Public Disclosure Authorized
Public Disclosure Authorized
Public Disclosure Authorized
Public Disclosure Authorized

103350

Strengthening River Basin Management in the Brahmaputra Basin

Lessons and Best Practices from the Mississippi River Study Tour

SAWI SOUTH ASIA WATER INITIATIVE

THE WORLD BANK
IBRD • IDA

Strengthening River Basin Management in the Brahmaputra Basin

Lessons and Best Practices from the Mississippi River Study Tour

SAWI SOUTH ASIA WATER INITIATIVE

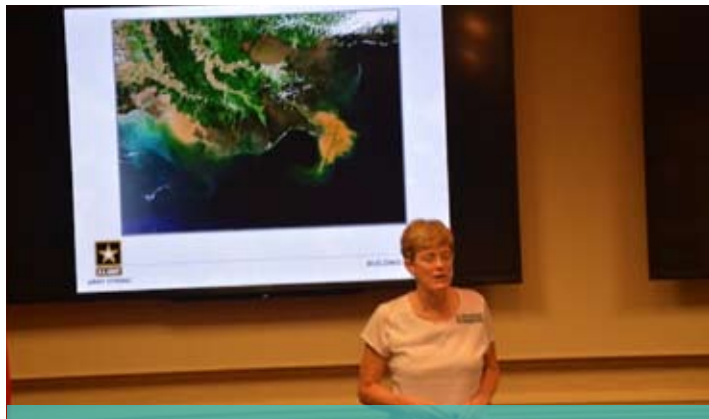
THE WORLD BANK
IBRD • IDA

Table of Contents

Introduction

Objective of the Study Tour

The South Asia Water Initiative (SAWI) organized a study tour to the Mississippi River Basin from June 14-18, 2015 as part of its knowledge exchange activities in the Brahmaputra basin. SAWI is a multi-donor partnership between the World Bank and the governments of United Kingdom, Australia and Norway. The initiative is working to increase regional cooperation in the management of the major rivers of the Himalaya in South Asia. The objective of the study tour was to share and learn best lessons in river basin management, specifically focusing on flood management, bank erosion, navigation, and integrated water resource management, and to share best practices within basins.



Dr. Barb Kleiss providing answers to participants

The participants included senior officials and technical specialists from India, Bangladesh and Bhutan. The study tour included visits to the Mississippi River Commission, the US Army Corps of Engineers, Engineers Research and Development Center, Mississippi Levee Board, and the New Orleans District.

While there was considerable opportunity for participants to gain technical capacity and learn modern approaches to river basin management, the key learning from the tour was to assess good practices that could be applied to the Brahmaputra basin. There were also focused technical discussions with experts on best practices and strategies to address common key challenges in managing large river basins.

The Basin Stories

The Brahmaputra basin covers 580,000 square kilometer (km^2), ranks fifth in the world in terms of total flow, and yet remains largely undeveloped. The basin spans China (50 percent), India (34 percent), Bangladesh (8 percent) and Bhutan (8 percent) and is home to more than 130 million people. Around 86 percent of the basin population lives in rural areas and earns less than a few thousand dollars per year.

In the wet season, the basin is prone to major flooding and rapid geomorphological changes that threaten property and life. In the dry season, low water availability and an uneven spatial distribution of water causes water stress and competition amongst users. Climate change is expected to increase evapotranspiration (thus increasing water demand), alter the spatial and temporal distribution of precipitation, increase the frequency and intensity of floods and droughts, and accelerate glacier melting. This compounds the existing water management challenges in the basin.

Additionally, in the Meghna Estuary (where the Ganges-Brahmaputra-Meghna rivers meet), sea-level rise poses serious environmental and social problems. To date, development in the basin

Participants on a riverboat being given an overview of the history of the Mississippi River Commission

has mainly been at national and sub-national levels. The lack of basin-wide planning and management to guide development, inform policy and increase regional cooperation means development has been piecemeal and fragmented and has not delivered major contributions to poverty reduction and economic growth.

The Mississippi is the largest river in the United States and third largest in the world, draining approximately 41 percent of the country. It extends from the continental divide in the Rocky Mountains to the Appalachian Mountains, and from just south of the Great Lakes to the Gulf of Mexico.

Historically, the Mississippi River and its major tributaries were managed mainly for navigation purposes, as the river provides critical transportation links for commerce. The river forms the main stem of a network of inland navigable waterways. Even today, river shipping remains the most economical and efficient mode of transportation for bulk commodities. For the system to be vital and efficient, it is critical that there is an efficient link between deep-draft ocean-going vessels and shallow-draft river boats. In order to ensure that the river remained navigable, the US federal government needed to control perennial floods that characterize the river.

The Mississippi River basin is a good example of how the role of the federal government has evolved with regards to flood control, and illustrates the different objectives for which it is managed. The US Congress established the Mississippi River Commission (MRC) to use an integrated basin-wide approach to water resources management.

The similarity of challenges between the two basins and means of tackling these in the Mississippi River basin offer a valuable opportunity for technical and policy learnings on basin cooperation in flood management, integrated water resources, and opportunities in navigation. Recently, the Ministry of Water Resources in India has called for basin-wide planning and engagement of riparian states in the management of water resources in the Brahmaputra.

In 2014, Bangladesh and the Netherlands agreed to work on the challenges of delta management in the Ganges-Brahmaputra-Meghna delta. Adaptive delta management has been highlighted as a key agenda for India and Bangladesh. Given the numerous initiatives under way on flood and disaster management, and the growing focus in South Asia on understanding the economic benefits of improved water resources management and the processes to achieve these, the study tour was especially timely.

Lessons from the Study Tour

The lessons from Mississippi highlighted during the tour are summarized below.

Executive Director of MRC giving an overview of the institutional arrangements

Successful flood management relies on robust institutions and policies

Tour participants learned the role that institutions play in flood management, and about policies and laws that have empowered them. MRC was established in 1879 by an act of the Congress to improve planning and management of the Mississippi River. Initially, MRC sought to foster navigation, promote commerce, and prevent destructive floods — an extremely difficult and complex set of engineering problems at the time.

After the flood of 1927, the engineering responsibilities fell on the US Army Corps of Engineers, while MRC continued to provide water resources engineering direction and policy advice to the Administration, Congress, and the Army. The mission remains the same as it was in 1879 — to lead the sustainable management and development of water-related resources for the overall well-being of the nation and its people.

The government and the US Army Corps of Engineers are mandated by law to inform all residents in high risk areas of the risks of living near the flood plain. Institutions in the U.S. are robust in that they have defined their roles and been successful in coordinating activities pre- and post-floods.

Flood management requires not only structural interventions but softer measures as well

To deal with flooding, local and national institutions in the U.S. have combined to erect an extensive flood protection system, to create river flood and hurricane forecasting, and develop evacuation plans and communications strategies. Participants learnt about the hard and soft investments in place to effectively control and manage the "design" flood (the high stage assessed as possible at any location). The size of this flood is not calculated based on historical time series of flood flows, but rather on the maximum projected stage at a location based on the routing of a series of back-to-back hypothetical meteorological events.

The Mississippi River and Tributaries (MR&T) project was authorized by Congress as part of the Flood Control Act of 1928. It had four key elements: (i) levees for containing flood flows; (ii) floodways for passage of excess flows past critical reaches of the Mississippi River; (iii) channel improvements and stabilization to provide an efficient and reliable navigation channel; and (iv) tributary basin improvements for major drainage basins. MR&T is a comprehensive water resources project for flood damage reduction and navigation improvement on the Mississippi River. Its elements depend on hard and soft measures and it has been successful in managing

both. Participants learnt that the success in managing the 2011 flood was testament to the fact that the project was a wise investment for the nation. This is also evidenced it its economic returns, which have been calculated to be a US$45 for every US$1 invested (USACE calculation).

A suite of decision support tools are required to make informed decisions and plans at a basin scale

In the Mississippi River basin, water management options are coupled with a number of basin-wide information and technology systems to improve the effectiveness of flood management. These systems include: (i) real-time analytical modeling that benefits from extensive monitoring and physical modeling; (ii) conjunctive management of multiple reservoirs to control water and sediment; and (iii) a real-time flood control decision support system. Hydraulic and coastal dynamic processes are modeled at the US Army Engineer Research and Development Center (ERDC). ERDC and its laboratories have extremely high-quality equipment, ranging from the world's fastest supercomputers to unique, one-of-a-kind physical models.

The participants visited different laboratories at ERDC including the Coastal and Hydraulics Laboratory (CHL), and met research hydraulic engineers at the ERDC. CHL focuses on experimental and computational expertise to address water resource challenges in groundwater, watersheds, rivers, reservoirs, lakes, estuaries, harbors, coastal inlets, and wetlands.

Many of the tools used at ERDC could be used specifically in the Brahmaputra for flood and sediment management.

Adaptive management requires resilience and coordination at all levels at all times

The example of New Orleans is one of adaptive management and resilience to repeated floods and hurricanes. Resilience enables communities to rebound from disaster and reduce long-term vulnerability, thus moving toward a more sustainable footing. Creating the elements of community resilience takes many years. Resilience includes adaptability and learning from experiences in other disasters, anticipating unexpected problems, and planning for redundancy in emergency response and recovery. In coping with extreme events from climate change and other hazards, the New Orleans experience highlighted issues of long-term planning that spanned all three levels of government: local, state and federal. For resilient communities, in advance of hazard events, the tri-level system (city, state, federal) of emergency response needs to effectively use, collaborate with, and coordinate with combined public and private efforts. Integrated water

Participants at ERDC

resources management and regulation are only possible when different levels of government work together. Achieving this coordination and community resilience is a long-term process, as demonstrated by the New Orleans example. But is it highly relevant to the Brahmaputra where people must adapt to living with floods.

Water resource management requires a multidisciplinary approach

A combinationof engineering, technological, social, economic and legal expertise is needed to manage a river basin. This requires coordination across departments and administrative regions from central government down to provincial government levels. A multidisciplinary approach also allows for: (i) equity and fairness when making difficult choices; (ii) establishment of democratic negotiation mechanisms to improve coordination and stakeholder engagement; (iii) optimization of water regulation and storage schemes based on cutting-edge water resources management and modeling and simulation; and (iv) establishment of a comprehensive water regulation information monitoring system and emergency response mechanisms. Watershed management with social and economic incentives is essential for basin-wide management.

Follow-up Activities

A key challenge in many negotiations on water is that the different countries in a basin are geographically not in the same place and have no forum for discussion. The study tour thus provided an opportunity for specialists from Bangladesh, Bhutan and India to be in the same place and jointly discuss and identify areas of collaboration and activities that may be undertaken to better manage the water resources of the Brahmaputra basin. Being in the Mississippi basin, the participants were also inspired to cooperate and develop their shared basin.

As a follow up, participants recommended that a Knowledge Exchange Forum be established to share knowledge on the Brahmaputra. The forum will operate at a technical level, identifying best tools and technologies and using these to identify solutions for different challenges in the basin. It is expected that this forum will foster cooperative data and knowledge sharing for improved river basin management. It will lay the ground work for discussions on data needs, river basin modeling and policy trade-off assessment. It will identify the core knowledge, institutional and capacity gaps that exist in the basin.

Other follow-up activities include attending a conference in December 2015 where participants will learn how different stakeholders in the U.S. river basins negotiate. The World Bank will liaise between government officials to facilitate this event.

There was unanimous agreement from a follow-up survey that the study tour led to improving trust between the countries and increased chances of regional cooperation.

Annex 1: List of Participants

Country	Name	Title	Organization
Bangladesh	Md. Rafiqul Islam	Consultant	World Bank
Bangladesh	Mr. Sarder Sirazul Hoque	Project Director, ECRRP	Bangladesh Water Development Board
Bangladesh	Mr. Sarafat Hossain Khan	Executive Engineer	Bangladesh Water Development Board
Bhutan	Ms. Tenzin Wangmo	Chief, Water Resources Co-ordination Div	National Environment Commission
Bhutan	Mr. Nidup Tshering	Watershed Management Division	Ministry of Agriculture & Forest
India	Mr. Munni Lal	Senior Joint Commissioner	Central Water Commission
India	Mr. Bommakanti Rajender	Joint Secretary (Policy and Planning)	Ministry of Water Resources (MoWR)
India	Mr. K M Alimalmigothi	Economic Adviser	MoWR
India	Mr. Banshmani Prasad Pandey	Director, Interstate Rivers Matter	Central Water Commission
India	Mr. Devendra Pratap Mathuria	Director, River Management Co-ordination	Central Water Commission
India	Mr. Visnu Deo Roy	Flood Forecasting	Central Water Commission
USA	Mr. William Young	Lead Water Resources Specialist	World Bank
India	Mr. Sanjay Gupta	Consultant	World Bank
USA	Ms. Laila Kasuri	Water Engineer	World Bank

Annex 2: Key People and Speakers

1. Stephen Gambrell, Director, Mississippi River Commission
2. Bob Anderson, Public Affairs Officer, Mississippi River Commission
3. Charles Camillo, Historian, Mississippi River Commission
4. Barbara A. Kleiss,Director, Louisiana Coastal Area Science and Technology Office USACE, Mississippi Valley Division
5. Andy Ashley,Engineer, Mississippi River Commission
6. Peter Nimrod, Chief Engineer, Board of Directors of the Mississippi Water Resources Association
7. Russell Beauvais, Engineer, Old River Control Structure
8. Jose Sanchez, Director, Coastal and Hydraulics Laboratory, US Army Engineer Research and Development Center
9. David Smith, Research Ecologist, Coastal Hydraulics Laboratory
10. Ty Wamsley, Research Engineer, Coastal Hydraulics Laboratory
11. Gary Brown, Research Engineer, Coastal Hydraulics Laboratory
12. Jennifer Tate, Research Engineer, Coastal Hydraulics Laboratory
13. Mary Cialone, Research Engineer, Coastal Hydraulics Laboratory
14. Keith Martin, Research Physicist, Coastal Hydraulics Laboratory
15. Duncan Bryant, Research Engineer, Coastal Hydraulics Laboratory

Annex 3: Agenda

Sunday, June 14, 2015	
6:00 pm	Delegation arrives at Jackson airport
8:00 pm	Transfer to hotel in Vicksburg by charter bus
8:30 pm	Introductions and group dinner
Monday, June 15, 2015	
8:00 am	Arrival at Mississippi River Commission
8:30 am	Welcome (Mr. Gambrell)
9:00 am	Introductions (Mr. Anderson)
9:30 am	MRC Overview (Mr. Camillo)
10:30 am	Room for River Brief (Mr. Ashley and Dr. Barb Kleiss)
11:30 am	Lower Mississippi River Museum (Mr. Anderson)
12:00 noon	**Lunch Break**
1:30 pm	Drive to Greenville, MS and meeting with levee boards
3:30 pm	Brief by Mr. Nimrod at Mississippi Levee Board Office
5:00 pm	Return to Vicksburg, MS
Tuesday, June 16, 2015	
8:00 am	Hotel checkout
9:00 am	Coastal and Hydraulics Laboratory - Building 3200
9:15 am	Welcome and ERDC and CHL Overview
10:00 am	Mississippi hydrology and modeling - Mr. Gary Brown
10:15 am	Storm Surge - New Orleans Katrina - Ms. Mary Cialone
10:50 am	Ship Simulator –Mr. Keith Martin
11:00 am	LSTF/Flume - Environmental Laboratory, Building3284
11:35 am	Fish Flume-Dr. David Smith
12:00 noon	Depart ERDC
	Lunch Break
2:00 –4:00 pm	Head to New Orleans, LA
4:00 - 6:30 pm	Visit ORCS (Hydro/Lowe Sill/Overbank; Morganza)
	Overnight stay in New Orleans
Wednesday, June 17, 2015	
8:00 am	Visit to USACE New Orleans District
8:15 am	Meet withMr. John Bivona and Ms. Carol Wittkamp
8:30 am	New Orleans Command briefing
10:15 am	Storm Surge, Sea Level Rise and River Levee System Briefings –
11:30 am	Mr. Will Veatch
1:30 pm	**Lunch Break**
2:00 pm	Travel to Metairie, LA and obtain briefing on PCCP
3:00 pm	Briefing with Mr. Dan Bradley briefing and conducting site visit at the 17th Street Canal area/PCCP area

SAWI SOUTH ASIA WATER INITIATIVE

THE WORLD BANK
IBRD • IDA

UKaid
from the British people

NORWEGIAN EMBASSY