

Trans-boundary Water Governance

Training Manual (Mahakali Basin)

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TRANS-BOUNDARY WATER GOVERNANCE

TRAINING MANUAL (MAHAKALI BASIN)



Tribhuvan University
CENTRAL DEPARTMENT OF ENVIRONMENTAL SCIENCE
Kirtipur, Kathmandu, Nepal

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नेपाल नगरपालिका संघ

Municipal Association of Nepal (MuAN)

मिति: २०७७।०६।२६

शुभकामना

मानवको वस्तीको विकासको इतिहास हेर्ने हो भने नदि तटिय क्षेत्रबाट भएको पाईन्छ । पानी जीवन जगतका लागि अमूल्य हुनका साथै यसले जैविक विविधता र ईकोसिस्टमका लागि पनि आवश्यक छ । हाम्रो देश नेपाल जलस्रोतको धनी देश हो र यस्तो प्राकृतिक स्रोतको भरपुर उपयोग गर्नु पर्ने हुन्छ । हामी नदि खोला नाला भन्ने वित्तिकै वाढी र पहिरोको रुपमा बुझ्न पुग्दछौ । जसले यसलाई स्रोतका रुपमा बुझेको छ तिनले अग्रगतिमा विकास गरेको पाईन्छ । हामीका हजारौ नदि नालाहरुको भरपुर उपयोग हुन सकिरहेको छैन । नदिको स्रोतबाट हामीले सिचाई, खानेपानी, पर्यापर्यटनको लाभ लिन सक्छौ । यसै महत्वलाई मध्यनजर गरि **ट्रोसा परियोजना** अर्न्तगत महाकाली नदि बग्ने स्थानीय गाँउपालिका अध्यक्ष, उपाध्यक्ष, र नगरपालिकाका मेयर, उपमेयर एवं प्रदेश प्रमुख तथा स्थानीय साभेदार संस्थाहरुको सहकार्यमा निर्माण गर्न लागिएको यस **अन्तरदेशीय पानी सुशासन सम्बन्धि तालिम पुस्तिकाले** महाकाली जलाधार क्षेत्रमा पानी सुशासनमा सहयोग गरी नदी तटीय क्षेत्रमा रहेका बासिन्दाको हक र हित प्रत्याभुतिका लागि अहम भुमिका खेल्ने छ भन्ने आशा गरेका छौ ।

यस तालिम पुस्तिकामा जलस्रोत, जलचक्र, नदिजन्य स्रोतहरु प्रभाव, एकीकृत जलस्रोत व्यवस्थापन, अन्तरदेशीय सहयोग र स्थानीयकरण, अन्तरदेशीय पानी व्यवस्थापन, नदि तटिय योजना लगायतका महत्वपूर्ण विषय समेटिएकाले यो नदि तटिय क्षेत्रका सबै सरोकारवाला निकायलाई सहयोग हुने विश्वास लिएको छु ।

यसका साथै महाकाली नदिको हकमा दुवै देशका नदि तटीय क्षेत्रका बासिन्दाको सहकार्यबाट नै महाकाली नदिबाट नेपाली समुदायले पनि आफ्नो जिविकोपार्जनमा सहयोग पुग्ने छ । यस तालिम पुस्तिकाले स्थानीय स्तरमा हुने योजना तर्जुमा वा कुनै पनि नदि वा पानी सुशासनको लागि यसले महत्वपूर्ण मार्ग निर्देशन गर्दछ ।

यस पुस्तकको कार्यान्वयनको हार्दिक शुभकामना व्यक्त गर्दछु ।

केशव बहादुर चन्द

संयोजक नेपाल नगरपालिका संघ

सुदूरपश्चिम प्रदेश





गाउँपालिका राष्ट्रिय महासंघ नेपाल

National Association of Rural Municipalities in Nepal

(NARMIN)

सुदूरपश्चिम प्रदेश नेपाल

शुभकामना

हाम्रो देश प्राकृतिक स्रोत साधनले भरिपूर्ण भएको देश हो । जल, जमीन, जंगल, जडीबुटी जस्ता प्राकृतिक स्रोतहरू नै मानव र जीवजगतको लागि आवश्यक स्रोत हुन । यस्तो स्रोतहरूको संरक्षण, सम्बद्धन र उचित तरिकाले उपयोग गर्नुपर्ने हुन्छ । यस्ता प्राकृतिक स्रोत साधनहरूको पहिचान र वातावरणिय सन्तुलन कायम रहने गरि उपभोग गर्नुपर्ने हुन्छ । हाम्रो सुदूरपश्चिम प्रदेशमा पनि जलस्रोतको भण्डार रहेको छ र यसबाट हाम्रो जनजीविकाका लागि आवश्यक पर्ने स्रोत जुटाउन सकिने हुन्छ । यस्ता स्रोत मध्ये महाकाली नदि पनि एक हो । महाकाली नदि अधिकांश भागमा सिमा नदि भएकाले यसबाट दुवै देशले आ-आफ्नो तरिकाले उपभोग गरिरहेका छन । नदि तटिय क्षेत्रका समुदायमा नजीकै स्रोतले भरिपूर्ण नदि वगिरहेको भए पनि सूचना, सिप आभाव, सरोकारवाला निकायमा पहुचको कमी आदिका कारण उचित लाभ लिन सकिरहेका छैनन ।

यस्तो परिवेशमा सिमा क्षेत्रमा रहेको महाकाली नदि तटिय क्षेत्रका समुदायको जीवनस्तर सुधारकाका लागि स्थानीय तह संगको प्रत्यक्ष समन्वय र सहकार्यमा संचालन भएको ट्रोसा परियोजना अर्न्तगत महाकाली नदि वग्ने स्थानिय गाँउपालिका अध्यक्ष, उपाध्यक्ष, र नगरपालिकाका मेयर, उपमेयर एवं प्रदेश प्रमुख तथा स्थानिय साभेदार संस्थाहरूको सहकार्यमा निर्माण गर्न लागिएको यस अन्तरदेशीय पानी शुसासन सम्बन्धि तालिम पुस्तिकाले महाकाली जलाधार क्षेत्रको वासिन्दाको हक र हित प्रत्याभुतिका लागी पानी शुसासनमा सहयोग भन्ने आशा गरेका छौ ।

यस तालिम पुस्तिकाले स्थानीय समुदाय, सरोकारवाला निकायलाई जलस्रोत, जलचक्र, नदिजन्म स्रोतहरू प्रभाव, एकिकृत जलस्रोत व्यवस्थापन, अन्तरदेशिय सहयोग र स्थानीयकरण, अन्तरदेशिय पानी व्यवस्थापन, नदि तटिय योजना निर्माण र स्रोत उपयोगमा सहयोग पुग्ने विश्वास लिएको छु ।

यस पुस्तकको तयार गर्ने निकाय र सरोकारवाला लाई हार्दिक धन्यवाद दिदै कार्यान्वयनका लागि सफलताको शुभकामना व्यक्त गर्दछु ।

दुर्गादत्त ओझा

अध्यक्ष

गाउँपालिका राष्ट्रिय महासंघ नेपाल
सुदुर पश्चिम प्रदेश धनगढी, कैलाली



स्थानीय विकास प्रशिक्षण प्रतिष्ठान

(स्थानीय विकास प्रशिक्षण प्रतिष्ठान) २०५०

जावलाखेल

Local Development Training Academy

(Established by Local Development Training Academy, 2049)

"An Autonomous, Professional, Client Centered, Gender Responsive National Institute of Excellence in the area of Local-Self Governance."



LDTA >>>



शुभकामना

महाकाली नदीको अन्तरदेशीय जिल्लाका जलशासनमा व्यवहारिक प्रशिक्षण पुस्तिका प्रकाशन भएकोमा स्थानीय विकास प्रशिक्षण प्रतिष्ठान खुशी व्यक्त गर्दछ। स्थानीय तहको क्षमता विकासका लागि अन्तरदेशीय जलशासन जस्तो महत्वपूर्ण क्षेत्रमा यस प्रशिक्षण पुस्तिकाको योगदान रहनेछ भन्ने मेरो बुझाई छ।

नेपालका अधिकांश राजनीतिक सीमाहरू नदीहरूबाट निर्धारित भएकोले नदीतटमा जीवनयापन गरिरहेका स्थानीय जनताको गुणस्तरीय जीवन यापनका लागि सम्बन्धित स्थानीय तहका नीतिनिर्माताहरू अन्तरदेशीय जलशासन सम्बन्धमा के कस्ता रणनीति बनाई कार्ययोजनासहित कार्यान्वयनमा लाने भन्ने विषयमा प्रष्ट हुनुपर्दछ। यसै विषयमा केन्द्रित गरी यो प्रशिक्षण पुस्तिका विशेषज्ञहरू तथा सरोकारवालाहरूको सहभागितामा तयार भएकोले यसको उपयोगबाट जलव्यवस्थापनमा दुरगामी प्रभाव पर्नेछ भन्ने प्रतिष्ठानलाई लागेको छ।

स्थानीय तहको योजनामा अन्तरदेशीय जलशासनलाई समावेश गर्न नीतिनिर्मातालाई लक्षित गरी तयार गरिएको यस प्रशिक्षण पुस्तिकाको सम्बन्धित स्थानीय तहहरूमा उपयोग गरी जलशासन सम्बन्धमा क्षमता विकास होस् र स्थानीय जनताको जीवन समृद्ध र सुखी होस् भन्ने शुभकामना व्यक्त गर्दछु।

हार्दिक शुभकामना !

(पीतकुमार श्रेष्ठ)

कार्यकारी निर्देशक

स्थानीय विकास प्रशिक्षण प्रतिष्ठान

Foreword

Nepal is one amongst the water-abundant countries with in the world, with 6000 rivers, a total mean annual runoff of 224 billion m³ and per capita water availability of 9000 m³. It is the most important natural resources of Nepal and can form the basis of the country's social and economic development. Yet, pollution, environmental degradation, development priorities and competing uses put pressure on waters, including transboundary waters. These pressure affect their sustainable management.

The major river basins of Nepal; Mahakali River, Karnali River, Gandaki River and Koshi rivers are transboundary in nature. They form the upper catchments of the Ganga River. The entire area of Nepal lies within the Ganga drainage basins and occupies 13 per cent of the total catchment of the Ganga basin. The rivers from Nepal contribute up to 70% of the Ganga's dry season flow, and about 45% of its average annual flow. Nepal and India have signed Koshi Agreement (1954: revised in 1966), Gandak Treaty (1959, revised in 1964), and Mahakali Treaty (1996), The treaties aim for the development of the shared rivers for flood control, irrigation and hydropower. The provisions of the treaties are contested in Nepal.

In 2002, the government of Nepal (GoN) prepared the Water Resources Strategy (WRS) and three years later in 2005 the National Water Plan (NWP). GoN devised NWP to promote IWRM principles and sustainable river basin management. The 2012 GoN's National Water Resources Policy (NRP) emphasises the need for cross-sectoral coordination to develop and manage the country's water resources. The Water and Energy

Commission Secretariat (WECS) functions as the coordinating body for developing river basin plans in Nepal.

The United Nations Sustainable Development Goal (SDG) 6 targets to achieve water and sanitation for all by 2030. SDG 6.5.3 reflects on implementing Integrated Water Resources Management (IWRM) through transboundary water cooperation. The cooperative approach is aimed at improving the standard of living, economic productivity, and build peace among riparian countries.

When rivers cross national boundaries, the management jurisdiction involves more than one country. Thus, political and sovereign components are involved which make managing of transboundary river a complex challenge. Since most of the river basins of Nepal are transboundary in nature, and three of those in the major rivers (Kosi, Gandak and Mahakali) are governed by existing bilateral treaties and agreements, IWRM could be a working concept in enhancing cooperation the management of transboundary rivers. It is not only an issue of water resource but that of governance, and that holistic approach necessary in managing rivers.

This manual is aimed at providing guidance to the local government representatives, water managers, and relevant stakeholders to get an insight on the various aspects of river basin management. The principle of IWRM and practical exercises presented in this manual will help in developing strategies for better governance of transboundary rivers.

Preface

Over half of the world's population live in basins that are transboundary in nature. Many of these basins face increasing water scarcity along with pollution increasing population density, urban expansion, industrial development, irrigation, and development interventions. Climate change by altering the precipitation pattern exacerbates the harmful impact on water resources. They further add on to degradation of water, ecology and environment.

Effective management of water resource at all levels, including transboundary requires approach that help overcome the challenges. The principles of IWRM is important in this endeavour and by institutionalizing it rivers can be better managed. Pursuit of IWRM principle can promote participation, transparency, and build capacity of stakeholders as we transit to better manage rivers.

The Central Department of Environmental Science Tribhuvan University (CDES-TU) has developed this training manual by has incorporating suggestions from professionals. It aims to provide relevant and practical knowledge for practitioners, government officers and water managers. The manual includes necessary tools in line with IWRM principles in managing transboundary-rivers.

Acknowledgement

CDES -TU developed this training manual with consultation and support of OXFAM, RUWDUC and SIDA. CDES-TU acknowledges the support of the various contributors and organizations. CDES-TU would like to thank Mr Rajesh Sada, Water Resources Specialist, WWF Nepal for his review and feedback. CDES -TU also acknowledges the feedback received from the participants of the training workshop organized on 30th–31st December 2018 in Dhangadhi. The content was discussed in the workshop whose participants provided suggestions and inputs from to enhance the quality of this manual. CDES -TU acknowledges the financial support from the TROSA OXFAM to develop this manual.

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Overview of the Manual

This training manual contains eight chapters, each divided into two parts. The first part provides overview of the topic and the second part exercise for the trainees. Figure 1 depicts the chapters in this manual:

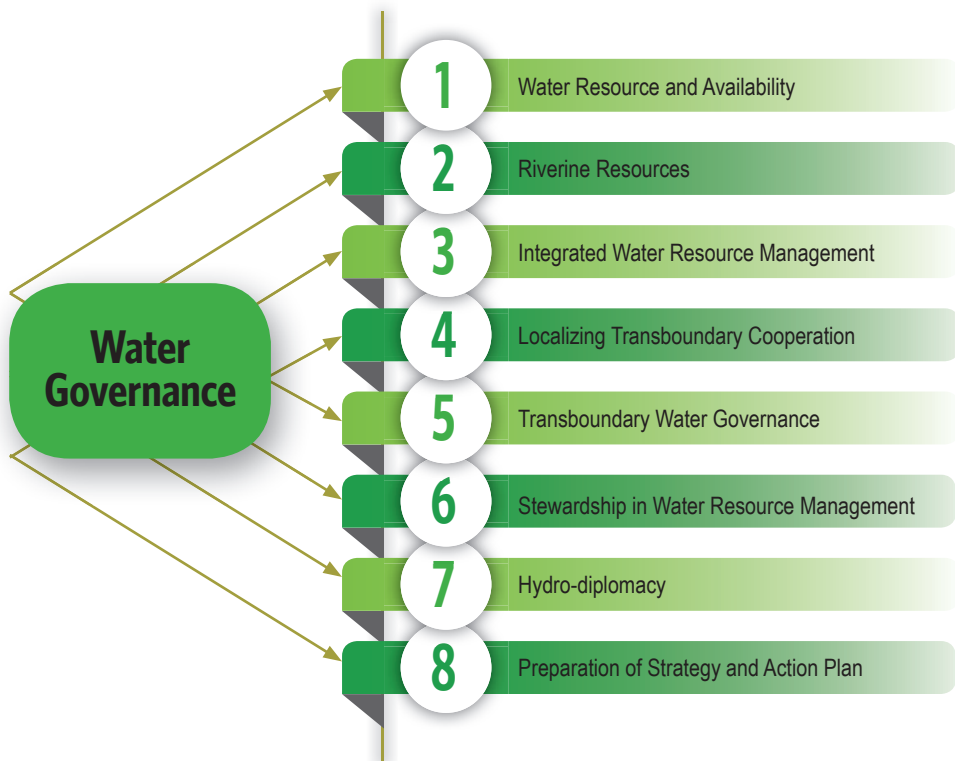


Figure 1: Trans-boundary Water Governance

Session Plan

This training manual is aimed at providing guidance to the local government representatives, water managers, and relevant stakeholders to appreciate various components involved in river basin management. It aims to be a reference guide to devise policies in managing transboundary rivers. The materials included will be delivered in a four day workshop with two sessions held on each day. The duration of the workshop, however, may depend on the level of understanding and interactions among the participants. A subject expert will deliver each session of the workshop.

Each chapter includes brief theory. It is followed by practical exercises as key elements. It is designed to elicit maximum interaction among participants. It includes role plays to analyze problem and solutions to sustainable water management.

After introducing all the participants of a workshop, facilitators will collect their expectations. Each session will include an overview, theory of each topic followed by practical exercise on each topic.

Session Planning

11 AM to 1 PM			2 PM to 4 PM		
DAY 1	SESSION I Water Resources and Availability	Overview	SESSION II Riverine Resources	Overview	
		Exercise/Discussion		Exercise/Discussion	
DAY 2	Integrated Water Resource Management	Overview	DAY 2	Localizing Transboundary Water Governance	Overview
		Exercise/Discussion		Exercise/Discussion	
DAY 3	Transboundary Water Governance	Overview	DAY 3	Stewardship in Water Resource Management	Overview
		Exercise/Discussion		Exercise/Discussion	
DAY 4	Hydro-diplomacy	Overview	DAY 4	Preparation of Strategy and Action Plan	Overview
		Exercise/Discussion		Exercise/Discussion	

Lunch Break 1 pm to 2 pm

Why is the training manual on water governance important?

The rationale for a training manual on water governance on transboundary basin is two-fold:

First, there is a need to have an integrated approach to manage the rivers of Nepal. Water governance with embedded IWRM framework could offer an entry point to manage a river. This manual can help policy makers and/managers develop a framework to manage transboundary rivers.

Second, when rivers cross the national boundary, the management of a river becomes complex as is the case between Nepal and India. Transboundary cooperation is key to address the challenges of managing transboundary rivers. This manual provides basic principle of water resource management.

What do the participants gain from this manual?

The participants shall get better insights about water resources, its services, and application of water governance framework such as IWRM in transboundary Mahakali River and other international shared rivers.

The manual has the following objectives:

- Participants would understand physical components of a river and its uses.
- Participants would gain knowledge on transboundary water governance and IWRM principle as a basic framework to manage transboundary rivers.
- Participants would learn about the ways to cooperate along transboundary rivers, governance structures and power in decision-making.
- Participants would understand about water stewardship and its application in water resource management.
- Participants would learn about hydro-diplomacy, its importance; and knowhow on preparing strategy and action plan for improving water governance and management.

MODULE 1

Water Resources and Availability

LEARNING OBJECTIVES

- Understanding the general hydrological cycle.
- Learning about the different types of water sources, their uses and their impacts.

Water can occur in three physical phases: solid, liquid, and gas. It exists in nature in all these phases in large quantities. Depending upon the climate of the place of occurrence, water can quickly change its phase.

The hydrologic cycle linking atmosphere-ocean terrestrial system makes water available in the nature. Water moves in its various phases from the atmosphere, to the earth, over and through the land, to the ocean and back to the atmosphere. The major components of the hydrologic cycle are precipitation (rainfall, snowfall, hail, sleet, fog, dew, and drizzle,), interception, depression storage, evaporation, transpiration, infiltration, interflow, percolation, moisture storage in the unsaturated zone, and runoff (surface runoff and base flow). Figure 2 shows water cycle as a

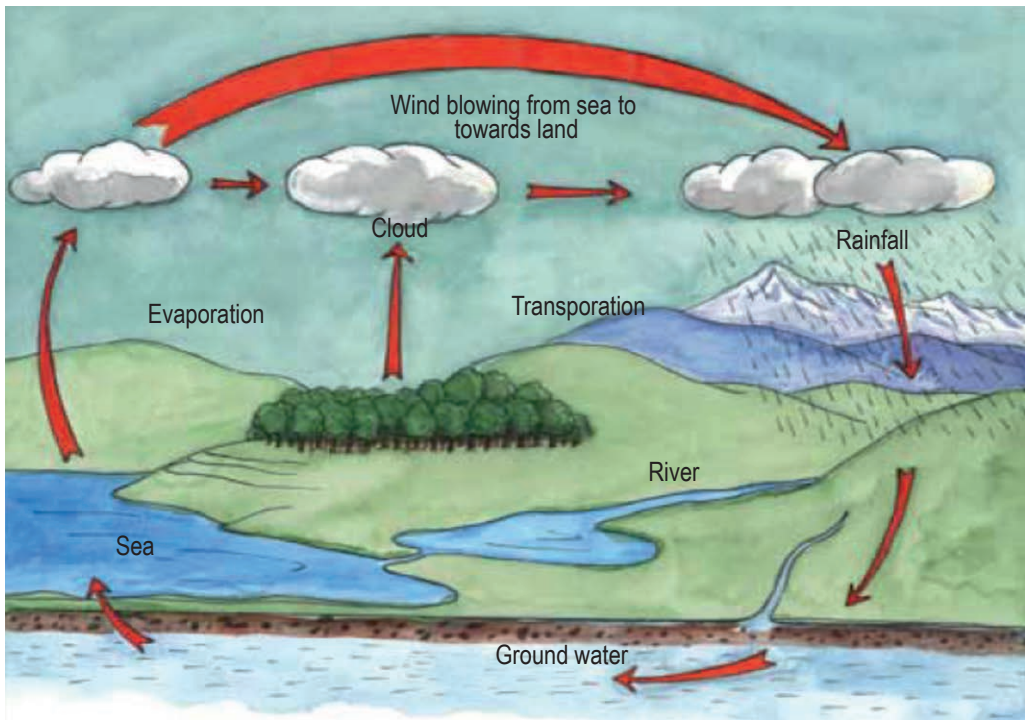


Figure 2: Water cycle

Dixit et. al. 2016

continuous process. Moisture evaporated from oceans and other water bodies precipitate in the form of rain, snow and hail. Some part of this precipitation returns to the water surface while some part falls upon the land. The cycle continues.

What are the water resources?

Water resources includes fresh water that are useful, or potentially useful, to society. The examples are for agriculture, industrial and recreational use. Groundwater, rivers, lakes and reservoirs are other examples.¹

1. <https://www.nature.com/subjects/water-resources>

Types of water sources

Surface water

Water in a river, lake or wetland is surface water. Precipitation replenishes surface water. It discharges to river and eventually to ocean. Glacier melt and precipitation are major supplier of surface water. The runoff characteristics of a watershed, the timing of precipitation, infiltration and local evaporation rates determine the flow of surface water.

Groundwater

Some precipitation infiltrates the ground and percolates downward through pores, fractures and crevices in soil, gravel and rock. This water form groundwater and flows into aquifers below the water table. There are two types of groundwater: sub-surface deep sub-surface, Sub surface groundwater flows just beneath the surface towards water bodies. The other is water in in deep aquifers (sometimes called "fossil water"). All groundwater is not accessible for human use. It is too deep to pump and too salty to be useful. Many cities and small towns in the world depend on groundwater for their water supplies.

Frozen water

Some water resources exist in the form of glaciers and ice. The Himalayas, which is also called third pole and the roof of the world, contain large glaciers and permafrost outside of the two poles. Ten of Asia's largest rivers flow from the Himalayas. More than a billion people's livelihoods depend on these rivers.

Water resources in Nepal

In Nepal water resources is available in the form of snow cover, rivers, springs, lakes, and groundwater. However, many areas in Nepal also face seasonal water scarcity defined as a particular period when demand exceeds water availability. Scarcity can constrain undertaking of domestic or productive activities (Murtinho et al., 2013). The three crucial dimensions that characterise water scarcity are a) physical lack

of water availability to satisfy demand. b) the level of infrastructure development that controls storage distribution, and access; and c) the institutional capacity to provide water services. Although Nepal's annual per capita water availability is over 9,000 cubic metres, this figure does not mean much place where people live and timing are considered. In hills of Nepal, rivers lie at the bottom of slopes and are inaccessible for use. Pumping water is expensive and in most places is not economically feasible. Local spring sources are the major source of drinking water for thousands of communities. In recent years, local springs are drying up. This process exacerbates water scarcity. As nearby sources become dry women have to walk down the hills to fetch water.

In plains (Tarai) of Nepal, people use groundwater well and hand pump. In some places water may not be safe for drinking because of arsenic contamination. Urban areas of Nepal face water shortage and lower water quality. This because of poor water services, increasing population density and pollution and poor operation and management. In addition, in cities groundwater is extricated in rate higher than recharge rate. Over-pumping lowers water able at an alarming rate.

Table 1: Water Resource in Nepal

Water resource availability	Nepal	World
Water resource availability	Nepal	1000 mm/year
Long term average annual precipitation in depth	1500 (mm/year)	42809.955 (Billions cubic meter)
Long term average internal renewable water resources (IRWR)	198.2 (km ³ /year)	
Total renewable surface water	210.2 (km ³ /year)	
Total renewable groundwater	20.0 (km ³ /year)	
Dependency ratio	5.71 (%)	
Total renewable water resources per capita	4,142 (m ³ /ind/year)	

(Source: FAO, 2016)

Figure 3: River basin with catchment area and discharge

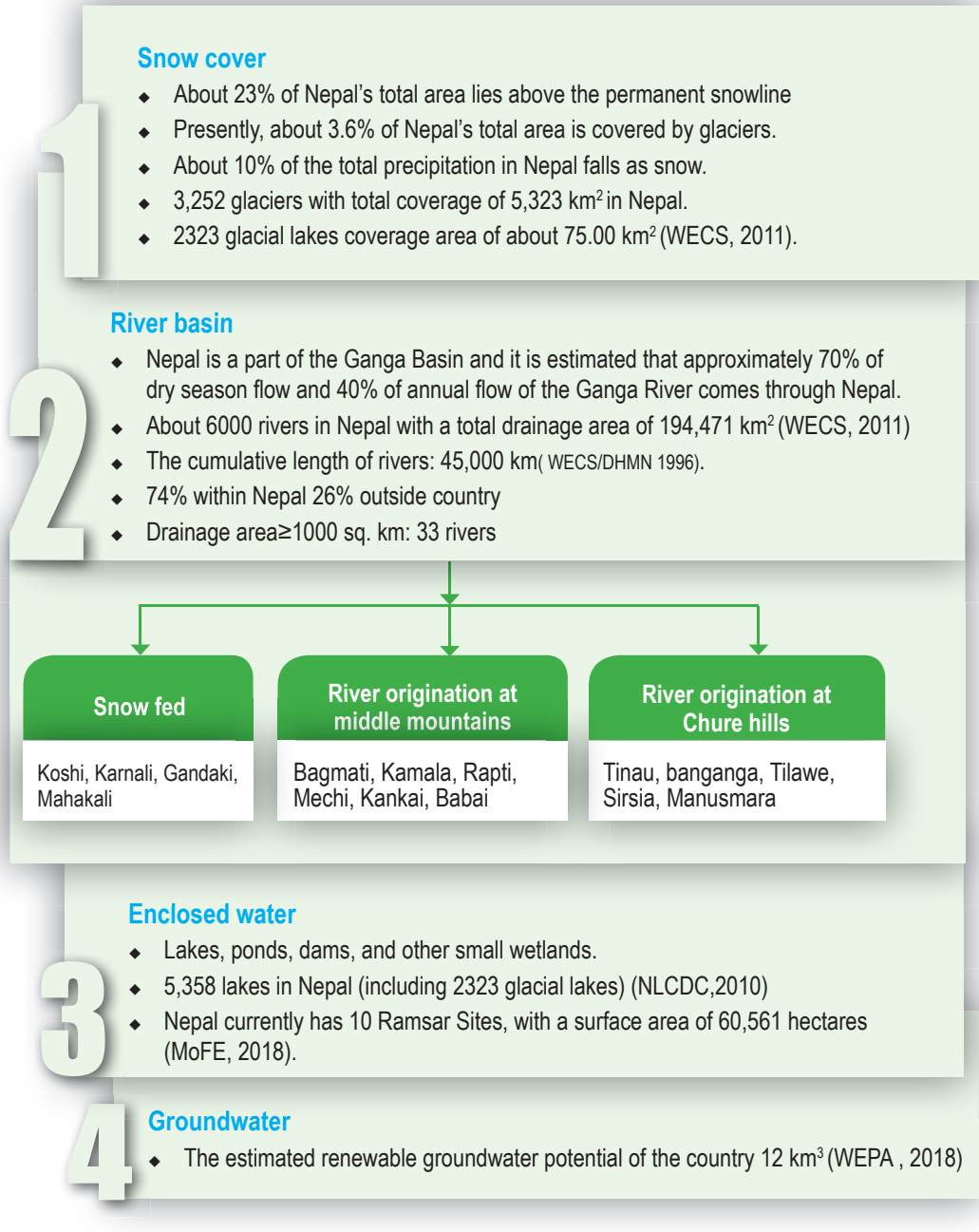


Table 2: River basin with catchment area and discharge

River Basin	Estimated catchment area in Nepal (km ²) #	Average discharge (m ³ /s)	Annual discharge (km ³ /year)
Rivers originating at the Himalayas			
Koshi	27,863	1409	45
Gandaki/Narayani	31,464	1600	50
Karnali	41,058	1397	44
Mahakali	5,188	573	18
Rivers originating at Middle Mountains and Hills	17,000	461	14.5
Rivers originating at Siwalik zone	23,150	1682	53
Total	145,723	7122	224.5

Total catchment area of each river basin is larger than shown in the table. Areas of the basins excluded in the table lie either in China or India.

Source: Water and Energy Commission Secretariat, 2005

Uses of water resource

Although there is plenty of fresh water on the Earth, water has not always been available when and where it is needed, nor is it always of suitable quality for all uses.

Impact of overuse of water resources

The increasing stress on freshwater resources is a serious concern. Climate change, rapid urbanization, increasing population density, hazardous development of infrastructures, change in land use and land cover stress water resources. The uncontrolled extraction of river beds, non-moderated growth in industrial activities, destruction of natural forest, and degradation of water bodies combined with rising demand for water and energy needs are some of the reasons increasing stress in water resources. In addition, around the world, water intensive life style has exacerbated stress on water resources.

Table 3: Uses of water with its description



Uses	Brief description	
Water Supply and Sanitation	<ul style="list-style-type: none"> ◆ SDG-6 is focused on both quality and quantity aspects of water. ◆ 87% of the country's population has access to the basic water supply at present (Budhathoki, 2019) ◆ Most of the urban water supply systems are not delivering water satisfactorily. ◆ Many rural water supply systems are not functioning properly. 	
Irrigation for Agriculture	<ul style="list-style-type: none"> ◆ At present, 42% of the cultivated area has irrigation of some sorts, but only 17% of the cultivated area has year-round irrigation (i.e. only 41% of the irrigated area gets year-round irrigation (WECS, 2011). ◆ In the Tarai, 82% of the total irrigated area (889,000 ha) is through surface irrigation and the remaining 18% through groundwater (WECS, 2011). 	 <p data-bbox="829 941 1259 1065">E.g.: Sikta Irrigation Project-42766 ha <ul style="list-style-type: none"> ◆ Ranijamara-kularia irrigation project-38300 ha ◆ Babai irrigation project-36000 ha ◆ Mahakali irrigation project (third Phase) under construction: 33520 ha </p>
Hydropower Development	<ul style="list-style-type: none"> ◆ The present situation is that Nepal has developed only approximately 1236 MW of hydropower² ◆ Recent estimate: at 40% dependable flows - for the run-of-the-river (ROR) hydropower potential in Nepal stands at 53,836 MW (WECS, 2011) 	<ul style="list-style-type: none"> ◆ Currently, four major storage projects are proposed as Indo-Nepal cooperative initiatives. These are the Chisapani-Karnali (10,800 MW), the Pancheswor (6480 MW), the Budhi Gandaki (600 MW) and the Sapta Koshi High Dam (3600 MW)
Industries, Tourism, Fisheries and Navigational Uses	<ul style="list-style-type: none"> ◆ Contributed to over 27 % of gross domestic production in the Agriculture sector in Nepal. Per capita fish production in Nepal for 2016/2017 reached 9 kg/year. (DOFD, 2016/17) 	
Environmental Services	<ul style="list-style-type: none"> ◆ Provisioning (e.g. fresh water and fish supply), regulatory (e.g. water and erosion regulation, self-purification), cultural (e.g. recreation and ecotourism) and supporting (e.g. soil formation, nutrient and water cycling) services 	

Table 4: Impacts of water use

Sectors	Positive Impacts	Negative Impacts
Water Supply and Sanitation	<ul style="list-style-type: none"> ▪ Nutrient recycling 	<ul style="list-style-type: none"> ▪ High level of water security required ▪ Surface and ground water pollution
Agriculture	<ul style="list-style-type: none"> ▪ Return flows ▪ Increased infiltration ▪ Decreased erosion ▪ Groundwater re-charge ▪ Nutrient recycling 	<ul style="list-style-type: none"> ▪ Depletion ▪ Pollution ▪ Salinization ▪ Water logging
Environment	<ul style="list-style-type: none"> ▪ Purification ▪ Storage ▪ Hydrological Cycle 	<ul style="list-style-type: none"> ▪ Erosion

MODULE 2

RIVERINE RESOURCES

LEARNING OBJECTIVES

- Provide an overview of riverine resources
 - Understanding the facts of riverine resources of Transboundary River
-

What is river?

A river is a natural flowing watercourse, usually freshwater, flowing towards an ocean, sea, lake or another river.

Rivers have two stages: middle and lowland. Mountain rivers are narrow and flows rapidly. In Lowland rivers are wider and have slow flow in meandering forms. In poles and high mountain areas glacier melt supplies water for rivers. Tributaries usually feed the primary river which then flow towards the ocean. They may also flow into an interior (partially enclosed) sea, an endorheic (opening less) lake, or it can disappear into a desert. A primary river and all its tributaries make up a river system.

River systems carry more than water. They also transfer energy, sediments and dissolved materials. They provide water and nutrients to ecosystems and agriculture. They act as corridors for migration of fish,

facilitate commerce, and attract recreation and meet faith-based needs. River ecosystem also includes river channels and their floodplains that house a wide variety of natural resources and provide various ecosystem services, They support livelihood of river communities (Figure 4).

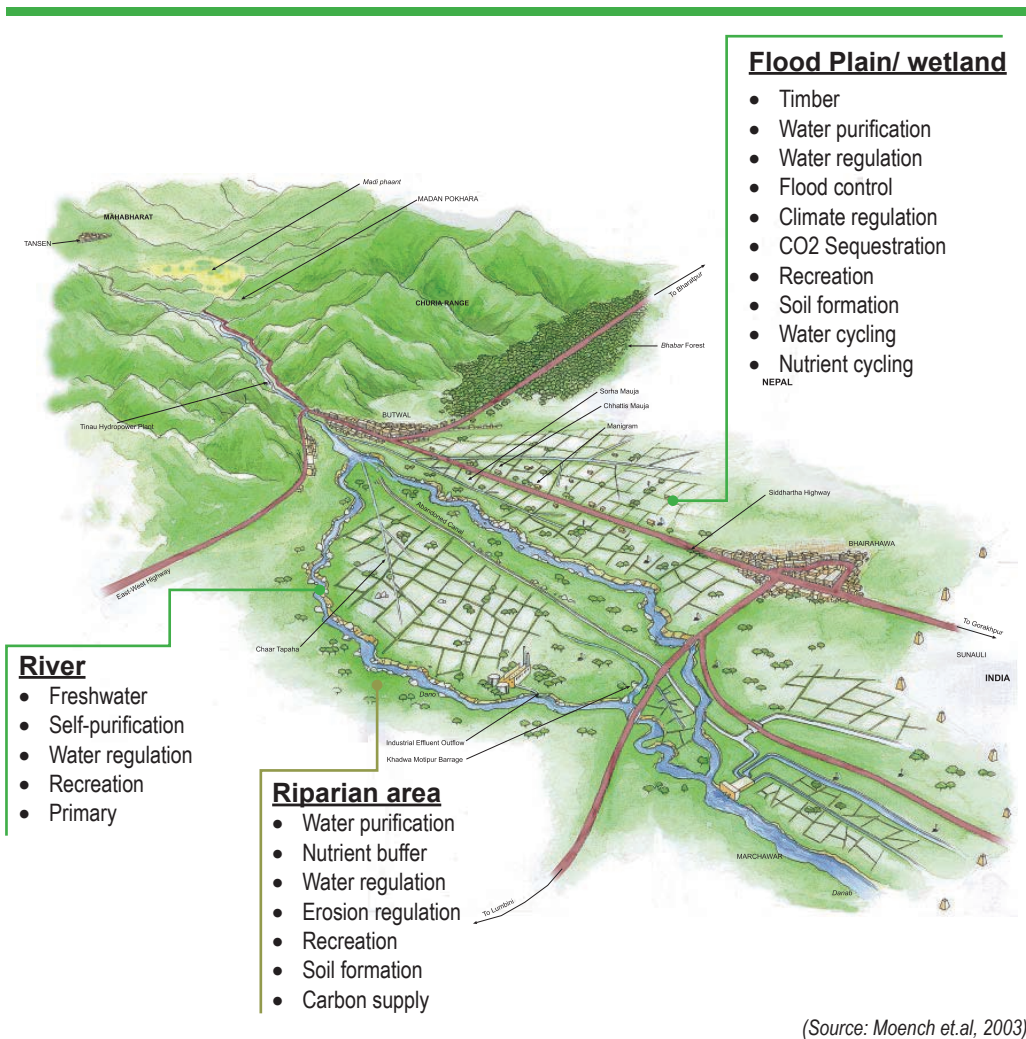


Figure 4: Major ecosystem services provided by rivers, riparian areas and floodplains/wetlands

What is the role riverine resources?

Ecosystem and biodiversity provide ecosystem services to people both directly and indirectly. The services determine people's wellbeing. The Millennium Ecosystem Assessment has categorised four ecosystem services: provisioning, regulating, supporting and cultural. Services refer to the human use of fresh water for domestic use, irrigation, power generation, and transportation. People depend on rivers for fresh water supply and sanitation. But there are many more services that rivers and floodplains provide for meeting basic human needs.

Figure 5 summarizes the major provisioning (e.g. fresh water and fish supply), regulatory (e.g. water and erosion regulation, self-purification), cultural (e.g. recreation and ecotourism) and supporting (e.g. soil formation, nutrient and water cycling) services that river ecosystem provide.

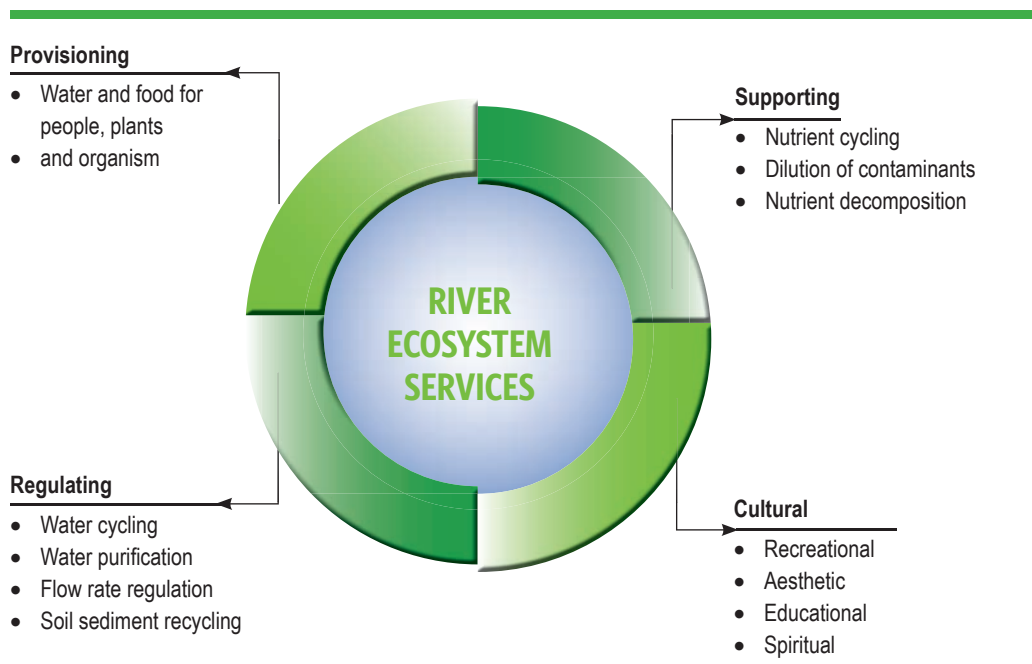


Figure 5: Ecosystem services of rivers operation

Riverine resources in Nepal

There are about 6,000 rivers in Nepal with a total drainage area of 194,471 sq. km. Out of these rivers, 33 rivers have a drainage area exceed 1000 sq. km. The drainage density expressing the closeness of the spacing of channels is about 0.3 km/sq. km (WECS, 2011). Nepal's wetlands exist as extension of the diverse floodplains formed by the four major rivers (Gandaki, Koshi, Karnali, and Mahakali) and other smaller rivers. River channels and floodplain house a wide variety of plants and animals that depend on the river for their survival. Table 5 presents an overview of Mahakali River.

River connectivity

Connectivity describes the degree to which matter and organisms can move among spatially defined units in a natural system. Riverine systems are characterized by their inherent water-mediated connectivity wherein the river itself represents both habitat and migration corridor. Connectivity acts on one temporal and three spatial dimensions: longitudinally from headwaters to confluences and the sea, laterally from the main channel to floodplains and vertically from the river towards the hypothetical interstitial and the groundwater.

Table 5: Overview of Mahakali River

Major habitat	<ul style="list-style-type: none"> Fast flowing river, backwater, tributaries, streams, inlet brooks, flood plains, swamps, marshes, pebbles, sandbars
Major tributaries	<ul style="list-style-type: none"> Uku, Radam, Chamelia, Sadan, Samania, Rupali, Buwa, Bali, Sarmali, Katela, Sirse, Puntura, Marthani, Ujelighat, Rangun, Kuna, Chaalte, Bas, Dhakne, Hatwani, Karali, Dharmadwar khola etc (Kunwar et.al., 2015). Of the tributaries, Chameliya and Rangoon are major tributaries' contributing sufficient and continuous inflow to the major system.
Physio-chemical	<ul style="list-style-type: none"> Maximum pH=8.8, TDS=110.0mg/l, DO=5.0mg/l and BOD= <2mg/l Water turbidity and pH were higher in Mahakali River System and lower in associated tributaries (Kunwar et al., 2015).
Plant species	<ul style="list-style-type: none"> Altogether 140 species of wetland plant species including 41 common species were reported from the Mahakali wetland (Bhandari, 2009). 140 species only from Mahakali River corridor. 78 species (55%) were ethno botanically important as folklore medicine, vegetable, fodder and timber. Similar number of 78 medicinally important plant species were reported from adjoining villages of Mahakali River (Pant & Panta, 2004).
Phytoplankton	<ul style="list-style-type: none"> 20 species of floating species and among them Azolla pinnata, Lemna species, Nitella species, Spirodella species, etc. are common floating.
Macrophytes	<ul style="list-style-type: none"> There were 18 major emergent species and shoreline emergent such as Arundo, Phragmites, Saccharum
Fish	<ul style="list-style-type: none"> 71 species (Shrestha, 2002)
Mammals	<ul style="list-style-type: none"> Shuklaphanta National Park (total of 24 mammal species Schaff (1978), 350 species of birds of which 180 are breeding species (Inskipp, 1989), 10 species of ectoparasites and biting flies Schaff (1978) Adapted from DNPWC website).

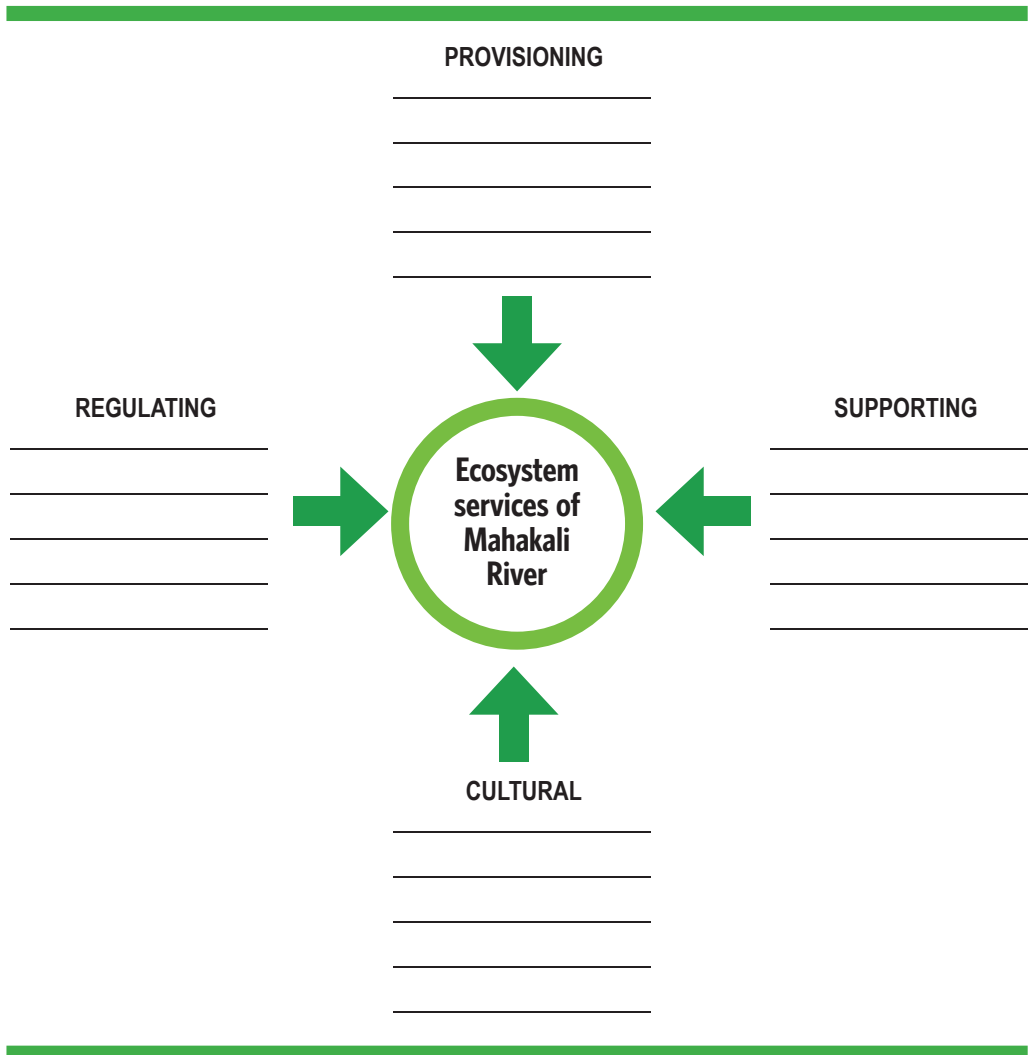
Exercise

At the end of this session, the participants will answer the ecosystem services and other characteristics of rivers.

Materials: Chart papers and mark pen

Time: 30 minutes Preparation

Ecosystem services of Mahakali River



MODULE 3

Integrated Water Resource Management

LEARNING OBJECTIVES

- Understand the key elements of an IWRM approach to sustainable management of water resources.
 - Understand key principles and themes in IWRM with respect to transboundary river management.
-

What is IWRM?

Global Water Partnership (GWP) has defined IWRM as a process which ‘promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.’ With understanding of natural systems, human systems and inter connecting sectors, practitioners can apply IWRM principle and tools in managing water resources. Natural systems include fresh water (also called blue and green water), upstream-downstream linkage, and quality-quantity interface of water. Human systems include plans and policies related to water resource management. Different sectors like forest, land, water have their own

policies and legislation. These policies and sectors interface as water is a common pool resource.

Principles of IWRM

IWRM principles are based on the Dublin Principles presented at the World Summit in Rio de Janeiro in 1992. The Dublin principles are:

- Water is a finite and vulnerable resource: Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment.
- Participatory approach: Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels.
- Role of women: Women play a central part in the provision, management and safeguarding of water.
- Social and economic value of water: Water is a public good and has social and economic value in all its competing uses.

Integrating three Es (Environment, Economy, and Equity): IWRM is based on equitable, efficient and sustainable management of water resources.

Why IWRM?

Water is vital for human survival and development. Increasing population density, increased economic activities and higher standards of living lead to competition for, and conflicts over, the limited freshwater resource. The following points should be considered in managing water resources.

- Water resources are increasingly under pressure from growth in population density, economic activities and increasing competition among users.
- Water withdrawals have increased more than twice and one third of the world's population live in countries that experience medium to high water stress.

- Pollution is further enhancing scarcity by reducing water usability downstream.
- Focus on managing existing ones better than developing additional sources. Sectoral approach to water management result in uncoordinated development and management of the water resource.
- Unsustainable development means greater impacts on the environment.
- Concerns about climate variability and climate change demand improved management of water resources to adapt to more intense floods and droughts.
- The conflict between upstream and downstream arises on water resource use and allocation.

The IWRM framework

It comprises three sections showing coordination as a basic tool.

Enabling Environment

- What makes up the “rules of the game” and makes it easy for stakeholders (people who have a say) to play their respective roles in the development and management of water resources?
- Determined by national, provincial, and local policies, legislation, budget allocation, and incentives
- Participation from all walks of life needs consideration applying a top-down and a bottom-up approach in national level, local level, and basin level.
- Trickle down action to the lowest appropriate level.

Institutional Roles

- The institutions (government departments, laws, administrative systems) which deal with policy, regulations, implementation, execution and oversight understand and deliver as per their roles and capacities

Management Instruments

- The elements and methods that enable decision makers to make rational and informed choices between alternative actions.
- Include a wide range of methods, both quantitative and qualitative, based on disciplines such as hydrology, hydraulics, environmental sciences, system engineering, legal sciences, sociology and economics.
- To make effective IWRM, it is necessary to select the group of instruments that better suit considering the existing social and political, and geographical, social and economic context

Below mentioned tools are developed by Global Water Partnership grouped into IWRM framework for IWRM implementation.

The Enabling Environment

1. Policies; Setting goals for water use, protection and conservation
2. Legislative framework - water policy translated into law
3. Financing and incentive structures - Financial resources to meet water needs

Institutional Roles

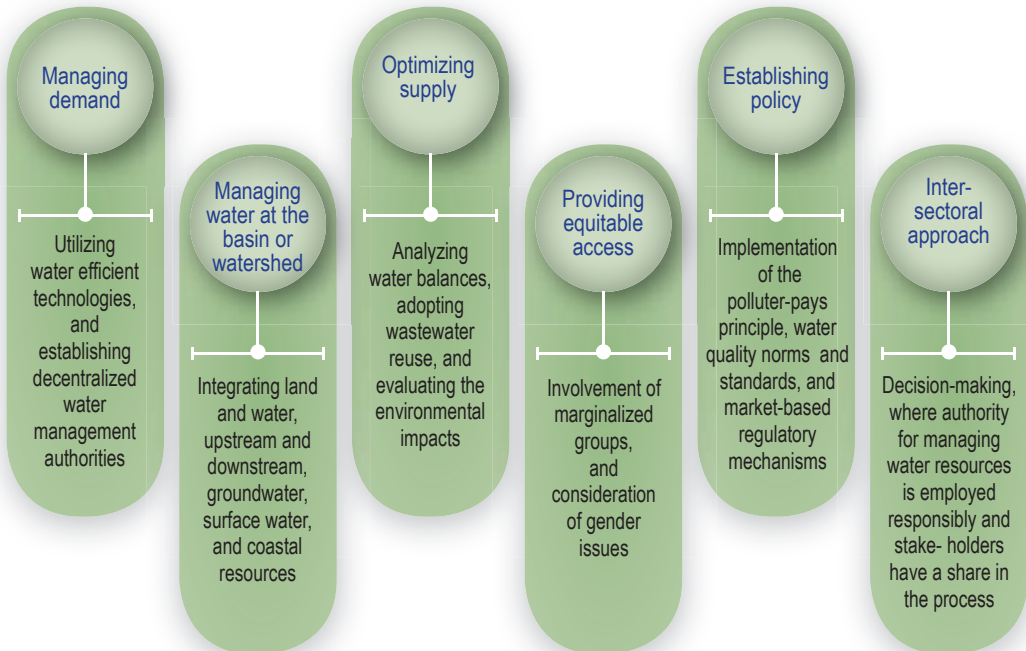
1. Creating an organisational framework - forms and functions
2. Building institutional capacity - developing human resources

Management Instruments

1. Water resources assessment - understanding resources and needs
2. Plans for IWRM - combining development options, resource use and human interaction National integrated water resources plans
3. Efficiency in water use - managing demand and supply
4. Social change instruments - encouraging a water-oriented society
5. Conflict resolution - managing disputes and ensuring sharing of water
6. Regulatory instruments - allocation and water use limits
7. Economic instruments - using value and prices for efficiency and equity
8. Information exchange - sharing knowledge for better water management

Components of IWRM

The key components of IWRM process are as follows:



IWRM plans in Nepal

The Government of Nepal (GoN) policies on water conservation and managements includes National Water Resources Strategy (2002) and the National Water Plan (NWP: 2005). In 2012, GON drafted the National Water Resources Policy. The National Planning Commission (NPC), the government body formulates development plans and policies across all sectors, while WECS in entrusted to achieve the objectives defined in the NWP. Koshi River Basin Management in Nepal is a good initiative. These programs need further support.

Institutional framework for IWRM

For implementation of IWRM principles, the river basin is a logical geographical unit. In order to bring IWRM principles into effect, following arrangements are needed:

- The stakeholders involved in decision making with the representation of all section of a society. Participation must ensure gender balance.
- Water resources management should be based on hydrological boundary.
- Organizational structures at basin and sub-basin levels should enable decision making at the lowest appropriate level.
- Government should co-ordinate the management of water resources across sectors at national level.

What is an integrated river basin planning?

Integrated River Basin Planning (IRBP) is a subset of IWRM at the basin scale. It involves procedures to plan use and management of land and water resources in a coordinated manner within a river basin and sub-basin levels. IWRM focuses in changing working practices to look at the bigger picture in which actors need to understand the scope of their actions and realize that these do not occur independently of the actions of others. IWRM coordinates water management across, between and within sectors

Exercise

Materials: paper

Time: 60 minutes

IWRM and how it can be used as a water resources planning, development and management process and understand the three components of IWRM: enabling environment, institutional roles and management instruments.

- Take one issue related to the Mahakali River.
- For the issue, using IWRM tools, identify
 - One relevant enabling environment tool
 - One relevant institutional role
 - One relevant management instrument to address this issue

Evaluating matrix for the respective basin

Enabling environment	<hr/>
Institutional arrangement	<hr/>
Management instruments	<hr/>

MODULE 4

Localizing Transboundary Cooperation

LEARNING OBJECTIVES

- Understanding the importance of localizing transboundary cooperation.
 - Managing trans boundaries issues at the local level.
-

A transboundary river crosses at least one political border, either a border within a nation or an international boundary. The management of transboundary rivers has become an important social and political agenda in recent years. Natural freshwater basin boundaries rarely coincide with administrative boundaries. Across the world, there are 153 countries sharing rivers, lakes and aquifers. Transboundary basins cover more than half of the Earth's land surface, account for about 60% of global freshwater flow and are home to over 40% of the world's population (UN & UNESCO, 2018).

Transboundary waters create social, economic, environmental and political inter-dependencies. They connect population across borders, economic sectors and ecosystems in the basins. Transboundary water cooperation is a prerequisite for sustainable development, peace, and stability.

The corresponding transboundary basins are home to over 2.8 billion people (42% of the world's population), cover 62 million km² of the land on Earth (42%), and account for 54% of global river discharge.

It is estimated that two thirds of the population already live in areas that are potentially water-scarce for at least one month of the year (UN & UNESCO, 2018).

Over the past few decades, global water crises have recurrently been recognized among the major threats facing the planet. Demand for water is expected to increase by around 1% per year due to pressures from economic development and changing consumption patterns. Such pressures are major challenges. Water pollution is a major threat to waters in Africa, Asia and Latin America, and further deterioration in water quality will negatively impact human health, the environment and sustainable development. The lack of cooperation among countries is a major barrier to address world's water crises. Most of the uncertainties and conflict in the water sector can be successfully addressed through cooperation whether it be at local, national or international level.

Because of lasting mistrust, Nepal, India and Bangladesh have missed an opportunity in benefitting from bilateral agreements. The bilateral negotiations between Nepal and India, and India and Bangladesh have resulted in agreements, and even treaties. However, actual progress to use the river waters for economic development and poverty alleviation in the region has been minimal.

The countries need to plan and implement cooperative strategies. They must plan joint action in which water could act as a catalyst for economic development. South Asian countries need to cooperate with each other more than ever in managing transboundary rivers for the wellbeing of their country and people. Cooperation can start from one shared basin. It could begin with exchange and dissemination of water-related data and information amongst countries. They could be a useful starting point for cooperation for better management of a shared river.

Joint research projects, technical and financial cooperation, data sharing, cost sharing for joint action, and the creating a platform for sharing and learning helps to build trust among riparian countries. Such actions are also crucial to increase communication channels between riparian to track progress and enhance cooperation.

Since 1820, there are about 450 transboundary water treaties signed. However, there is a lack of arrangements to support sustainable development and management of transboundary rivers, lakes and aquifers (UN and UNESCO,2018)

Developing cooperative mechanisms at local level

Governance is the process by which decisions are made and actions are taken with responsibility, participation, available information, transparency, custom, and rule of law. It is an art of coordinating decision-making between and among different jurisdictional levels, and potentially also non-state actors such as multinational corporations, international organizations, and NGOs.

In transboundary waters, governance structures can be developed for various purposes: in managing and allocating shared waters; in coordinating water-related development and conservation activities; in protecting aquatic environments for human and environmental health; and in developing collaborative responses to climate change impacts.

The Mekong River Basin encompasses six nations; China, Myanmar, Cambodia, Lao PDR, Thailand and Vietnam. China and Myanmar have declined joining the coordinated management plan. Although lack of participation from China and Myanmar affects a responsive approach in a basin, the other four riparian – Cambodia, Lao PDR, Thailand, and Vietnam – have been able to implement relatively successful cooperative mechanisms, including standards for minimum flows, procedures for exchanging information, and creation of a river basin commission. They have been able to engage China, and Myanmar in some extent in dialogue aimed at exchanging information.

Cooperative mechanisms components

Cooperative mechanisms can be pursued through a formal organization developed for specific purposes such as managing transboundary waters, or through offices or departments of two or more riparian governments whose representatives meet periodically or as per need for joint programs. Where strained cross-border relation or other

Scope and applicability of cooperative mechanism: The basin approach

- Countries of each basin are better able to respond to the challenges of hazards, crisis and avoid similar ecological disasters.
- Able to plan and coordinate both short-term and long-term strategies, and develop local, national, and basin-level priorities for managing shared waters.
- Basin countries gain the ability to pool their resources to maximise the benefits of their shared waters, and can together shoulder disasters and other burdens.

Substantive and procedural rules

Procedural rules

provide the means through which substantive rules are implemented.

Substantive rules

rights and obligations of the parties

The development of adequate procedural rules is emphasized as a first step

Procedural rules

The development of adequate procedural rules is emphasized as a first step.

Data sharing

The data and information that should be generated and exchanged includes: scientific and technical data related to climatic conditions in the basin; the transboundary water body itself, and the surrounding basin environment; geographic, cultural, and socio-economic information on the populations and ecosystems that depend on the watercourse; current and planned water uses; and management activities including regulatory actions and conservation measures.

Monitoring

Allow parties to observe and inspect changing conditions in the basin, evaluate whether each side is fulfilling its commitments per the agreement, and be mindful of unexpected consequences resulting from implementing treaty provisions.

Technical and financial cooperation

Example: create a shared financial resource pool, which can operate as an insurance or an emergency fund, to offset the negative effects of floods and droughts.

Prior notice and consultation

An agreement that will notify and consult riparian in case one of the riparian countries plans to build new water infrastructure in the shared water resource.

Mechanisms for responding to alternative/changing scenarios

Reduce the negative effects of extreme weather events, unexpected industrial contamination, and other unforeseen events.

Means for dispute resolution

International agreements should incorporate means for dispute resolution, which can include diplomatic negotiations between political representatives, establishment of an expert/fact-finding commission, third party negotiation.

Amendment mechanism

Several amendment mechanisms can make international agreements inherently more adaptable to changing circumstances.

Substantive rules

Fixed allocations

Allocating fixed water quantities can give the parties the certainty that they will get a guaranteed quantity of water. This might make negotiations easier, and the country can convince public citing it as successful negotiations.

Fixed allocations with flexibility provisions

Fixed allocation plans can be coupled with mechanisms that allow for greater flexibility in the implementation or interpretation of allocations and obligations. For example, fixed quantity allocations can be combined with percentages of flows to provide more efficient and flexible allocation mechanisms.

Prioritization of water uses

Water allocation should be in line with the priority order. For example in Nepal the priority of use is: drinking and sanitation use comes first followed by irrigation, livestock, energy, industry, and environment.

challenges halt cooperation, institutionalizing transboundary water management within a dedicated binational (or multilateral, where the basin encompasses over two riparian) unit can be an effective means for implementing cooperative mechanisms.

Following are the major components essential for localizing cooperative mechanism.

Steps for cooperating mechanisms

Institutional structure and authority

Lautze et al., have developed a nomenclature to distinguish three basic types of institutional mechanisms:

1. Councils
2. Commissions and
3. Authorities

While these terms are not used universally, this nomenclature provides useful guidance to interpret and assess the structure and authority in any institutional mechanism.

Councils

Councils usually comprise representatives from the two parties (usually between one and nine) who meet at periodic intervals to discuss issues of concern. They have an advisory function towards their governments and do not have decision-making authority.

Commissions

Commissions typically consist of two to three bodies. Often, they include a secretariat that functions as an administrative support and creates an organization, and a body composed of commissioners who represent the individual countries. The main functions of a commission consist of monitoring, coordination, harmonization, policy setting, and facilitation of planning. Like councils, they usually have a consultative and advisory function and do not have decision-making authority.

Authorities

Authorities are of two types. Usually they are either applied to concrete water development projects, in which case they take the character of a public company; or they function as basin authorities. In this case basin authority develop strategy for the entire basin, and periodically reallocate the river's water based on changes in flow and availability, and the changing needs of its member states.

Institutional flexibility and agility

Institutional mechanisms should not be hampered with changing events and obligations. It can incorporate flexible management systems that allow the institutions to adapt their mechanisms, activities, and policies in response to changes (Droughts, flood, etc.)

Stakeholder participation in institutional mechanisms (inclusive GESI)

Institutions established to implement cooperative transboundary water cannot function effectively without participation from grassroot level. Transboundary water issues are often of greater significance to local border communities than to the broader populations of the riparian nations. Local actors and decision-makers are better informed about local and regional cross-border concerns. Identified solutions are likely to be more realistic and effective by empowering and including local stakeholders in decision-making.

Political level of implementation

Interest that a national government may have in a local issue is often related to the distance of the place where the issues origin from the capital city. Management of water resources that cross a political boundary may be more effective at a political level that is more agreed to the geographical scope of the resource.

Financial and other support for institutional mechanisms

The absence of financial mechanisms to support and sustain the institution's activities can reduce the institution's effectiveness.

Different funding options

- Include contributions from the member states, which can stem directly from national budgets or community levies.
- Taxes on water and/or hydropower companies and polluters (basin organization can make use of this fund).
- External funding options, institutional mechanisms might pursue public and private donors, and the option of public-private partnership.

Example

Ongoing Interventions in Mahakali River Basin with six-point declaration by the provincial government and the follow up commitments and agreements by the local governments afterwards as listed below.

- To address the transboundary water issues and improve livelihood of the vulnerable communities of Mahakali River basins in Nepal and India through policies and programs.
 - To set up and implement institutional policies by conducting research on topics such as appropriate utilization of river resources, conservation of bio-diversity and rights of river basin communities for the effective implementation of community centric plans and sustainable management of the river.
 - To play an effective role for collaboration and cooperation with local government for improved water governance and overall development of vulnerable communities living in Mahakali River Basin.
 - To work in cooperation with civil society organizations, government and non-government actors to empower and ensure water rights of vulnerable women along the Mahakali River Basin.
 - To set up federal and provincial level expert commission on the Mahakali River Basin in consultation with concerned stakeholders for conservation, utilization and overall development of the Mahakali River.
 - To urge the governments to set up transboundary Mahakali River Commission as provisioned in Mahakali Treaty between Nepal and India for conservation, utilization and overall development of the Mahakali River.
-

MODULE 5

Transboundary Water Governance

LEARNING OBJECTIVES

- Understanding and accessing the transboundary water resources and its governance system.
 - Dimension of water governance in Mahakali River.
-

Governance comprises all the processes of governing: whether undertaken by the government of a state, by a market or by a network over a social system; and whether through the laws, norms, power or language of an organized society. Water governance refers to the political, social, economic and administrative systems in place that influence water's use and management.

A large portion of major freshwater basins in the world fall within the jurisdiction of over one nation. Although the number of river basins that can be classified as international river depends partly on the definition, the number is also increasing because there are newly independent countries. There are 310 international river basins covering 47.1% of the planet's land area (Mc Cracken and Wolf, 2019). Nineteen of these basins are shared by five or more states.

There are two global legal frameworks on the transboundary water governance which addressed the challenges of many countries who share water resources. They are 1966 Helsinki Rules on the Uses of Waters of International Rivers and United Nations Watercourses Convention (UNWC), which was adopted in 1997 and entered into force in 2014. Transboundary water governance is also characterized by certain legal criteria and obligations which can change or expand depending on the context in which it operates. General principles of the transboundary water governance are included in article 5, 6, 7, 8, 9 and 10 of UN Watercourse Convention 1997. They are equitable utilization and participation, factors relevant to equitable utilization, obligation not to cause significant harm, general obligation to cooperate, regular exchange of data and information and relationship between different kinds of uses

Dimensions of transboundary water governance

UNESCO considers that there are four dimensions to governance termed as social, economic, political and environmental. They are briefly described below:

Social

It focuses on equity of access to and use of water resources.

Economic

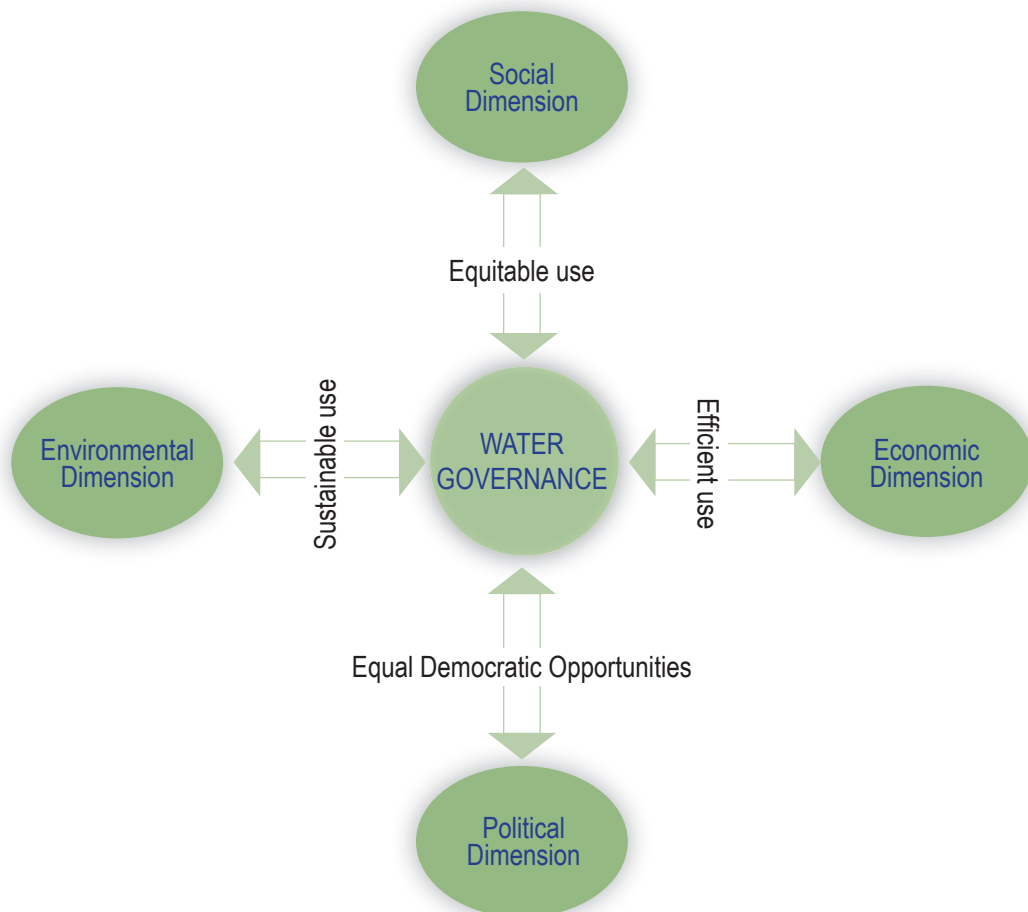
It highlights efficiency in water allocation and use, as well as best value in access to water and sanitation.

Political

It focuses on providing stakeholders and citizens with equal rights and opportunities to take part in various decision-making processes.

Environmental

It emphasizes sustainable use of water and related ecosystem services to enable lasting access to water and sanitation for all.



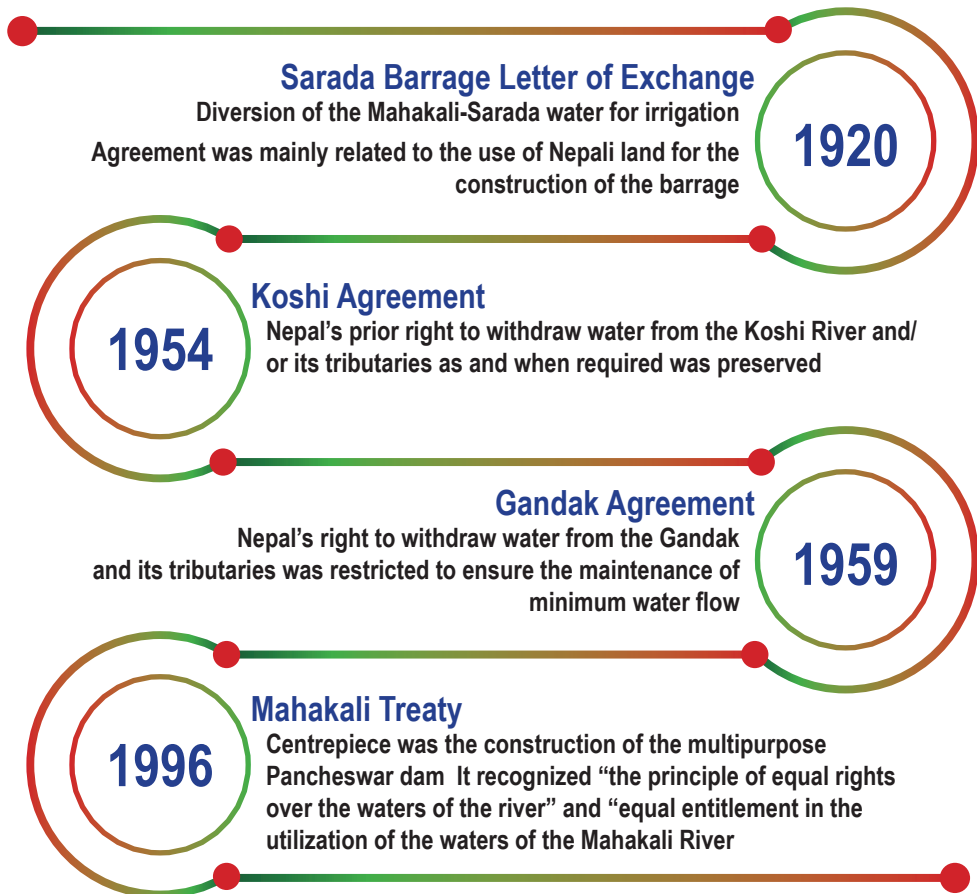
There are two broadly framed justifications for countries to engage in management of transboundary water resources.

- The first is the realization that interdependencies in the upstream and downstream areas in a river basin cannot neglect as conflicts may arise because of such indifference.
- The second is the recognition that collaboration could bear fruits for countries with better policies and management practices in water and other sectors.

International water laws governing transboundary waters have evolved out of previous experiences in water management, and it is now widely believed that basin-wide cooperation is the ideal solution to the problem of managing transboundary river-basins.

Nepal-India

Nepal is an upper riparian country and India is a lower riparian country sharing major rivers, Mahakali (Sarada in India), Karnali, Gandaki and Koshi, all originate in the Himalaya and join the Ganga at different locations in India after crossing Nepal. These river systems contribute about 70% of dry season flows and 40% of annual flows of Ganges. As an upper riparian, theoretically Nepal needs not worry of rivers that flow from Nepal to India. However, the infrastructures built on these rivers have exacerbated flood and inundation in Nepal's side, affecting lives of river communities.



Water rules and relationships have grown by considering local needs, customs, society, culture, and religious beliefs. Treaties and agreements on international river basins vary according to parties to the agreement (bilateral/multilateral), subject (data collection, allocation, planning, construction, etc.), territorial extent (the whole basin or parts of it), and intensity of cooperation (from duty to inform to implementation of joint programs).

Good transboundary water governance

McCaffrey (2007) sets two criteria for good transboundary water: substantive and procedural. Substantive criteria promote cooperation for joint management, and sustainability for a healthy and renewable environment. Procedural criteria provide guidance for the substantive principles in international law and promotes transparency, predictability and accountability (Figure 6).

Mekong River: the Mekong River flows 4,909 km through six countries: China, Myanmar, Thailand, Lao PDR, Cambodia, and Viet Nam. Cooperation on the Mekong between the riparian countries had been ongoing since 1950s in the form of the Mekong Committee. The four countries of the LMB, Cambodia, Lao PDR, Thailand and Vietnam signed the “Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin” on the 5th of April 1995. China and Myanmar, which form the upper part of the Mekong basin, have not signed the 1995 Mekong Agreement but have been attending MRC’s governance meetings as Dialogue Partners since 1996. Council Members of the Mekong River Commission (MRC) review the situation and come to mutual conclusions on the management and development of water and related resources within the framework.

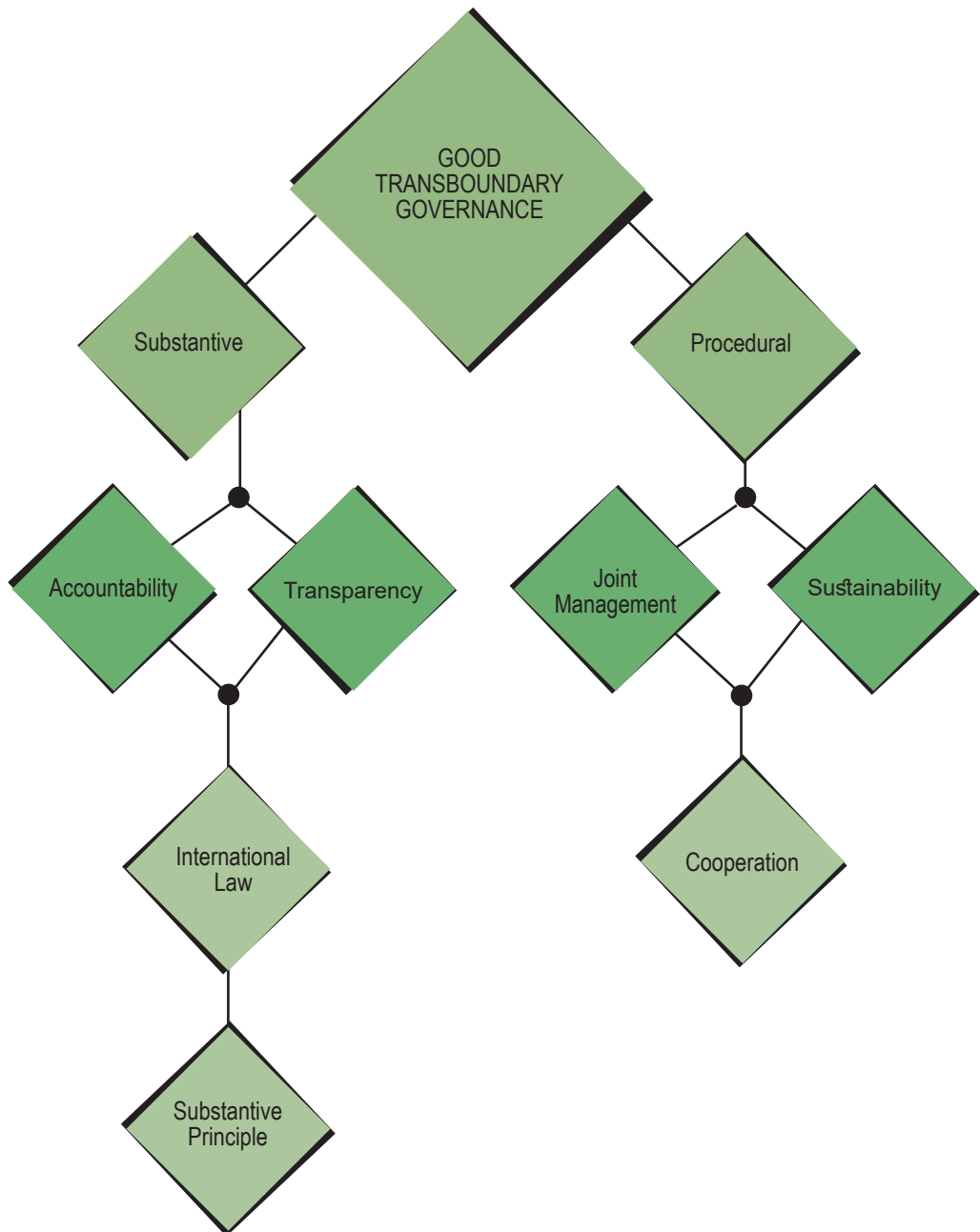


Figure 6: Good transboundary governance matrix

Example from Mekong River

Water resources management in the LMB is a mix of a “cooperative and coordinating model” at the basin scale (facilitated through the MRC), and four national models where individual sovereignty, customs and administrative systems dominate.

Exercise

Materials: Pen and Paper

Time: 30 minutes

Issues in basin related to transboundary water resource management

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MODULE 6

Stewardship in Water Resource Management

LEARNING OBJECTIVES

- Understand the concept of stewardship on water resource management.
 - Achieving stewardship in water resource management.
-

Water resource management comprises planning, developing, distributing and managing the use of water resources. The process recognizes all the competing needs of water and seeks to allocate water equitably among all users.

Water resource management is based on:

- Sustainable water resources planning and management.
- Participatory approach to water resources, planning and management.
- Water allocation based on demand, supply and equity.

Basic function for water resources management

The figure 7 shows the basic functions for water resources management in a river basin. The table 6 describes these functions.

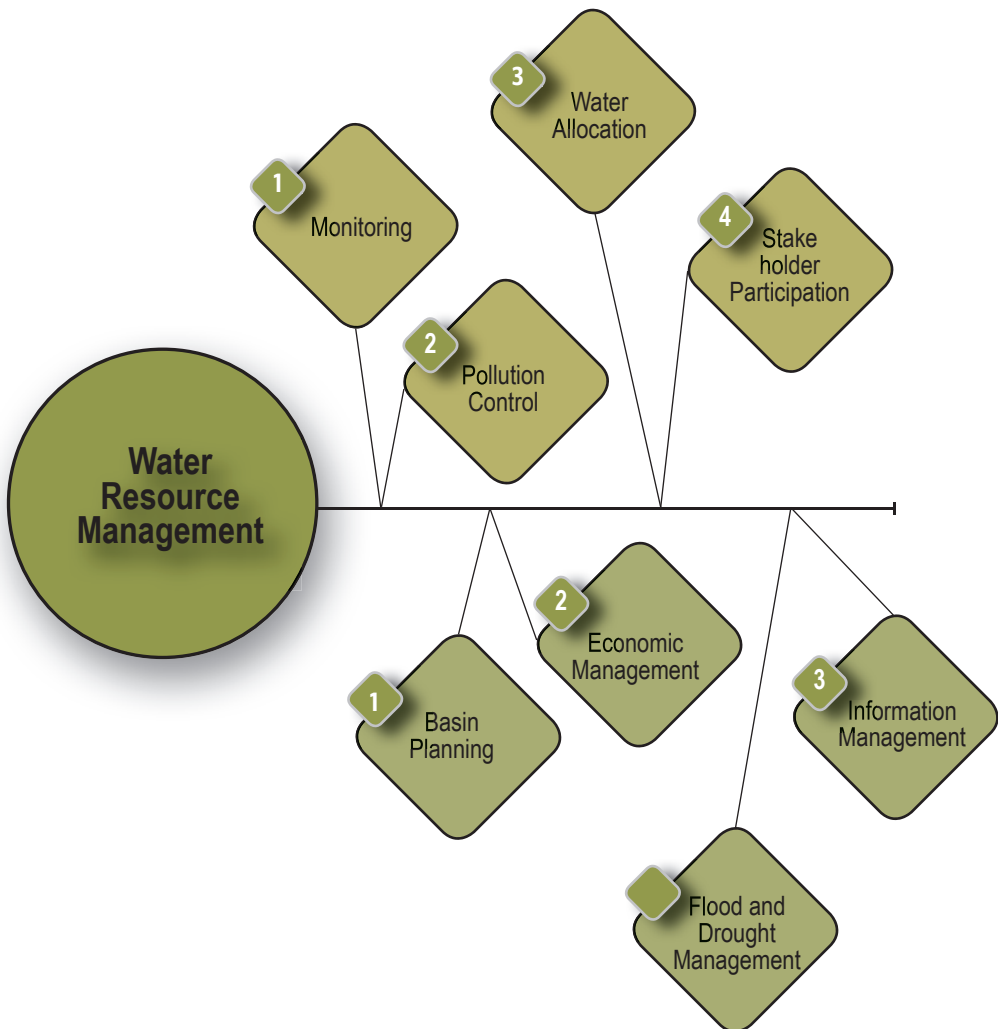


Figure 7: Basic Function for Water Resources Management

Table 6: Functions of water resources management in a river basin

Functions	Examples of activities
Stakeholder participation	<ul style="list-style-type: none"> ● Develop and maintain an active stakeholder participation process through regular consultation. ● Provide expert advice and technical help to local authorities and other stakeholders in IWRM.
Water allocation	<ul style="list-style-type: none"> ● License for water uses including enforcement of rules.
Pollution control	<ul style="list-style-type: none"> ● Identify major pollution problems ● Licensing and managing polluters
Monitoring of water resources, water use and pollution	<ul style="list-style-type: none"> ● Carry out hydrological, geographical and socio-economic surveys for planning and development of water resources. ● Develop, update and maintain a hydrometric database required for compliance monitoring of water use allocation.
Information management	<ul style="list-style-type: none"> ● Define the information outputs that are required by the water managers and different stakeholder groups in a river basin. ● Organise, co-ordinate and manage the information management activities so that the water managers and stakeholders get the information they require.
Economic and financial management	<ul style="list-style-type: none"> ● Set fees and charges for water use and pollution.
River basin planning	<ul style="list-style-type: none"> ● Conduct situation analysis with stakeholders. ● Assess future developments in the basin.

There is no blue-print for designing an organizational framework to meet the water management objectives and to exercise all the water resources management functions. An important aspect is that there are many institutions as well as water authorities that must be involved in conducting water resources management.



What is water stewardship?

Water stewardship is defined as “the use of water that is socially equitable, environmentally sustainable and economically beneficial achieved through a stakeholder-inclusive process that involves site and catchment-based actions”. Good water stewards understand their own water use and catchment context. Shared water challenges represent opportunities to create shared value through collective action.

Why stewardship in water resource management?

The water stewardship involves learning, acting, doing and progressing. It is about the private sector collaborating with governments, other businesses, NGOs, communities, and others to protect shared freshwater resources. Stewardship in water resource management is needed to

understand water use and its impacts, and to work collaboratively and transparently for sustainable water management within a catchment. It helps to drive social, environmental and economic benefits.

How to develop better water stewardship?

The process to develop water stewardship is presented below.



Outcomes from better water stewardship

- Good water governance
- Sustainable water balance
- Good water quality status
- Healthy status of important water-related areas

Exercise

Arrangements for achieving stewardship in Mahakali River Basin?

Who?

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What?

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How?

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MODULE 7

Hydro Diplomacy

LEARNING OBJECTIVES

- Understanding the concept of hydro-diplomacy for cooperative water governance between transboundary nations/states.
 - Hydro-diplomacy to prevent water related conflicts.
-

Background

Water is a prerequisite in any society. Water management, therefore, is a key component for sustainable development. Managing water resources responsibly is vital for achieving food and energy security, universal access to drinking water and sanitation, improved health, woman's right and gender equality, equitable social and economic development.

Hydro-diplomacy is a dynamic process and works under the premise that water cooperation assists riparian countries to achieve mutual benefits. It is a tool for riparian states in balancing national sovereign interest and enhancing cooperation in sharing common water resources. Hydro-diplomacy encourages participation of all stakeholders in the same platform for achieving shared benefits. The aim is to promote the economic and social benefits for countries sharing transboundary basins and preventing the militarization of water-related conflicts.

Cooperative governance between countries is necessary in formulating long-term strategies for sustainable management of international river basins and water resources. Hydro-diplomacy has a major role to play in this context and goes well beyond the science of water management to more on sovereignty, political security and economic considerations.

There are three elements at the heart of hydro-diplomacy, which align closely with the principal objectives of the UN Charter. The elements are:

1. The preventive nature of diplomacy in maintaining peace and security.
2. The need for dialogue in which traditional bilateral diplomacy is complemented by multilateral and multilevel diplomacy.
3. The notion of collective responsibility of the international community.

Why hydro-diplomacy?

A general pattern of unilateral development and transformation has emerged over time, known as the 'crisis curve'. Riparian implement water development projects unilaterally first within their territory, often without consultation with their neighbours, to avoid the political intricacies of the shared resource. At some point, one of the riparian, usually the regional power, will implement a project that affects at least one of its neighbours. This might be for meeting the demand of existing uses in the face of decreasing relative water availability.

Hydro-diplomacy: dimensions

One of the most important aspect of hydro-diplomacy is international cooperation applied to water resources extending beyond the borders of one country. International cooperation requires and is facilitated by the existence of three dimensions: political, normative and institutional. These three dimensions operate at various levels: local, national, regional and international.

Political

In transboundary basin, most important political instrument is the basin plan which defines the strategies to adopt medium and objectives for a specific period. Such a plan is the political negotiations among the basin countries; it needs to be developed along the line of legal provisions in the basin agreement.

Normative

The basin agreements are primarily the law for the basin which constitutes the framework for regulating state actions for management. They are complemented by creation of a basin institution and the development of the set of political and technical instruments (basin development plan and strategic actions).

Institutional

It represents the operative arm since they are fundamental means to deliver policy and law. There are a variety of institutions operating at a different administrative level. The challenge is to achieve institutional coordination to avoid fragmented actions.

International instruments

- UN convention on law of the non-navigational uses of international watercourses is a framework and guiding instrument for the development of new basin agreements. This convention is not yet into force, but many of the principles contained in it are recognized as part of customary international law.
- UNECE convention on the protection and use of transboundary watercourse and international lakes is a regional agreement. The convention contains stricter and more specific provisions on monitoring, research and development, consultations, warning and alarm systems, mutual assistance and exchange of information, and access of information by public.

International water law encompasses the accepted set of rules governing relations among sovereign nations over freshwater resources. Starting with the Nepal-India agreement on Koshi project, which set a poor example, this has comprehensively dealt with the Gandak project agreement and the treaty on integrated development of the Mahakali River.

National scenario of water treaties

There are no significant rivers left where Nepal and India have not signed agreement. Different agreements between Nepal and India are described below:

The Sarada agreement, 1920

This is the first international agreement in the subcontinent that was based on the exchange of letters in 1920 with united government in India. It was done for the construction and operation of the Sarada Barrage. Nepal agreed to transfer 4093.88 acres of its land on the east bank of Mahakali River to the then British India so Sarada Barrage across the river could be built to irrigate lands in Awadh. In exchange, Nepal received an equal amount of land elsewhere. In addition, the exchange agreed to provide Nepal 460 cusec of water and provided the water is available, a supply up to 1000 cusec from the Sarada canal. This allocation was used for developing Mahakali Irrigation Project.

Koshi project agreement, 1954

This agreement was done primarily to control flood by the Koshi by building a barrage and embankments. The embankment is 130 long, starting from the Nepal in both sides of the Koshi bank. These embankments protect 280,000 ha of land in Indian side. From the 3770 feet long Koshi barrage with 56 gates, there are Eastern and the Western irrigation canals to irrigate 1,159,000 ha agriculture land in India. The 1954 agreement did not mention benefits to Nepal. A 20 MW hydroelectric power plant was built in the Eastern Canal.

The treaty was revised on December 19, 1966, with following arrangements:

- Nepal shall withdraw water from the Koshi and its tributaries as and when required.
- Land acquired and leased to India for 199 years.
- GoN shall get 50% power generated by any powerhouse within a 10-mile radius of barrage site.
- Chatra Inundation Canal proposed to irrigate 66,000 ha land of Nepal but it irrigates 10,000 ha.

Gandak project agreement, 1959

This is the agreement between Nepal and India for irrigation, a hydroelectric power and flood control. On the Gandak River, a barrage is constructed and its two canals provide irrigation for 1,340,000 ha of Bihar, 500,000 ha in UP India, and 63,000 ha in Nepal. A 15 MW HEP was built in west canal to provide electricity to Nepal and navigation facility which has not functioned ever.

Integrated Development of the Mahakali River including Sarada Barrage, Tanakpur Barrage and Pancheswar Project, 1996.

First two projects: Sarada barrage and Tanakpur barrage have already been executed by India at the Mahakali River, an Indo-Nepal border. From Tanakpur project, Nepal gets a supply of 1000 cusec of water in the wet season, 300 cusecs in the dry season, and an annual supply of 70 million kW of energy, free of cost. Integrated Development of the Mahakali River treaty arranges for sharing water from the Sarada canal and the Tanakpur barrage replacing previous arrangements.

It also proposes to develop Pancheswar Project as a joint Indo-Nepal Hydroelectric project on Mahakali River with a powerhouse on two sides. The treaty is criticized for its intention to ensure the continuity of the Sarada barrage and legalise the Tanakpur project. It was constructed

initially entirely for Indian benefit, without benefits to Nepal. The Mahakali treaty's water sharing provision is also contested and there is no agreement between Nepal and India. The Mahakali treaty has not been implemented.

Furthermore, Mahakali Commission, with an equal number of members from each country, is proposed for implementing the treaty. It will be guided by the principles of equality, mutual benefits and no harm to another party.

Exercise

- Put together perspectives of stakeholders on their views and understanding about what hydro-diplomacy (discussion)
- Imaginary transboundary river basin negotiating exercise
- Discussion between countries representative



MODULE 8

Preparation of Strategy and Action plan

LEARNING OBJECTIVE

- Developing a strategy and action plan for integrated water resource management
-

A strategy is bigger than a plan, and it questions the efficacy of plans. It has a large scope and focuses on outcomes and delineates pathways to the desired outcome. A strategy foresees different influencing factors, both seen and unforeseen, and comes to terms with the whole situation, not just on result.

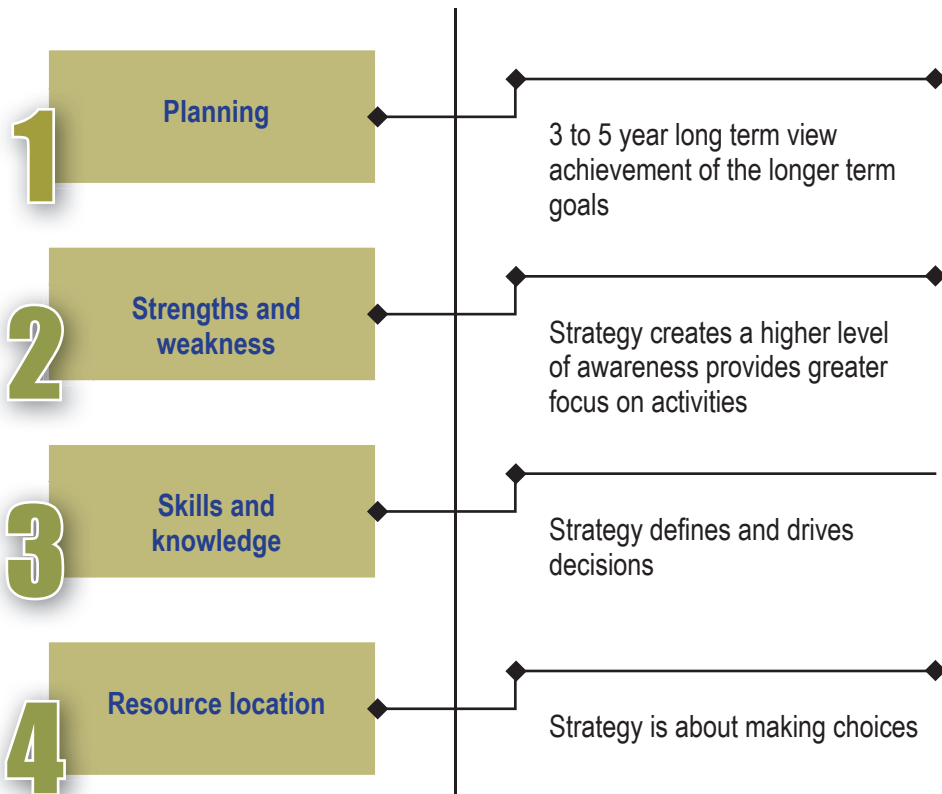
A plan is usually a list of steps taken to accomplish a goal. A plan gives answers to the questions like how, when, where, who, and what? A plan is a necessary step to achieve goals. However, developing a plan should not be the first step in implementing a project.

Why strategy?

Strategy is needed for:

- Identifying objectives
- Setting objectives which are achievable & measurable
- Prioritizing tasks effectively
- Identifying the steps needed to achieve goals
- Being able to work effectively under pressure
- Completing work to a deadline

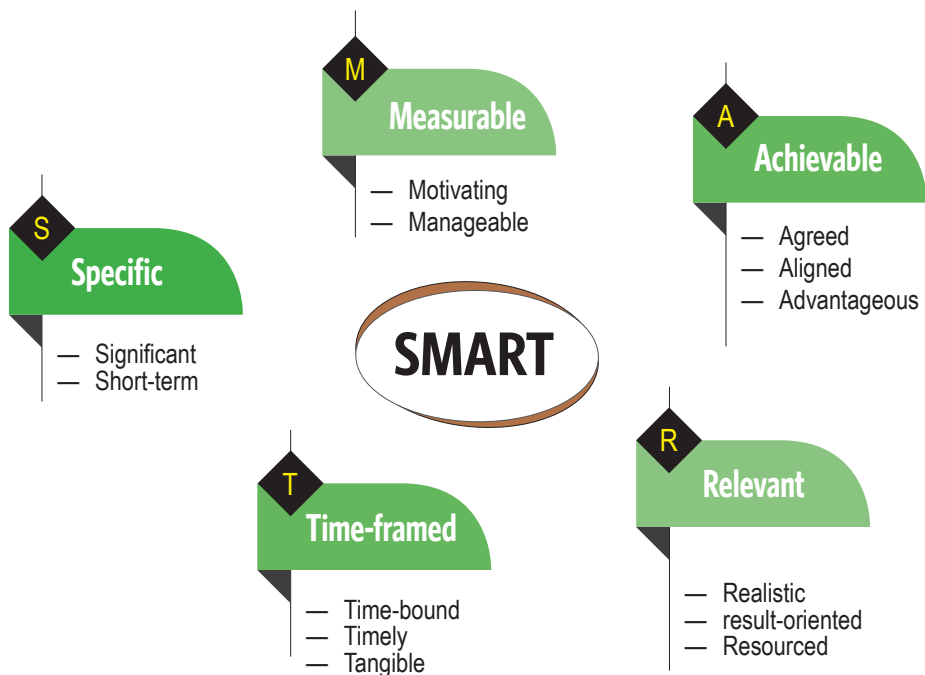
Importance of strategy



An action plan works if:

- Leaders have a clear vision for its implementation.
- Everyone knows what their roles and responsibilities.
- Strategies are implemented to address under-achievement, raise expectations, improve ethos, and standards.
- Resources are available.
- Mechanisms are used for monitoring the implementation and progress of plan.
- Mechanisms are in place for evaluating the effectiveness of the action.

The Action plan comprises a series of 'SMART' objectives to address the areas identified for action.



Action plan: target, tasks and success criteria

Stage	Implementation activities	Evaluation activities
Stage 1	Preparations (initial Task)	Check for readiness
Stage 2	Routes (tasks)	Check progress
Stage 3	Destinations (targets)	Check success

Source: Hargreaves and Hopkins, 1991

Mekong river basin development strategy

The preparation and adoption in 2011 of the Basin Development Strategy by the Lower Mekong Basin Countries is an important milestone in the history of cooperation under the framework of the Mekong River Commission (MRC). The Strategy defines a dynamic basin development planning process that will be reviewed and updated every five years. It defines the following Strategic Priorities for Basin Development:

- Opportunities and risks of current developments addressed
- Irrigated agriculture expanded and intensified
- Environmental and social sustainability of hydropower development greatly enhanced
- Essential knowledge acquired
- Options for sharing benefits and risks identified
- Climate change adaptation strategy implemented
- Basin planning integrated into national systems

The Strategy also includes:

- Basin objectives and management strategies defined for water-related sectors
- National-level basic water resources management processes strengthened
- Basin-level water resources and related management processes strengthened
- Rigorous basin-wide environmental and social objectives and baseline indicators defined; and
- Capacity building programme implemented, linked to MRC's overall initiatives and complementary to national capacity building activities

Exercise

Prepare a strategy of particular basin based on all the exercises done in other sessions.

Goal

Improvement Strategies

Tasks/ actions steps	Responsibilities	Resources	Timeline
What will be done?	Who will do it?	Funding/time/people/materials	By when? (day/month)
1.	1.	1.	1.
2.	2.	2.	2.
3.	3.	3.	3.
4.	4.	4.	4.

Action Plan review and update

<i>Results/Accomplishments</i>	<i>Next step</i>	<i>Date</i>
<i>Results/Accomplishments</i>	<i>Next step</i>	<i>Date</i>

MODULE 9

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