animalia	*Neophron percnopterus*	Egyptian Vulture, Egyptian Eagle	EN	2014	D
Animalia	*Neotis denhami*	Denham's Bustard, Stanley Bustard	NT	2014	D
Animalia	*Numenius arquata*	Eurasian Curlew, Curlew	NT	2012	D
Animalia	*Opisthoteuthis calypso*		VU	2014	U
Animalia	*Opisthoteuthis massyae*		VU	2014	D

KINGDOM	SCIENTIFIC NAME	COMMON NAMES(S)	RED LIST STATUS[1]	YEAR ASSESSED	TREND (I, D, U, S)[2]
Animalia	*Oryx dammah*	Scimitar-horned Oryx	EW	2008	U
Animalia	*Osteolaemus tetraspis*	African Dwarf Crocodile, West African Dwarf Crocodile	VU	1996	U
Animalia	*Oxynotus centrina*	Angular Rough Shark	VU	2007	U
Animalia	*Pan troglodytes*	Chimpanzee, Robust Chimpanzee, Common Chimpanzee	EN	2008	D
Animalia	*Panthera leo*	Lion, African Lion	VU	2015	D
Animalia	*Panthera pardus*	Leopard	NT	2008	D
Animalia	*Papio papio*	Guinea Baboon	NT	2008	U
Animalia	*Phoeniconaias minor*	Lesser Flamingo	NT	2012	D
Animalia	*Physeter macrocephalus*	Sperm Whale, Spermacet Whale, Cachelot, Pot Whale	VU	2008	U
Animalia	*Polemaetus bellicosus*	Martial Eagle	VU	2013	D
Animalia	*Prionace glauca*	Blue Shark	NT	2009	U
Animalia	*Pristis pectinata*	Smalltooth Sawfish, Wide Sawfish	CR	2013	D
Animalia	*Pristis pristis*	Largetooth Sawfish	CR	2013	D
Animalia	*Procolobus badius*	West African Red Colobus, Bay Colobus, Western Red Colobus, Red Colobus	EN	2008	D
Animalia	*Pronothobranchius kiyawensis*		NT	2010	U
Animalia	*Pterodroma feae*	Cape Verde Petrel	NT	2014	I
Animalia	*Raja clavata*	Thornback Skate	NT	2005	D
Animalia	*Raja undulata*	Undulate Skate, Undulate Ray	EN	2009	D
Animalia	*Rhincodon typus*	Whale Shark	VU	2005	D
Animalia	*Rhinobatos albomaculatus*	White-spotted Guitarfish	VU	2009	D
Animalia	*Rhinobatos irvinei*	Spineback Guitarfish	VU	2009	D
Animalia	*Rhinobatos rhinobatos*	Common Guitarfish, Violinfish	EN	2007	D
Animalia	*Rhinolophus guineensis*	Guinean Horseshoe Bat	VU	2008	U
Animalia	*Rhinoptera marginata*	Lusitanian Cownose Ray	NT	2009	U

KINGDOM	SCIENTIFIC NAME	COMMON NAMES(S)	RED LIST STATUS[1]	YEAR ASSESSED	TREND (I, D, U, S)[2]
Animalia	*Rhynchobatus luebberti*	African Wedgefish, Guitarra, Lubbert's Guitarfish, Spikenose Wedgefish	EN	2006	D
Animalia	*Rostroraja alba*	White Skate, Bottlenose Skate, Spearnose Skate	EN	2006	D
Animalia	*Rynchops flavirostris*	African Skimmer	NT	2012	D
Animalia	*Sagittarius serpentarius*	Secretarybird, Secretary Bird	VU	2013	D
Animalia	*Sapho infumosa*		NT	2010	U
Animalia	*Sarotherodon occidentalis*		NT	2010	U
Animalia	*Scyliorhinus stellaris*	Nursehound	NT	2009	U
Animalia	*Smutsia gigantea*	Giant Ground Pangolin, Giant Pangolin	VU	2014	D
Animalia	*Sousa teuszii*	Atlantic Humpbacked Dolphin, Teusz's Dolphin, Atlantic Hump-backed Dolphin	VU	2012	D
Animalia	*Sphyrna lewini*	Scalloped Hammerhead	EN	2007	U
Animalia	*Sphyrna mokarran*	Great Hammerhead, Squat-headed Hammerhead Shark, Hammerhead Shark	EN	2007	D
Animalia	*Squalus acanthias*	Spurdog, Spiny Dogfish, Cape Shark, Piked Dogfish	VU	2006	D
Animalia	*Squatina aculeata*	Sawback Angelshark, Spiny Angelshark, Monkfish	CR	2007	D
Animalia	*Squatina oculata*	Smoothback Angel Shark, Monkfish	CR	2007	D
Animalia	*Stephanoaetus coronatus*	Crowned Eagle, Crowned Hawk-Eagle, Crowned Eagle	NT	2012	D
Animalia	*Terathopius ecaudatus*	Bateleur	NT	2012	D

KINGDOM	SCIENTIFIC NAME	COMMON NAMES(S)	RED LIST STATUS[1]	YEAR ASSESSED	TREND (I, D, U, S)[2]
Animalia	*Thunnus alalunga*	Albacore Tuna, Albacore Fish, Aáhi Taria, Bastard Albacore, Bonito, Langvin Tuna, Long-finned Tuna, Longfin Tuna, Long-fin Tunny, Longfin Tunny, Tuna, Albacore	NT	2011	D
Animalia	*Thunnus albacares*	Yellowfin Tuna, Yellowfinned Albacore, Allison's Tuna, Pacific Long-tailed Tuna	NT	2011	D
Animalia	*Thunnus obesus*	Bigeye Tuna	VU	2011	D
Animalia	*Torgos tracheliotos*	Lappet-faced Vulture	VU	2012	D
Animalia	*Trichechus senegalensis*	African Manatee, Seacow, West African Manatee	VU	2015	U
Animalia	*Trigonoceps occipitalis*	White-headed Vulture	VU	2012	D
Plantae	*Vitellaria paradoxa*	Shea Butter Tree	VU	1998	U

Source:

[1] EW = extinct in the wild, CR = critically endangered, EN = endangered, VU = vulnerable, NT = near threatened

[2] I = increasing, D = decreasing, U = unknown, S=stable. Several cells in this column were blank in the IUCN dataset.

ANNEX E: ADDITIONAL MAPS

Figure 17. Regions of Senegal[143]

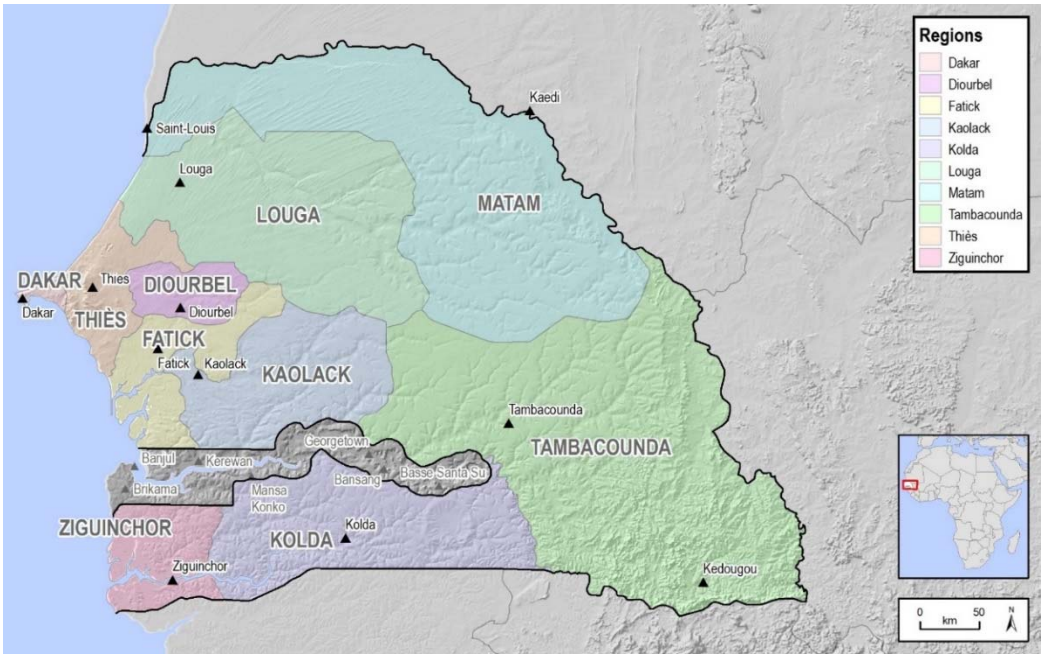
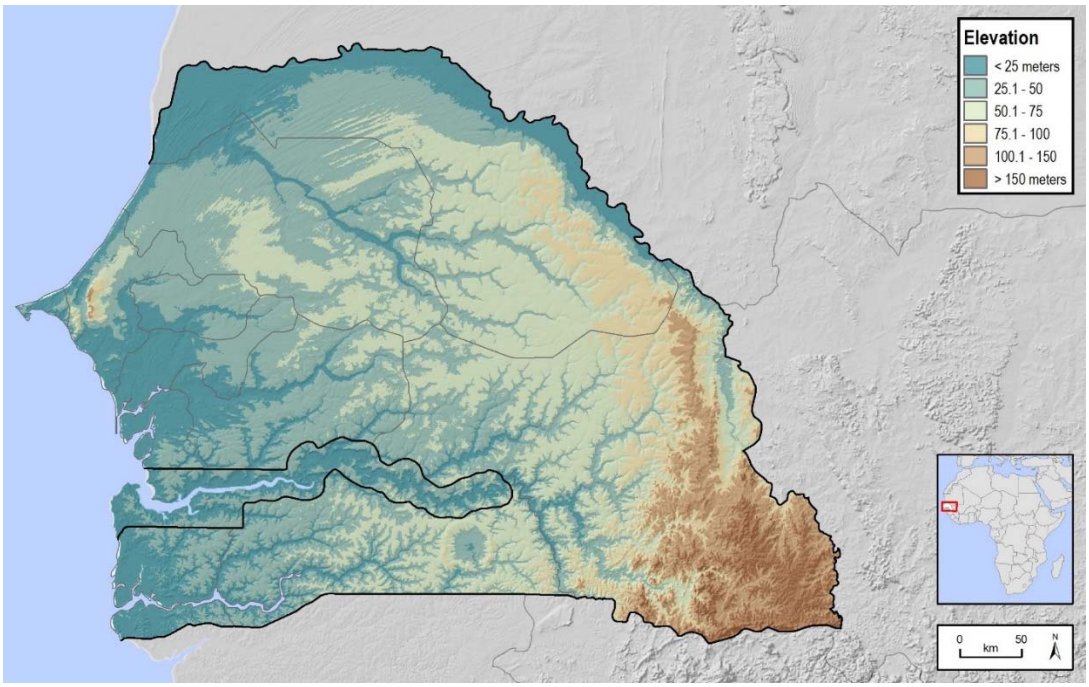


Figure 18. Elevation of Senegal[144]



[143] Source: Natural Earth
[144] Source: USGS HydroSHEDS

Figure 19. Soil Carbon in Senegal[145]

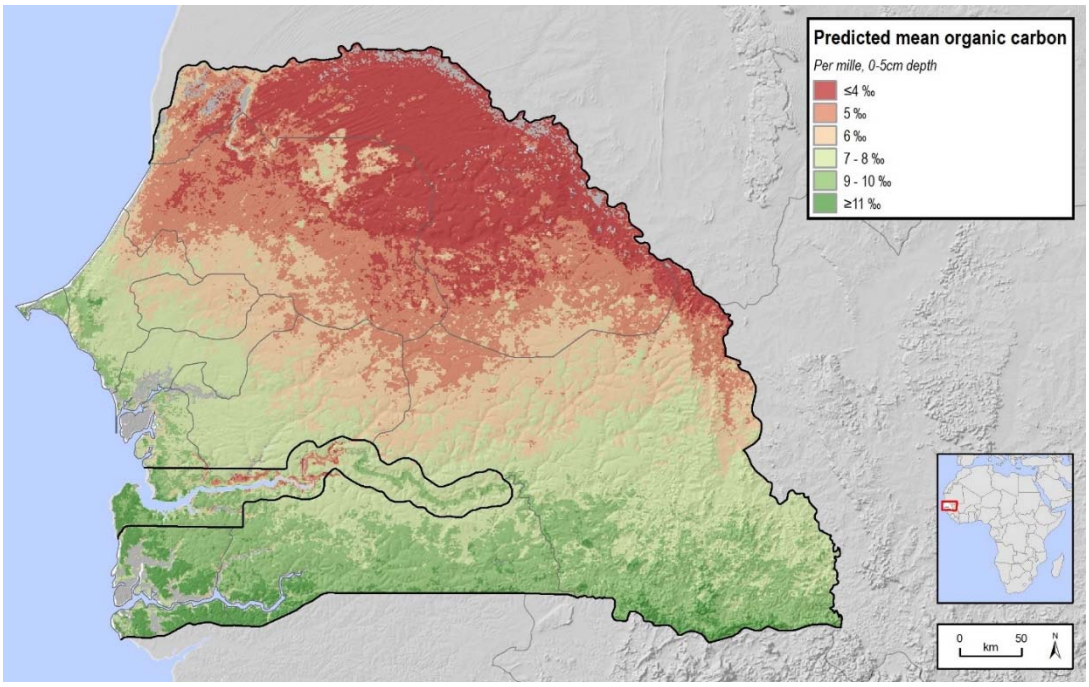
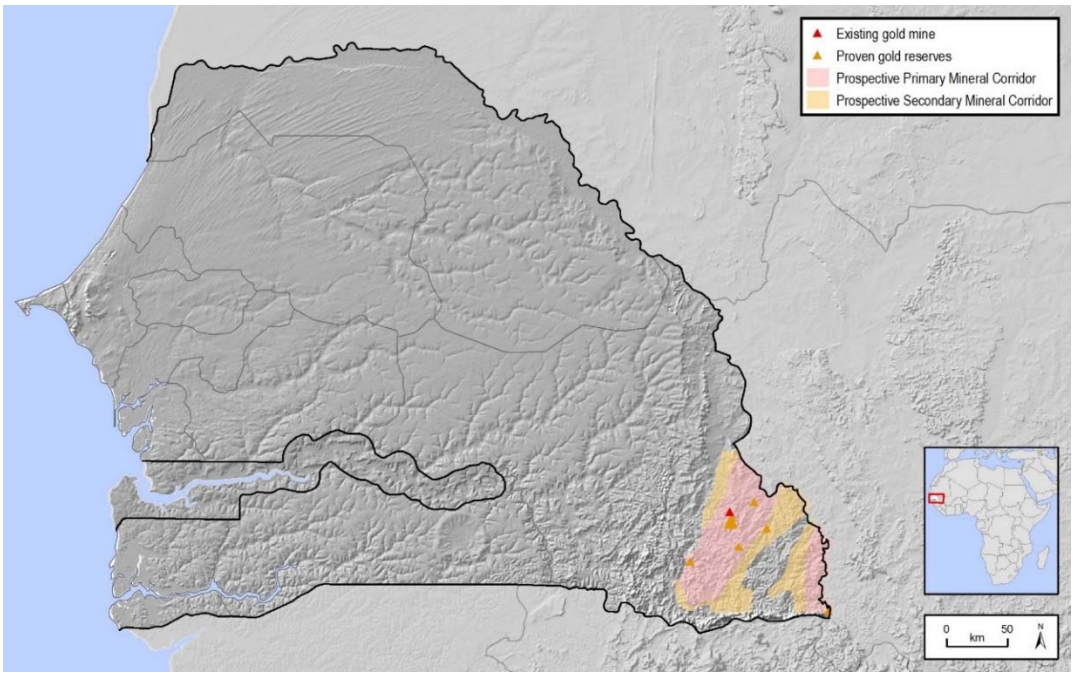
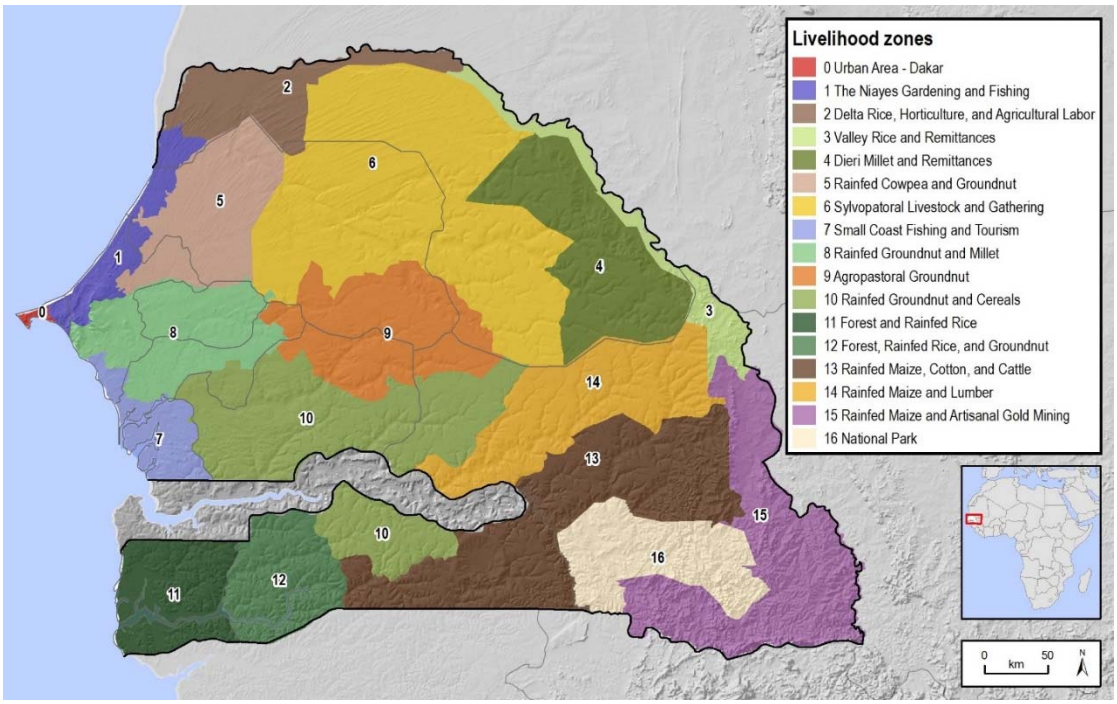


Figure 20. Mines in Senegal[146]



[145] Source: ISRIC
[146] Source: Teranga Gold Corporation

Figure 21. Livelihood Zones in Senegal[147]



ANNEX F: ENVIRONMENTAL ACTIVITIES AND PROJECTS IN SENEGAL

Figure 22. Multilateral Development Bank Projects in Senegal

PROJECT NAME	LOCATION	MDB	COST (US$ MILLIONS)	CATEGORY (A, B, C)	SECTOR
Sendou II (2-125 MW coal power plant)	Sendou	AfDB	TBD	A	Energy
OMVG II and OMVG I (2 HPP)	Sanbangalo region of Senegal; Guinean region of Koletan	AfDB	Not found	A	Energy
Dinguiraye-Niori-Keur Ayib Road	Kaolack Region	AfDB	30.2	B	Transportation Infrastructure
Senegal Urban Water and Sanitation Project	Dakar region	WB	70	B	Water
Stormwater Management and Climate Change Adaptation Project	Dakar region	WB	110.9	A	Water
Skills for jobs and competitiveness	Throughout	WB	76.5	B	Vocational training; education
Senegal Banda Gas to Power Guarantee	Unknown	WB	99	A	Energy and Mining
Senegal Sustainable and Inclusive Agribusiness Project	St. Louis region	WB	80	A	Agriculture

[147] Source: FEWSNET

PROJECT NAME	LOCATION	MDB	COST (US$ MILLIONS)	CATEGORY (A, B, C)	SECTOR
Community-based Sustainable Land Management Project	Near Lac de Guiers	WB	86.02	B	Agriculture
Senegal Taiba Ndiaye Independent Power Producer Project	Taiba Ndiaye	WB	160	A	Energy
Casamance Regional Development Pole	Casamance	WB	46	B	Agriculture
Senegal Quality and Equity of Basic Education	Throughout	WB	217.7	B	Education
Electricity Sector Support Project	Dakar region	WB	93.5	B	Energy
Senegal Tertiary Education Governance and Financing For Results	Throughout	WB	127.3	B	Education
Second Sustainable and Participatory Energy Management (PROGEDE II)	Throughout	WB	19.37	B	Energy
Transport and Urban Mobility Project	Dakar to Bamako, Mali	WB	97	B	Transportation Infrastructure
Dakar Diamniadio Toll Highway	Dakar to Diamniadio	WB	531.4	A	Transportation Infrastructure
Rural Lighting Efficiency	Rural areas	WB	1.8	B	Energy

ANNEX I: BIOGRAPHICAL SKETCHES OF TEAM MEMBERS

Mamadou Saliou Diallo, Team Leader. Mr. Diallo, currently Program Coordinator of *Guinée Ecologie*, a Guinean environmental NGO established in 1990, is an international consultant/trainer specializing in environmental and natural resources conservation issues. He is an experienced trainer proficient in USAID environmental procedures (Reg.216 and related ADS) and the conduct of Best Practices Review (BPR), Environmental Threats and Opportunities Assessment (ETOA), and 118-119 studies. He has 14 years of experience working with USAID environmental procedures in Mali, Madagascar, Burundi, Senegal, Sierra Leone, Liberia and Benin, and served as the lead consultant on BPRs for Liberia and Benin. His additional work experience in Africa covers the Seychelles and all countries of West Africa except Nigeria and Cape Verde. Mr. Diallo holds a 1972 D.E.S. (Diplôme d'Etudes Supérieures) in Literature and Linguistics from the University of Kankan, Guinea.

Charles Hernick, ETOA Specialist. Mr. Hernick (The Cadmus Group, Inc.) is an expert on USAID environmental compliance requirements, including FAA Sections 118 and 119, most recently demonstrated as Team Leader for the Mali ETOA (2015), through his contributions to assessments in Peru and South Sudan, and his management of a tropical forestry/biodiversity and climate change vulnerability assessment for 10 Caribbean countries. He has six years of ecology field- and laboratory-based research experience. He has leveraged his background in ecology and economics to conduct environmental impact assessments for development projects in Asia, Africa, and Central America. He has conducted trainings and guest lectured on numerous environmental issues in the U.S., Latin America, and Africa. He has managed extensive policy and finance research and analysis, and has facilitated expert consultations in the design of U.S. policy for mitigating the financial risks associated with environmental liabilities (i.e., polluter pays principle/financial assurance). Mr. Hernick has a B.S. in Ecology from the University of Minnesota and an M.A. in International Relations and Environmental Policy from Boston University.

Muhammad (Yaya) Diallo, Regional Environmental Specialist. Muhammad Yaya Diallo based in Conakry, is a Guinean with over five years of environmental consulting experience, primarily in West Africa, with a focus on water, natural resource conservation and protected areas management. Mr. Diallo has a Master's degree in environmental law and a Bachelor's degrees in economics and business. He is the Principal technical advisor of Guinée Ecologie (local NGO). Mr Diallo recently led a project on tropical forest conservation in his country and works closely with international organizations such as IUCN, IIED, Arcus Foundation, etc.

Bakary Doucouré, Senior Senegal Environmental and Institutions Expert. Dr. Doucouré is a sociologist with a PhD in Social Sciences. He has over ten years of experience in research and consulting, and has worked for several national institutions in Senegal and for international institutions. He is also the author and co-author of several scientific articles and reports. He has ensured the scientific coordination of several studies and research teams nationally (Senegal) and sub-regionally (West Africa). He has worked on issues related to the environment for eight years.

Ashley Fox, Research, Analysis, and Production Support. Ashley Fox is an environmental compliance professional with a background in international development and two years of experience providing technical support to the USAID Bureaus for AFR, DCHA and E3. She provides backstopping support to USAID BEOs by reviewing and drafting IEEs and EMMPs and conducting affirmative investigation research for Multilateral Development Bank (MDB) projects. She has supported the planning and execution of Environmental Compliance and Environmentally Sound Design and Management (ESDM) workshops in Senegal and Rwanda and was an Evaluation Team member in the March 2015 Mid-Term Performance Evaluation of the USAID/COMFISH project in Senegal. Ms. Fox has a B.A. in International Development and Political Economy from Tulane University.

Dan Mahr, **GIS Specialist.** Dan Mahr is a GIS specialist with five years of experience using geographic information systems in environmental science applications, including climate change assessments, land use change studies, demographic modeling, and hydrographic analyses. Mr. Mahr is responsible for developing and implementing technically demanding large-scale data processing and visualization workflows. He supplements ArcGIS with the Python programming language to automate complex GIS tasks in custom GIS tools. In a previous ETOA for USAID, Mr. Mahr leveraged a mix of data from stakeholders and new sources to create over thirty maps on the physiography, hydrology, ecology, land use, and economic development of Mali and the surrounding Sahel region. The final datasets were made available in an open-source GitHub repository (cadmusgroup.github.io/USAID-Mali-ETOA/) that allows for crowdsourced contributions to GeoJSON vector datasets via Git pull requests. In another project for USAID, he modified AERMOD—an EPA air modeling software suite—to function in Kosovo by drastically modifying input data. He also created a geoprocessing tool that visualized the outputs of over 500 air quality modeling runs in a consistent and understandable format. In a 118/119 Assessment for Vietnam, Mr. Mahr prepared a series of maps describing the ecology, physiography, climate, and demographics of Vietnam. By client request, the source GIS datasets used were all publicly available to enable reproducibility and many were global-scale to enable intercomparison. Mr. Mahr has a B.S. in Environmental Science from Brown University, where he conducted honors research on remote sensing of agricultural intensification later published in Philosophical Transactions of the Royal Society B: Biological Sciences.