South Asia Water Initiative (SAWI)
Multi-Donor Trust Fund
Annual Report
FY10
(July 2009 – June 2010)

Prepared by the World Bank

for the 3rd Annual Donors Meeting

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Australian Government
AusAID

NORWEGIAN MINISTRY
OF FOREIGN AFFAIRS

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THE WORLD BANK

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ACRONYMS

ADD	Abu Dhabi Dialogue
ADD-G	Abu Dhabi Dialogue Group
ADD-KF	Abu Dhabi Dialogue Knowledge Forum
ADD-KC	Abu Dhabi Dialogue Knowledge Committee
AusAID	Australian Government Overseas Aid Program
BRIC	Bangladesh Rivers Information and Conservation Project
COP	Conference of the Parties
DfID	Department for International Development
FMIS	Flood Management Information System
FY	Financial Year (July 1 – June 30)
GCM	Global Climate Model
GIS	Geographic Information Systems
GoB	Government of Bangladesh
GoI	Government of India
GoN	Government of Nepal
ICIMOD	International Center for Integrated Mountain Development
IDA	International Development Association
IRSA	Indus River System Authority
NGRBA	National Ganga River Basin Authority (India)
MDTF	Multi-Donor Trust Fund
MOEF	Ministry of Environment & Forests (India)
MOU	Memorandum of Understanding
SAWI	South Asia Water Initiative
SBA	Strategic Basin Assessment
UNFCCC	United Nations Framework Convention on Climate Change
WAPDA	Water and Power Development Authority (Pakistan)
WECS	Water and Energy Commission Secretariat (Nepal)

FOREWORD

The South Asia Water Initiative (SAWI) is premised on the notion that the challenges and opportunities arising in the management of South Asia's water resources are shared by all of the countries dependent upon them. These massive rivers have complex and highly variable hydrologies, and serve some of the world's poorest and most densely populated communities. The potential of these rivers systems – to sustain ecosystems, livelihoods and cultural values, and to produce food and clean energy – is vast. The full, sustainable potential of these rivers, however, can only be realized when there is greater knowledge and cooperation among the countries and stakeholders that share them.

The goal of SAWI is, therefore, to strengthen water resources management within and between the countries of South Asia, with an emphasis on regional cooperation and adaptation to climate change. The importance of these issues is clearly recognized as a key challenge for this rapidly growing region.

In the past year, we have seen a growing demand for the sorts of activities delivered by SAWI: the development of stronger, shared knowledge, the opportunity for multi-stakeholder dialogue, and action on the ground to put these ideas into practice. This year has seen repeated calls – from national conferences to COP15 and from the Kathmandu Post to the New York Times – for enhanced information sharing and regional cooperation on water management and climate change adaptation. This year's devastating floods in Pakistan underscore the urgency and inevitability of more effective, cooperative management of the region's water.

The past year has also seen growing support, interest and resources. We are delighted that the Government of Norway has joined SAWI as our newest partner, and have begun early discussions with two additional potential donors. The SAWI team and program continues to grow both in South Asia and in Washington, DC. Early SAWI research is now shedding new light on long-held beliefs about the ways in which the Himalayan Rivers work, providing essential knowledge and insights as to how they can best be managed. Ownership and involvement is growing across the region and the program's reach is expanding to include new stakeholder groups, like the private sector. There is tremendous interest in this Initiative, and much that it can accomplish.

This report, prepared for the 3rd Annual Meeting of the SAWI Development Partners to be held in Kathmandu, Nepal on 28-29 September 2010, is intended to provide a brief update on activities supported and the financial status of the SAWI MDTF for the World Bank's 2010 Fiscal Year (FY10), i.e. from July 1, 2009 to Jun 30, 2010. It follows the previous Annual Report for FY09, which was prepared in September 2009.

We hope it will give our partners a sense of the challenges, progress and promise of SAWI.

Claudia W. Sadoff

Program Manager, SAWI

OVERVIEW

The South Asia Water Initiative (SAWI) was launched in 2008 with the explicit objective: "*to promote the goals of poverty reduction, economic development, mitigation and adaptation to climate change, and water security through significant and measurable improvements in water resources management and development at the regional, international basin and national levels in South Asia."* In particular, SAWI has always aimed to address some of the seemingly intractable challenges in the region which persist due to their complexity or sensitivity, but which otherwise resolved would promote these goals.

At the time, the conventional wisdom in policy, diplomatic and academic parlance was that both basin-wide agreements and cooperatively designed and operated infrastructure were needed on the major rivers of South Asia in order to protect populations from drought and flood, and to better utilize increasingly scarce water resources. Yet while this view was widely held to be the right course of action, it was also recognized that it was based primarily on perceptions, philosophy and country knowledge, rather than on robust knowledge of the hydrological, economic and social dynamics of the various river basins in their entirety. It was also widely recognized that many of the national institutions needed to achieve eventual basin-wide agreements and cooperative management and development were not in place. In particular, certain kinds of institutions, such as national and regional parliamentary dialogue and in-country basin organizations, were particularly lacking.

Through its Multi-Donor Trust Fund, the early of focus of SAWI has therefore been to build knowledge and institutions, and to promote multi-stakeholder, information-based dialogues within countries, across basins and throughout the region. Over the last two years, what we have found is that the new knowledge being generated under SAWI differs in important ways from conventional wisdom, suggesting that mind sets must change and water management strategies must be "re-imagined".

This year, what we have heard is a clear call from governments and from civil society for sustaining and deepening dialogues and institutions within and across countries on issues of water management and climate adaptation. The growing scale of the challenges involved in managing floods and other water-related climate change risks add to the urgency for cooperative learning and action in South Asia.

Key Achievements of the past year have included:

- **Strengthening Institutions**
    - At the regional level, the **Abu Dhabi Dialogue** continues to grow. This year saw strengthened engagement from major partners and a national level dialogue in China.
    - At the national level, SAWI support has been instrumental in the early development of India's **National Ganga River Basin Authority** which is the country's first basin-wide authority, on its longest and most populous river with important regional linkages.

- **Building Information**
    - At the regional level, early results have been shared from the **Ganges Strategic Basin Assessment** (SBA) which is the most comprehensive set of hydrological and economic models of the full Ganges system to date.
    - At the national level, Nepal's first geo-referenced **(GIS) Water Resources Knowledge Base** is being developed and a major **Groundwater Study** was completed in India.
- **Facilitating Investment**
    - At the regional level, in response to a call from the Abu Dhabi Dialogue Group, a **regional hydromet monitoring project** is being explored.
    - At the national level, relevant design aspects of **investments in India, Nepal and Bangladesh** have been supported.

But **Key Challenges** remain:

- **Perceptions are persistent**
    - Resistance is to be expected when stakeholders are confronted with new information that contradicts long-held beliefs and practices, or when new institutions are perceived to threaten the existing balance of powers and mandates. Sustained engagement and consultation is needed.
- **Political sensitivities and uneven levels of engagement**
    - Water resources management in constrained and uncertain environments will always force trade-offs. Against a backdrop of historical tensions and complex geopolitics, broad regional engagement remains a central challenge for SAWI.
- **Growing SAWI**
    - SAWI is a young program, focused on medium- and long-term challenges. The demand and potential scope of work for the initiative is vast. Growing and targeting SAWI strategically will be essential.

In terms of resource use, donors have to date committed a total of $ 9.5 million to the Multi-Donor Trust Fund, of which $ 5.5 million has already been transferred to the World Bank. Of this, about $ 4.4 million has been allocated to SAWI activities, and $ 2.2 million has already been committed and disbursed.

THE SAWI PORTFOLIO

To achieve its objectives, the SAWI Multi-Donor Trust Fund promotes work that is inter-disciplinary and inter-sectoral, cutting across traditional water divides to meet the growing challenges in the region. The current SAWI portfolio contains activities on three geographic levels:

- **Regional**
- **River Basin,** and
- **National**.

Why these levels? First, at the ***regional*** level, SAWI supports countries in building the knowledge, the relationships, and the institutions necessary to achieve water security and manage climate change risks. The primary mechanism is the Abu Dhabi Dialogue which brings 7 countries together around the hook of 'common problems' in the Greater Himalayas to forge a knowledge-based partnership of states. A potential outcome is an increased willingness to share the benefits of a cooperative approach to river basin management and development, leading over time to potential regional cooperative investment.

Second, at the ***river basin*** level, SAWI supports countries that share river basins, including through strategic basin assessments of water systems and economic dynamics in order to build a better understanding of the impacts of current management, and of future scenarios under a cooperative, benefit-sharing approach and under climate change. The intended outcome is a robust information base for basin-wide discussions, and ultimately closing the knowledge gap. To date, the focus has been on the Ganges Basin where three major riparians have long struggled to share the river between them as well as to agree on its hydrological dynamics and economic benefits.

Third, at the ***national*** level, SAWI supports technical assistance, capacity building, and the preparation and implementation of sovereign in-country projects with regional dimensions that build local information and institutions in order to leverage investments across borders. In this reporting year, SAWI has funded research, dialogue, institution building, and projects in Bangladesh, India, Nepal, and Pakistan that support SAWI's objectives in the wider basin context.

SAWI activities are identified and aligned to meet immediate, actionable needs and to complement and leverage the range of World Bank and development partner activities undertaken in the South Asia Region. Below are highlights of SAWI activities undertaken in this reporting period.

A. REGIONAL ACTIVITIES

- The Abu Dhabi Dialogue (ADD)
    a. The 4th Abu Dhabi Dialogue: 22-23 October 2009
    b. Abu Dhabi Knowledge Forum Small Grants Program
    c. The Abu Dhabi Dialogue in China: 15-17 June 2010
- The Challenges of Hydropower in the Himalayas
    a. Reducing Technical Barriers to Sustainable Hydropower Development
    b. Good Environment Practices in Hydropower Projects
- Regional Hydromet Monitoring (Proposed)

THE ABU DHABI DIALOGUE (ADD)

The Abu Dhabi Dialogue (ADD)[1] is a non-formal consultative process designed to promote greater cooperation and a better understanding of risks and opportunities on the rivers that rise in the Greater Himalayas. Increasing water resource constraints and uncertainty about the impacts of climate change on the Rivers of the Greater Himalayas are unifying concerns.

Each year the ADD brings together key decision-makers and respected opinion-makers from Afghanistan, Bangladesh, Bhutan, China, India, Nepal and Pakistan to discuss these critical issues and explore opportunities for action. The ADD provides a unique platform for dialogue among key stakeholders both within and between countries.

To foster a candid dialogue, ADD discussions are non-attributable and non-representative (the views of the members are not to be construed as representing their government's or institution's positions) and there is no expectation of a consensus outcome from these meetings. Nevertheless, a consensus vision emerged from the 2nd Dialogue, calling for a:

> *"cooperative and knowledge-based partnership of states fairly managing and developing the Himalayan river systems to bring economic prosperity, peace and social harmony, and environmental sustainability from the source to the sea."*

At the request of the Abu Dhabi Dialogue Group (ADD-G), SAWI supported and facilitated the 2nd ADD in 2007, the 3rd ADD in 2008, and the 4th Abu Dhabi Dialogue in this past year. Demand and ownership of the Dialogue is strong and growing.

[1] The name of the Dialogue derives from the 'First International Conference on Southern Asia Water Cooperation' held in Abu Dhabi in September 2006, hosted by the International Institute of Strategic Studies (IISS) with the support of the UK Foreign and Commonwealth Office. The recommendation of the meeting was for the dialogue to be sustained, focused on the rivers that rise in the Greater Himalayas, and facilitated by the World Bank.

At the 3rd ADD in Singapore in 2008, the Abu Dhabi Dialogue Knowledge Forum (ADD-KF) was launched. The ADD-KF is envisioned as a broad, inclusive forum focused primarily on knowledge – as a complement to the relatively exclusive ADD-G which focuses primarily on policy. National level dialogues are also supported as a means of broadening the dialogue.

At the 4th ADD this past year, discussions began in earnest regarding a potential regional investment program in hydromet monitoring. The 5th ADD is scheduled to be held on 15-16 December in Bangkok.

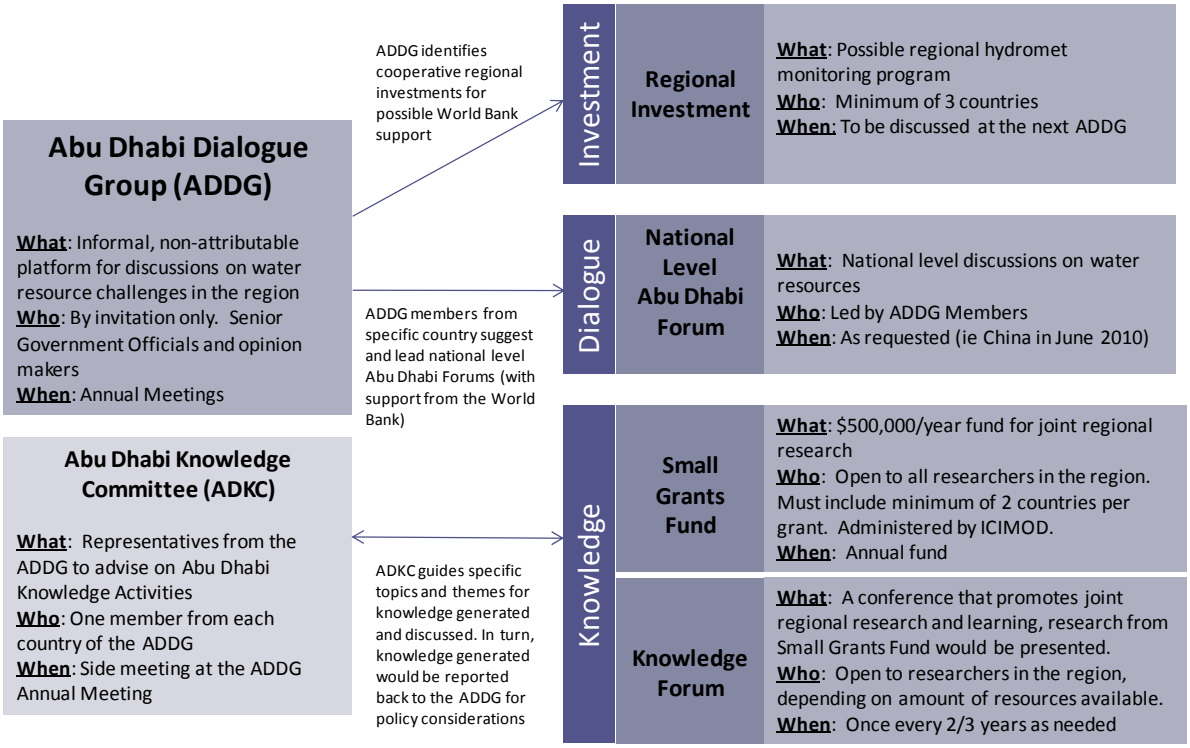
Responses to initial planning communications for the 5th Abu Dhabi Dialogue

"I am one of the strong supporters of this initiative and therefore wish to participate in the forthcoming ADD5 meeting." September 7, 2010 from Nepal's Secretary of Energy, responsible for water resources.

"This ADD process and the good work emanating from it is very close to my heart, that I keep referring to it in my everyday work and meetings, both within and outside Bhutan." September 10, 2010, from Bhutan's Division Head, Water Resources Coordination, National Environment Commission.

The current suite of ADD activities is seen in Figure 1.

Figure 1: The Abu Dhabi Dialogue



THE 4TH ABU DHABI DIALOGUE: 22-23 OCTOBER 2009

The ***4th Abu Dhabi Dialogue on the Rivers of the Greater Himalayas: Practical Steps to Achieving a Knowledge-Based Partnership of States*** was held in Abu Dhabi from October 22-23, 2009. Participants from Afghanistan, Bangladesh, Bhutan, China, India, Nepal and Pakistan engaged in discussions ranging from the preliminary design of the Ganges Strategic Basin Assessment, to examples of state-of-the-art regional hydromet technologies, to the structure and direction of the Abu Dhabi Knowledge Forum. Key outcomes of the Meeting follow.

The Abu Dhabi Dialogue should continue with a vision to formalize in the future. All ADDG members strongly supported the continuation of the ADD. While acknowledging that cooperation is often very

difficult, the ADD provides an opportunity for continued interactions between countries on water resources issues. ADDG members had a divergence of opinions regarding how quickly the ADD could be institutionalized. To ensure that all countries could continue to engage in the ADD, participants agreed that formalization should remain a medium-term vision.

The broad outlines of the Knowledge Forum were agreed by the ADDG members. The Knowledge Forum will remain a platform to encourage data sharing and collaborative research in the region. There are to be two major components: (i) a Small Grants program – to support collaborative research partnerships that include at least two countries in the region; and (ii) inclusive, regional Knowledge Forum Meetings – providing researchers in the region a platform to share knowledge, both the work produced with the support of the ADD small grants as well as relevant own-financed research.

The Knowledge Forum will be guided by the Knowledge Committee (ADD-KC). One ADDG member from each country is part of the Knowledge Committee. The ADKC will provide guidance on specific themes and topics to be discussed by the Knowledge Forum to ensure that the research will have policy relevance.

The World Bank was requested to explore the possibility of a cooperative regional project. Data sharing remains an important gap that might help catalyze greater regional cooperation. ADDG members suggested that a regional hydromet system should be explored. In the future, regional hydropower and other water resources projects could also be explored.

ABU DHABI DIALOGUE KNOWLEDGE FORUM SMALL GRANTS PROGRAM

Following the deliberations at the 1st ADD-KF, SAWI has raised funds on behalf of the ADD-G to enable the launch of a Small Grant Fund to support knowledge generation and dissemination activities on the Rivers of the Greater Himalayas.

The purpose of the Small Grants Fund is to facilitate collaboration among knowledge institutions from different countries sharing the Rivers of the Greater Himalayas, and support them to work together in a collaborative manner. Proposals will be accepted from research partnerships representing two or more countries, and can be used to initiate new knowledge generation, to expand current (national) project activities across boundaries, or to disseminate knowledge within the region.

As discussed during the 4th Abu Dhabi Dialogue, ICIMOD will administer the Small Grants Fund. They will issue calls for proposals, convene a selection committee consisting of ICIMOD and World Bank representatives, manage the flow of funds, and monitor outputs. The Abu Dhabi Knowledge Committee will determine priority topics and themes for the grants in order to ensure that research undertaken is policy relevant, and be given the opportunity to provide 'no objections' to the selection committee's recommended list of proposals. In turn, the knowledge and information gathered and generated by the grants program would be reported back to the full ADDG for possible policy considerations.

Also as discussed, Abu Dhabi Knowledge Committee members and affiliated institutions will not be eligible to apply for the Small Grants Fund to ensure that the selection of grant recipients remains impartial.

It is expected that the Fund will be launched in the coming FY11.

THE ABU DHABI DIALOGUE IN CHINA: 15-17 JUNE 2010

A ***Workshop on Capacity Development of Transboundary Water Management*** was held 15-17 June 2010, Lijiang, China. The workshop was conceived in response to a request from ADDG members. The workshop was sponsored by SAWI and the Swiss Agency for Development and Cooperation, and organized jointly by the World Bank and the Center for International Transboundary Water and Eco-Security of Tsinghua University. The workshop involved over 40 high-level participants from relevant Chinese agencies, and explored state-of-the-art technical and institutional approaches in transboundary water management.

Participants agreed that a significant knowledge gap remains for effective management of China's transboundary rivers and proposed the following activities as a way forward:

- A similar workshop should be held next year, with an enhanced focus on international legal frameworks and benefit sharing on transboundary waters.
- A seminar should be held on water resources development and cooperation on the Lancang-Mekong River, with participation from upstream and downstream riparians.
- Additional physical data and information should be collected, particularly in higher altitudes and in the cryosphere; new physical and economic models should be developed to better understand the dynamics of China's transboundary rivers.

The event was significant in having the participation of a senior official from the Ministry of Water Resources. This was, to our knowledge, the first time that a senior government official has participated in a transboundary waters workshop that included international participants. The team was very pleased with the depth of substance provided in the workshop, and associated discussions.

THE CHALLENGES OF HYDROPOWER IN THE HIMALAYAS

Despite national differences in hydrology and positions on international rivers, there are many common challenges to designing and operating water infrastructure in the Himalayas. A specific concern remains in the field of hydropower where unusually high sediment loads as compared to global averages necessitate a distinct Himalayan approach and where a regional body of knowledge and community of practice would be especially useful. With this objective, SAWI has supported several distinct activities in this area, including two in this FY:

REGIONAL COOPERATION TO REDUCING TECHNICAL BARRIERS TO SUSTAINABLE HYDROPOWER DEVELOPMENT IN SOUTH ASIA

The objective of this activity is to identify technical barriers in the fields of geotechnical engineering and tunneling and sediment management, and to propose solutions to identified technical challenges. The project was executed by:

(i) carrying out site visits to existing and proposed hydropower facilities in India and Nepal,
(ii) conducting discussions with local hydropower engineers and engineering geologists, and
(iii) conducting workshops in Delhi and Kathmandu

All components were aimed at identifying barriers and discussing their potential solutions. The hydropower projects that were visited included operating facilities and new projects that were in the design and construction phases of development. These activities not only allowed identification of technical challenges, but also revealed non-technical issues hampering proper execution of hydropower development projects.

A gap analysis was executed to compare regional and international practice. This was done by preparing matrices identifying state-of-the-art practices and indicating their use at reviewed projects.

The report of this investigation is now being finalized.

GOOD ENVIRONMENT PRACTICES IN HYDROPOWER PROJECTS

The primary objective of this activity is to identify, analyze and document good practice examples that recognize the environmental and related social practices in the hydropower sector in the South Asia

region, across India, Nepal and Bhutan. Work on this activity was recently launched and is currently ongoing. Outputs will include:

(1) A study to identify good practices in environmental management and related social practices in hydropower projects in South Asia (Bhutan, Nepal and India). The study will include desk research, site visits and discussions with project developers;

(2) Documentation of each of the identified good practices, and analysis of their potential for replication in upcoming hydropower projects in the region; and

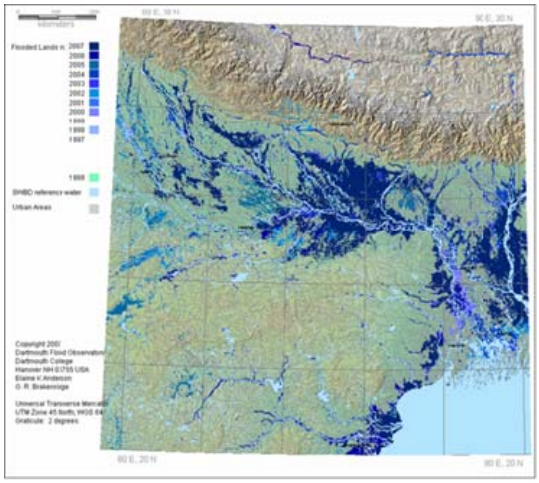
(3) Initial dissemination of the good practice documentation.

REGIONAL HYDROMET MONITORING (PROPOSED)

At the request of the ADDG, early discussions have begun regarding the development of a regionally inter-operable hydromet monitoring system.

The Himalayan Basins face substantial threats from climate variability. The region remains highly vulnerable to droughts and floods that not only devastate lives and livelihoods, but also undermine progress on economic growth and poverty alleviation. Figure 2 demonstrates the extent of flood affected areas in the Ganges Basin.

Figure 2: Flood Affected Areas in the Ganges Basin



Data availability and sharing are critical to enable improved water resources and disaster management in the region. The current hydro-meteorological, glacier, and sediment observation networks in South Asia need significant strengthening if they are to function at the necessary spatial/temporal scale, and with adequate reliability and lead time, for the effective management of disaster risk, water infrastructure and farming systems. In addition, the existing systems are inadequate to support the assessment of climate change implications. Modern hydro-meteorological observation systems (ground and satellite-based) and related IT improvements offer Himalayan countries the ability to leapfrog technologies and develop state-of-the-art systems to benefit all riparians. There are significant regional and country level benefits that can be derived from improved harmonization and exchange of hydro-meteorological data among riparian states, notably for water resources and flood management.

B. BASIN ACTIVITIES

- The Ganges Strategic Basin Assessment
- Social Dimensions of Climate Change in the Ganges Basin
- Ganges-Brahmaputra-Meghna River Basin Groundwater Study
- Good Practices in Cumulative Impact Assessment for Hydropower Development (Proposed)

THE GANGES STRATEGIC BASIN ASSESSMENT

In South Asia, there is no common knowledge base or analytical framework to explore options and facilitate cooperative planning, nor is there an effective institutional mechanism for basin-wide riparian dialogue and cooperation. To begin to address these issues, SAWI has begun to explore options to inform and facilitate a dialogue on regional cooperation at the international basin level. In its first year, SAWI has focused on the Ganges Basin in particular. The flagship for this work is the Ganges Strategic Basin Assessment (SBA) which aims to provide an information base and an opportunity for constructive multiparty dialogue among the three riparians. The main objective is to build knowledge and promote dialogue on the risks and opportunities of cooperative management in the Ganges.

The Ganges River Basin is the most populous basin in the world with over 500 million inhabitants and flows from the world's highest peaks in Nepal to fertile plains in India and the world's largest mangrove forest in Bangladesh. Many common perceptions on the dynamics of the basin exist both within the countries and between the countries. Yet, no comprehensive model or shared knowledge base is available to understand the risks and opportunities in this basin.

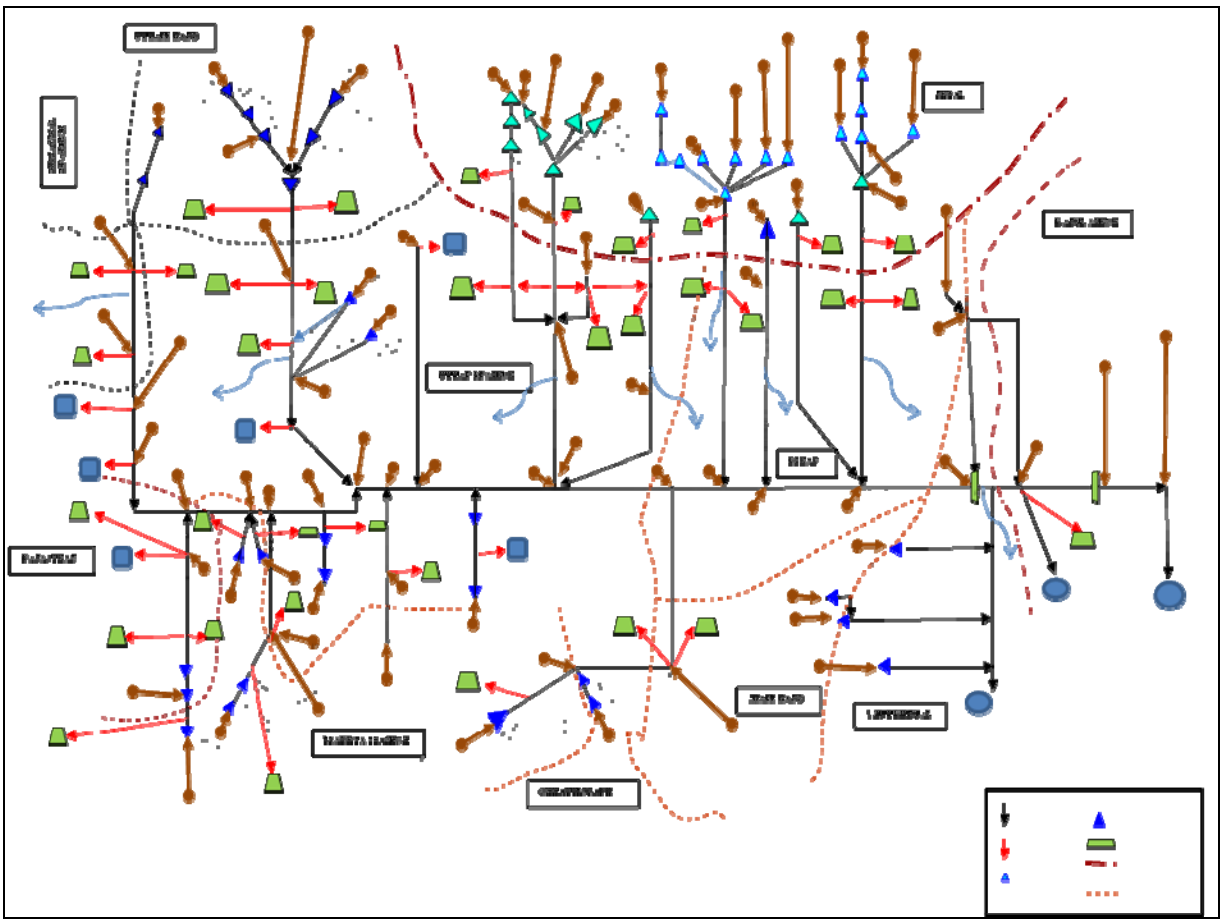
The centerpiece of this regional research/technical assistance work is the development of a shared Ganges Basin knowledge base and set of nested hydrological and economic river basin models that will be used to examine alternative scenarios across a range of future potential development and climate change scenarios for the Ganges (see Figure 3.) The models are designed to be of adequate reliability and detail to facilitate an informed discussion, and help focus efforts towards international cooperation. A planned third major component of this work (in addition to the water systems and economic analyses) focuses on social analysis, more specifically the social dimensions of climate change described in greater detail in the next section.

These new models now represent the most comprehensive knowledge base available on the Ganges River Basin. The multi-disciplinary SBA Team, building on inputs from several regional institutions, has completed the initial modeling. Consultations have been held with regional stakeholders at two points in the process to date, and an international Expert Advisory Group was convened in January 2010.

The results of the research reveal important findings that run counter to conventional wisdom regarding the dynamics of the Ganges River System. In particular, it is a common belief in the region that large-scale upstream water storage infrastructure (i.e. large multi-purpose dams in Nepal) could

control downstream floods in India and Bangladesh. The model suggests that even full development of large dams in Nepal would have a negligible effect on basinwide floods. These findings could greatly influence the region's flood management strategy, and the direction of some of the World Bank projects currently under preparation In Bangladesh, India and Nepal.

Figure 3: Schematic of the Ganges River Basin



The models suggest that upstream storage development (constructing dams in Nepal):

- ***Will reduce high flows (flood peaks) in tributaries rivers of the Ganges, but is unlikely to significantly reduce flood events in India or Bangladesh.*** The volume of flows that could be captured, even with full development of all of the largest known dam sites in Nepal, is only equivalent to about 10% of the annual Ganges River flow. In contrast, storage on the Murray-Darling in Australia (a system of comparable size) is about 150%, and storage on the Nile is equivalent to some 200% of annual flow. This means that the potential impact on high flows/flood peaks on the mainstem of the Ganges would be negligible.

Even within the tributaries, a decline in high flows/flood peaks would not directly diminish flooding. Most of the tributaries that would support large dams in Nepal are entirely embanked, and these embankments are virtually never over-topped. The immediate cause of most flood events are heavy rainfall in numerous, smaller unembanked tributaries simultaneously, and the failure (breach) of embankments on larger tributaries. Therefore, the impact of upstream water storage even within tributaries is much less valuable for flood control that is commonly believed.

- ***Will augment low flows to India and Bangladesh, but the best use of the additional flow is unclear.*** Upstream dams can capture high flows in the wet season and release that water in the low season. The model suggests that low flows could be significantly enhanced, perhaps even doubled in the driest month or two each year. The values that could be derived from these enhanced low flows will depend on agricultural productivity (which is currently very low) and the value of ecosystem services including the buffering of salinity intrusion in the mouth of the river.

- ***Provide significant hydropower benefits to Nepal.*** The models confirm the high value of hydropower benefits available in Nepal.

- ***Not help dilute water quality challenges in India.*** The confluence of the rivers that could bring significantly enhanced low flows into the Ganges system lie downstream of the highly polluted stretches of the river in India.

The impact of climate change in the basin remains very unclear. While the 23 Global Climate Models (GCM) agree that temperature will likely increase in the basin, they do not agree on the direction of precipitation change.

Some ***possible policy implications*** of the model results include the need to:

- Explore soft options to address flooding, including real time hydromet and early warning systems
- Encourage planned conjunctive use of surface and ground water in Eastern Uttar Pradesh & Bihar
- Improve on the climate change knowledge and data gap

The second set of regional consultations, held in August 2010, shared these initial results with governments and stakeholders in Bangladesh, India and Nepal. Although some of the results were surprising to stakeholders, there was keen interest and support for the Ganges SBA. Looking ahead, a draft report will be completed in December 2010 and a second Expert Advisory Group Meeting will then be held. Dissemination of the final report is currently planned for Spring 2011 in the three countries.

SOCIAL DIMENSIONS OF CLIMATE CHANGE IN THE GANGES BASIN

The main objective of this activity is to better understand the social dimensions of water variability in the Ganges Basin. More specifically, this analytical work aims to develop a better understanding of (i) the potential social impacts of hydrology regimes and local economic conditions – whether resulting from policy/investment decisions or climate variability/change – and (ii) the effectiveness of current coping and adaptation strategies, at household and community levels, with a particular focus on early warning systems and other community-based measures.

"*The floods come every year but usually they are manageable… in 2004 and 2007, they were extreme. Overnight, water levels rose and covered even the roofs of the houses here. We moved everything to higher levels, livestock, food, everything, but there was water everywhere."*

–Female respondent, Muzzafarpur District, Bihar, India

To date, the SAWI Trust Fund has assisted in the delivery of the following:

"*When the floods come, we move to the embankments with some food, and then we wait. We wait for the sound of the helicopters to come and bring food."*

–Female Respondent, Muzzafarpur District, Bihar, India

(1) The design of micro-level analysis in the Ganges Basin to investigate the social dimensions of flood, drought, low flows, water quality issues and salinity intrusion in the Basin. The aim of this work is to establish themes and commonalities in understanding how physical vulnerabilities are embedded within key social institutions, as well as how "soft" responses (both coping and adaptation initiatives), most notably community-based early warning systems, could be strengthened. The data collection for this analysis has already begun, and has been completed in flood and drought prone areas of Bihar (Madhubani, Muzzafarpur, Kosi area for floods, and Gaya for drought), as well as in the Sunderbans area of India (in the state of West Bengal) and on the topic of water quality in Allahabad and Kanpur. Additional fieldwork is ongoing or planned in the drought-prone area of Rajshahi-Godagari Upazila in Bangladesh, the flood prone area of Rajbani Upazila in Bangladesh, as well as the Bangladesh Sunderbans area.

(2) The targeted design of project-specific recommendations for ongoing analytical and operational work in the World Bank. These briefs are based on field work, and highlight key social dimensions and issues that are relevant to the project's design.

The overriding challenge to this work has been to demonstrate the value of addressing key social concerns in the Basin in a systematic and holistic way, and to demonstrate the utility and necessity of including social perspectives in regional water agendas. By looking at the social dimensions on a basin level, this study intrinsically recognizes the linkages that people in different countries have in using and managing the risks of a shared river system. This analytical work contributes to ongoing technical assistance and operational work in the region, and will highlight key lessons for the region specifically on the topic of flood impacts, the value of early warning systems, and community-based

"*If Aila [cyclone of 2009] comes again, we would rather die."*

–Female respondent, Sunderbans area of West Bengal, India

responses and adaptation strategies that could be shared on a cross-national platform.

GANGES-BRAHMAPUTRA-MEGHNA RIVER BASIN GROUNDWATER STUDY

A key finding from the Ganges Strategic Basin Assessment (SBA) is the need for planned conjunctive use of surface and ground water in the basin. Groundwater is a critical resource for the countries in the Ganges-Brahmaputra-Meghna River Basin, supporting economic activity and livelihoods. Groundwater storage also plays an important role in the characteristics of the floods in these basins. This proposed activity will build on: (i) an existing regional hydrogeologic analysis and groundwater flow model of the Bengal Basin, which spans Bangladesh and small parts of India, Nepal, and Myanmar, aimed at developing sustainable groundwater management practices for large regions of this transboundary aquifer system that would provide arsenic-free groundwater supplies for the foreseeable future; and on (ii) the recently completed World Bank Report "*Climate Change implications on salt water intrusion, groundwater resources and water management in the coastal zone of Bangladesh"* which provides an initial understanding of the potential impacts of climate change on salt water intrusion in the Bangladesh coastal zone aquifers.

This proposed activity will begin with a scoping study to determine the status of hydrogeologic knowledge and data availability for groundwater resources in the entire Ganges-Brahmaputra-Meghna River Basin. It will then launch a first effort to provide modern groundwater modeling as a tool to inform water resources management in the Basin. It will also consider localized impacts of human development and climate change on groundwater resources near the international border of India and Bangladesh. This work will also be of significance to evaluating recent findings of significant regional groundwater depletion across the entire Basin – a finding determined both by satellite imagery and by long-term groundwater level measurements in Bangladesh and in India.

Key issues to be addressed in this proposed activity are the impacts on groundwater levels, on groundwater and surface water availability, and on the transboundary water flow of:

(i) current irrigation practices,
(ii) future development and management alternatives,
(iii) possible sea level rise, and,
(iv) possible climate-change driven variations in recharge and river flows.

GOOD PRACTICES IN CUMULATIVE IMPACT ASSESSMENT FOR HYDROPOWER DEVELOPMENT (PROPOSED)

The main objective of this proposed work is to provide support to an on-going review of cumulative impact assessments in the context of cascaded hydropower development in India. This follows the recent sharp focus of India's Ministry of Environment and Forests (MOEF) on improving the practice of

environmental impact assessment and management in India across the economy. In the hydropower sector, MOEF has identified its particular concerns on the river basin level (rather than on the level of an individual project), and emphasized the need for cumulative impact assessment.

The proposed specific activity to be funded under SAWI is to bring international and possibly national experts to IIT-Roorkee for a workshop on cumulative impact assessment, to present case studies from other countries and to brainstorm on the approach to cumulative impact assessment that would be appropriate in the Indian context. The workshop is proposed to be held in early FY11.

C. NATIONAL ACTIVITIES

- Bangladesh: Bangladesh Rivers Information and Conservation Project
- Bangladesh: Improving Water Quality in the Dhaka Watershed
- India: Institutional Development for the National Ganga River Basin Authority (NGRBA)
- India: Groundwater Study "Deep Wells and Prudence"
- India: Support to Bihar Flood Management Information System (FMIS) Project (Proposed)
- Nepal: Water Resources Knowledge Base (GIS)
- Nepal: Capacity Building for River Basin Modeling
- Nepal: Workshop of Transboundary Water and International Law
- Nepal: Summiteers' Summit in Copenhagen
- Nepal: Mountain Initiative
- Nepal: River Conservation Act (Proposed)
- Pakistan: Support to Water Sector Capacity Building and Advisory Services Project

BANGLADESH

BANGLADESH RIVERS INFORMATION AND CONSERVATION PROJECT

The main objective of the Bangladesh Rivers Information and Conservation (BRIC) Project is to support the Government of Bangladesh in managing and developing its national water resources in an integrated manner. Specifically, the Project focuses on modernizing Bangladesh's hydrology network and restoring the productivity of the Gorai river systems.

Over the past year, SAWI funds were used to put an expert team in place to shape the initial design of the Project. Concept review was successfully completed in March 2010, and 3 major feasibility studies are expected to be launched in FY11.

IMPROVING WATER QUALITY IN THE DHAKA WATERSHED

The objective of this activity is to support the Government of Bangladesh in developing an effective, sustainable and replicable model to reduce industrial water pollution in the Dhaka watershed.

Through this project, SAWI funds are being used to co-finance a 500,000 USD World Bank-led "Non Lending Technical Assistance" activity called the Responsible Sourcing Initiative. The objective of this activity is to encourage the Bangladeshi textile industry to adopt less polluting, more energy efficient and cleaner production processes through new partnerships between the suppliers of major multi-national apparel retailers and brands, Bangladeshi textile industry trade associations, and the Government of Bangladesh. This activity, which has been formally requested by the Government of Bangladesh, will be jointly implemented by the World Bank, IFC, and the Natural Resources Defense Council (NRDC). It will be implemented and completed in 2011.

INDIA

INSTITUTIONAL DEVELOPMENT FOR THE NATIONAL GANGA RIVER BASIN AUTHORITY (NGRBA)

Launched in 2009, the new National Ganga River Basin Authority (NGRBA) is a flagship of the Government of India (GoI) to clean and conserve the Ganga in India. In India, the mainstem of the river runs through 5 basin states: Uttarakhand, Uttar Pradesh, Bihar, Jharkhand, and West Bengal. Associated investments under the NGRBA Program aim to address some of the major issues and infrastructure gaps in key sectors, namely: (i) wastewater management, (ii) solid waste management, (iii) industrial pollution control, and (iv) river front management. The "Mission Clean Ganga" aims to stop the dumping of all untreated waste into the river by 2020. Upon request, the World Bank is preparing a major project to support the NGRBA program. Upon request, the World Bank is supporting MOEF in the preparation of a major project to support the NGRBA program. With approximately $1 billion allocated in IDA funds, the task team is preparing the project for delivery to Board by June 2011.

To date, SAWI funds have been used to support analytical work on the institutional development needed to improve the resilience and engagement of the NGRBA program.

In particular, the SAWI Trust Fund has supported the delivery of two specific activities:

(1) A workshop on the "Global Experiences with River Cleaning and Basin Management" held in New Delhi in April 2010, and co-hosted by MOEF. The aim was to share experiences from international rivers, including Indian rivers, that have been successfully cleaned or improved, and to engage a wide array of stakeholders

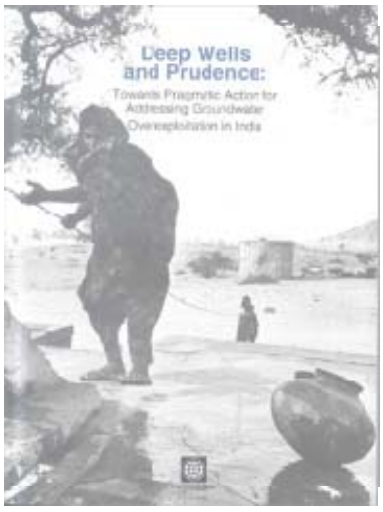
in discussion on these issues. Speakers were brought from the Sabarmati River in Ahmadabad, the San Antonio River in Texas, and the Murray Darling in Australia. Participants and Panelists also included members of Central Government and of the five basin states, and key engaged members of civil society, including the nine expert members who sit on the high-level NGRBA. The Minister of Environment inaugurated the workshop.

(2) A targeted TA program on institutional development, including the services of several consultants (including the former CEO of the Murray Darling Basin Commission) hired to advise Government on a range of issues, including: river basin management and institutional design.

Going forward, there is scope for a deepening of SAWI engagement. To date, SAWI funding has been instrumental in enabling the Bank to engage on difficult issues and on the creation of new institutions, which, when established, will be transformative in scope. No basin organization of this scale exists in India today. In the years ahead, more work will be needed to support the operational units of the NGRBA at both the Center and in the Basin States, and it must be recognized that these institutional reform efforts take time, often many years.

Immediate next steps in FY11 include: (i) continuing the technical assistance for the establishment of an operational NGRBA basin organization; (ii) supporting innovative pilots, such as developed of the first CDM carbon credit program for a river clean-up program; and (iii) dissemination of global knowledge and best practice, including for example through study tours to similar rivers and appropriate clean-up initiatives, like the Danube and the Rhine in Europe, and other once majorly polluted rivers in less developed countries.

GROUNDWATER STUDY



The World Bank Study and Technical Assistance Initiative on Groundwater Management in India was conceived with two main objectives: (a) to identify management strategies for promoting sustainable groundwater use in India, within a systematic, economically sound, and politically feasible framework; and (b) to provide focused technical support for enhancing the outcomes of groundwater management interventions under World Bank-financed projects in participating states. It was recognized that the conventional command-and-control approaches as well as the classically prescribed economic approaches are impracticable for managing groundwater overexploitation in India, due to the sheer scale of the problem and the political sensitivities attached to it. Attention was therefore focused on developing a "Plan B" involving the pursuit of pragmatic approaches that could make incremental improvements

largely within the existing institutional framework, and on building political support for gradual and realistic institutional improvements at higher levels by first demonstrating successful interventions at local levels.

The initiative was conducted from 2006-2009, and the final Report released this FY.

SUPPORT TO BIHAR FLOOD MANAGEMENT INFORMATION SYSTEM PROJECT (PROPOSED)

Bihar is India's most flood-prone State, with 76% of the population in the north living under the recurring threat of flood. Floods not only affect lives, livelihoods, and the productivity and security of existing investments, but are also a disincentive for additional investments in Bihar. The Government of Bihar is therefore keen on the speedy implementation of the World Bank's Flood Management Implementation Support (FMIS) Project Phase II, which would improve flood management in the State.

This follows and builds on the previous phase in which the Bank, under a previous DfID-financed grant, supported Bihar in initiating a FMIS Cell, aimed at generating and disseminating timely and customized information to move the sector agencies from disaster response to improved disaster preparedness and to support flood control and management in the flood-prone areas of the State. A variety of materials related to the status of floods in Bihar were produced using remote sensing and geographic information systems (GIS) techniques.

The proposed activity would build on this previous effort and improve the Government of Bihar's capacity to use state-of-the-art forecasts and to enhance last-mile connectivity for flood preparedness and information management. In particular, funds would be used for targeted studies to review modern flood management techniques, including the integration of satellite with ground-based systems, and to assess embankments; to hire international experts to assist Cell Specialists in Bihar; and for training workshops to build capacity of the staff.

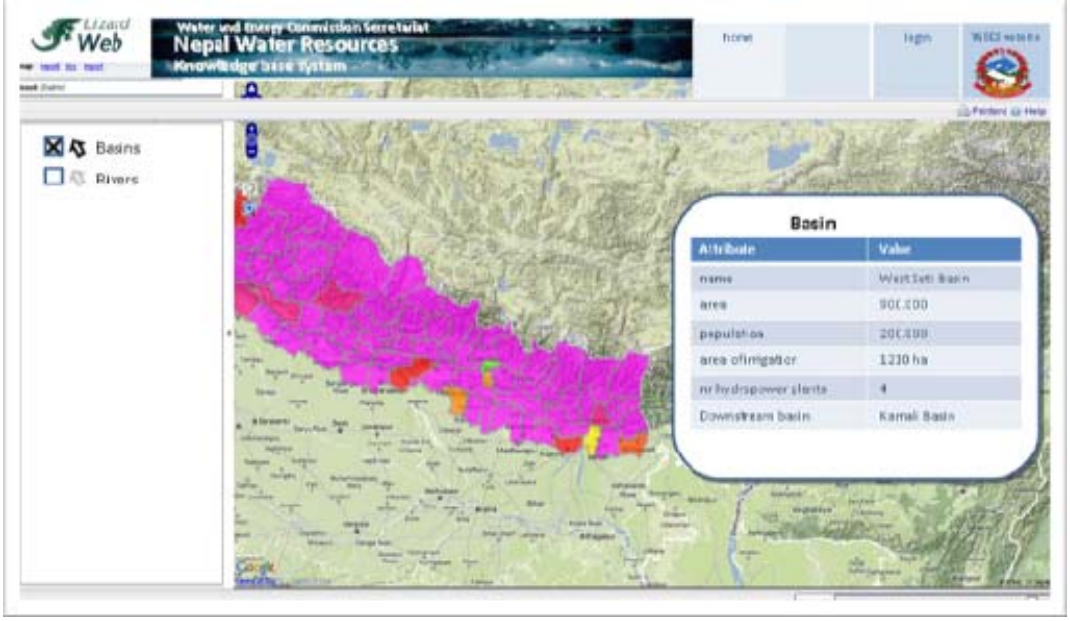
Nepal

WATER RESOURCES KNOWLEDGE BASE (GIS)

It is important for Nepal to facilitate rapid access to key data and information for improved understanding of water supplies and demands, risks and opportunities in the basins of Nepal. To this end, the Water and Energy Commission Secretariat (WECS)—the government body mandated to implement river basin management and to guard against conflicting uses of water within basins—has requested the World Bank and SAWI for support in the development of a GIS-based spatial knowledge base of water resources. This will serve as a fundamental tool for decision-support as well as an advocacy tool for WECS to use in communicating with the many stakeholders inside and outside Government who need to understand the opportunities and weigh the trade-offs inherent in water resources development. Furthermore, this information system will be the main knowledge platform of

the Water Resources Information Center that is currently being established at WECS under the ongoing World Bank-financed Irrigation and Water Resources Management Project. A consulting firm was contracted in April 2010 to develop the system and train WECS staff. Initial results were presented during a workshop in Kathmandu in August 2010 that demonstrated the knowledge base's great potential; participants included a wide range of stakeholders from across government and the private sector. WECS is planning for the final dissemination workshop by end November 2010.

Figure 4: Nepal Water Resources Knowledge Base Portal



CAPACITY BUILDING FOR RIVER BASIN MODELING

WECS has also requested support for capacity building in river basin modeling. With no capacity of its own to model basin-wide flows and withdrawals, WECS's capacity to manage water resources, and in particular to allocate water when there are competing demands or understand the upstream/downstream impacts of infrastructure development, is severely constrained. To meet WECS's request, SAWI delivered a two-part course for key staff from WECS and other relevant government agencies in both August/September and November 2009. The final outputs of this activity were both trained staff and two functioning basin models, for the Babai and the West Rapti Basins.

WORKSHOP OF TRANSBOUNDARY WATER AND INTERNATIONAL LAW

Based on the mandate provided by the Government of Nepal, a Transboundary Water Cell has been established in WECS to serve as the Government of Nepal's focal point for transboundary waters. SAWI supported a workshop on Transboundary Water Management and International Law held on June 7,

2010. Over 30 participants from different Ministries participated in this workshop focusing on Nepal's international rivers treaties. The main objectives of the workshop were to familiarize the participants with the history of international rivers treaties and international water law, the norms and common practices of international river negotiations, and the relevant lessons for Nepal.

SUMMITEERS' SUMMIT IN COPENHAGEN: 11 DECEMBER 2009

The Government of Nepal, with advice and support from SAWI and other donor partners, hosted the *Summiteers Summit to Save the Himalayas* in Copenhagen as a Side Event to the UNFCCC's COP15 Meeting and to mark International Mountain Day. Himalayan summiteers gathered to raise awareness of the challenges faced by high mountains – where temperatures are rising fastest – in the context of climate change.

This event followed in the spirit of the Kathmandu to Copenhagen Conference, supported by SAWI August 31-September 2, 2009 and reported in the previous annual report, which was the first Ministerial-Level conference on climate change in South Asia. Following this Copenhagen event, the Prime Minister of Nepal announced the launch of the Mountain Initiative, detailed below.

MOUNTAIN INITIATIVE

Following the successful Kathmandu to Copenhagen Conference and the Summiteers' Summit, the Prime Minister of Nepal has continued to advocate for the needs of high mountain states in global climate change discussions, and announced the launch of the Mountain Initiative during the Copenhagen COP15 meetings by saying:

> *"I therefore take this opportunity to call on all the mountain countries and stakeholders to come together, form a common platform and make sure that mountain concerns get the due attention in the international deliberations. Let us make sure that our interests are prominently represented in future COP negotiations and let us make sure that our efforts of adaptation get the required international support."*

Since COP15, the Mountain Initiative has delivered two well-received side events at the UNFCCC meetings in Bonn, and is planning a global, Ministerial-Level conference of mountainous countries in 2011. SAWI, along with a consortium of development partners, is providing support for these efforts.

RIVER CONSERVATION ACT (PROPOSED)

The Government and civil society stakeholders have indicated the need for support to develop a Nepal River Conservation Act to ensure appropriate conservation and management of the country's 6,000 rivers. The Nepalese legal framework governing rivers, including their conservation and sustainable use, highlights numerous difficulties, particularly with respect to clarity of applicable regime, implementation, enforcement, cross-sectoral coordination at the national level, and management capacity at the local level. Existing acts and regulations are rarely complied with and enforced, and many overlap on jurisdictional issues thus creating ambiguity.

Pending the Government's official request, SAWI funds are proposed to be used to assess the existing policies, conduct basin wide consultations, organize a National River Summit with key stakeholders and experts, and carry out communication and advocacy campaigns to support the development and passage of an Act.

Pakistan

SUPPORT TO THE WATER SECTOR CAPACITY BUILDING AND ADVISORY SERVICES PROJECT

The Pakistan Water Sector Capacity Building Project is a $38 million IDA credit financed by the World Bank and under implementation since 2009. Its main objective is to support the capacity building and analytical work needed to ensure the effective management and development of the Indus River system. In particular, the Project supports capacity building of and support to federal institutions and their staff involved in the planning, management, and development of the Indus river system, such as the Indus River System Authority (IRSA) and the Water and Power Development Authority (WAPDA). In the initial period, SAWI funds were used to engage and dialogue with key stakeholders, and build support in the Government of Pakistan. The Project is now under implementation, and specific activities to improve data monitoring and measurement of water flow have been undertaken. This will not only benefit inter-province water sharing but also complement the proposed regional hydromet project which will both build on national data networks and provide more accurate information.

TRUST FUND MANAGEMENT

A. GOVERNANCE

The SAWI Multi-Donor Trust Fund (MDTF) is managed by the World Bank in close collaboration with its Donor Partners. The governance structure currently in place is such that the Bank is responsible for the day-to-day administration of the MDTF but is equally obligated to adopt a participatory and flexible approach working closely with Donor Partners.

Specific governance arrangements currently comprise two operational layers:

(1) An internal World Bank team dedicated to fiduciary management of the trust fund and communicating and reporting to Donor Partners on a regular basis. This includes organizing and preparing the Annual Meeting and its associated Annual Report, as well as ensuring regular updates are made on progress, and on the dissemination of key reports and findings as they are produced.

(2) A Trust Fund Committee comprised of Donor Partners and the World Bank which reviews the program on an annual basis at the end of each fiscal year (July to June) and approves the program and budget for the subsequent year. The Committee is also responsible for providing strategic oversight, inputs to substantive program design, and monitoring SAWI financed activities. The Committee operates by consensus (i.e. no voting rights) and maintains an informal approach to governance. The Committee is limited to financing partners and will be expanded as and when new Donors come on board.

In addition, two additional governance layers may be added. These additional layers were floated when SAWI was first conceived as potential additions in the longer term. Their suitability and timeliness should now be re-visited and discussed.

(3) A Regional Consultative Committee to give countries in the region a consultative role in the formulation and implementation of SAWI's activities. This Committee was deliberately not created in SAWI's early years but may now be appropriate. It could, for example, initially comprise of focal points from individual countries as per the current arrangements of the ADD.

(4) An Advisory Group from experts in the fields in which SAWI is active. This could include individuals from bilateral and multilateral development institutions, from diplomatic cadres and embassies, from academia and policy think tanks, and from civil society and NGOs. This could deepen the knowledge base, tap into cutting-edge research and practice, and guide SAWI on its overall strategy and work program as it moves forward. On the other hand, individual activities

funded by the MDTF often have their own set of advisors and experts on the specific subject and the suitability of this governance layer needs to be discussed.

B. STAFFING

SAWI is now led by a senior SAWI Program Manager based in Kathmandu and by a Trust Fund Manager based in New Delhi. Operations analysts, financial resource management specialists, and lawyers also support them from Washington. Together, this core team guides SAWI in terms of overall strategic direction and manages the Trust Fund including both governance and fiduciary responsibilities. Specifically, the core team oversees: work plans, fund flows and replenishments, calls for funds, disbursement of funds to agreed activities, monitoring and reporting, and reviewing new proposals.

In addition to the core team managing the MDTF, many sector specialists in the World Bank work on SAWI-financed activities. This includes staff based in the main SAWI hubs of Washington, New Delhi and Kathmandu, as well as from the region's other main country offices (Dhaka, Islamabad, Kabul, and a focal point in Beijing for China's engagement on the Abu Dhabi Dialogue). This extends the reach of the team considerably with specialists in water resources, environment, and climate change among others included in the extended SAWI community at the Bank.

Additional staff may be needed and will be discussed, particularly the case for a high quality, experienced Communications Specialist.

C. FINANCIAL REPORTING

The present Development Partners, alongside the World Bank, and the current donors to the MDTF are the Government of the UK (through DFID), the Government of Australia (though AusAID), and the Government of Norway (through the Ministry of Foreign Affairs and NORAD).

Total funds pledged amount to US$ 9.5 million, and as of the end of FY10, US$ 5.5 million has been effectively deposited in the World Bank. This leaves a remaining commitment to deposit US$ 4 million in FY11 and FY12. Table 1 shows the status of pledges, deposits and remaining commitments to deposit.

In this reporting period, a new Memorandum of Understanding (MOU) was signed by Norway to join the MDTF. In addition, amendments were signed by all donors to create a new "recipient executed grant" window within the Trust Fund. This was necessary in order for ICIMOD to administer the Small Grants Fund of the Abu Dhabi Dialogue Knowledge Forum. Previously, the MDTF was structured as Bank executed in its entirety.

Table 2 summarizes the status of the MOUs.

Table 1: Pledges, Deposits and Remaining Commitments

Contributing Partners	Pledges			Deposits in Donor's Currency	Deposits in US$	Remaining Deposits in Donor's Currency	Remaining Deposits in US$
	Currency	Amount in currency	Amount in US$[2]				
AusAID	AUD	3,000,000	2,747,179	1,500,000	1,330,200	1,500,000	1,416,979
DFID	GBP	2,442,000	3,745,985	2,052,000	3,137,257	390,000	608,728
Norway	NOK	18,000,000	3,013,643	6,000,000	1,034,947	12,000,000	1,978,696
Total			9,506,807		5,502,404		4,004,403

Table 2: SAWI Memoranda of Understanding

Contributing Partners	Currency	Commitments in donor's currency	Deposit in donor's currency	Deposit as of % of commitments	Date of M.O.U
AUSAID	AUD	3,000,000	1,500,000	50 %	Signed: 05/27/2009 Amended: 04/13/2010
DFID	GBP	2,100,000 42,000 300,000	1,710,000 42,000 300,000	81 % 100 % 100 %	Signed: 11/28/2008 Signed: 03/24/2009 Signed: 12/07/2009 Amended: 07/12/2010
Norway	NOK	18,000,000	6,000,000	33 %	Signed: 12/07/2009 Amended: 04/06/2010

The pace of disbursements is accelerating as SAWI grows. Since inception, a total of $1.46 million has been disbursed from the MDTF (see Table 3). However, in this year (FY10), US$ 1.37 million was

[2] These are approximate amounts due to exchange rate fluctuations, and differences in rates between the time pledges are made as compared to deposits.

disbursed as compared to only $90,000 in FY09 when the MDTF was in its first year. In addition, about $700,000 has already been committed for further disbursement in FY11 as the MDTF picks up the pace.

Details of the flow of funds to specific projects are provided in the tables below. Table 3 shows the activities supported by SAWI, and their allocations and expenditures to date for both FY09 and FY10. Expenditures are defined as the sum of actual disbursements and commitments made in contract. Table 4 indicates the extent to which SAWI grants are leveraged by World Bank funds – where applicable, as not all SAWI activities are directly leveraged in this way.

Table 3: Table of SAWI Allocations and Expenditures by Activity (FY09 + FY10)

	Activity	Status	Amount Allocated To date (US$)	Amount Disbursed + Committed To date (US$)	Amount Disbursed through end of FY 10 (US$)
Regional	Abu Dhabi Dialogue: Regional Cooperation Dialogue on Rivers of Greater Himalayas	Ongoing since 2007	750,000	251,268	237,345
	Abu Dhabi Knowledge Forum: Small Grants	Forthcoming	500,000		
	Good Environment Practices in Hydropower Projects	Ongoing since 2010	50,000	44,992	
	Regional Cooperation in Sediment Mgmt for Hydro	Completed	120,000	103,367	90,589
	Regional Cooperation to Reduce Technical Barriers to Sustainable Hydropower Development	Finalizing	50,000		
Basin	Ganges Strategic Basin Assessment	Ongoing since 2008	1,000,000	1,023,380	777,903
	Social Dimensions of Climate Change in the Ganges Basin	Ongoing since 2009	140,000	41,290	40,310
	Ganges-Brahmaputra-Meghna River Basin Groundwater Study	Ongoing since 2010	175,000	165,000	
National	Bangladesh: Rivers Information and Conservation	Forthcoming	100,000		
	Bangladesh: Improving Water Quality in the Dhaka Watershed through Responsible Sourcing	Forthcoming	250,000		
	India: NGRBA, Institutional Development & Strategic Communications	Ongoing Since 2009	550,000	176,627	74,135
	India: Groundwater Study "Deep Wells and Prudence"	Completed	32,000	2,883	2,883
	Nepal: Water Resource & Climate Change (multiple activities)	Ongoing since 2008	700,000	378,605	238,698
Total			**$4.42 million**	**$2.19 million**	**$1.46 million**

Table 4: World Bank Administrative Budget for SAWI Activities to Date

Levels	Countries	Bank Budget (US$)		Project Pipeline & Potential Investment	Size of Investment (US$)
		Allocated	Actuals to Date		
Regional	Abu Dhabi Dialogue	50,000	0	Potential regional project on the Himalaya Rivers	Not yet defined
River Basin	Ganges SBA	255,000	245,000	Economic & Sector Work (Research & Dialogue)	Not applicable
National	Bangladesh	260,000	138,000	Rivers Information and Conservation	160 million
	Bangladesh			Dhaka Environment and Water (DEW) project	100 million
	India	408,000	682,000	NGRBA Project	circa > 1 billion
	Nepal	265,000	181,000	Water Resources and climate technical assistance	circa 50 million
	Pakistan	430,000	432,000	Capacity Building & Advisory Service Project	38 million
Total		**US$1.67 million**	**US$1.68 million**		**US$1.35 billion**

LOOKING FORWARD

As this report is finalized and we meet in Kathmandu, we are reminded of the unique and immense water challenges in the region. Floods continue to rage across much of Pakistan from Punjab through to Sindh, only briefly clouding the news coverage of simmering tensions between India and Pakistan on border storage projects regulated by the Indus Waters Treaty. Millions have been displaced and lost livelihoods and land in what will surely be an epic reconstruction effort in the months and years to come. In Bihar's northern districts, floods once again threaten to breach embankments imperiling the lives of over a million people unprepared for disaster. These current affairs only highlight the reality of South Asia's immensely difficult hydrology and the continued relevance of SAWI's objectives to promote water security in the region. Despite the herculean efforts required, the activities financed by SAWI and highlighted in this report do, in their incremental way, make a difference.

In the coming year, the focus of SAWI efforts is likely to be on flood management, on regional cooperation on hydromet and data sharing, and on building local water institutions. The year ahead will see the dissemination of the messages of the Ganges SBA, in particular with regard to flood management strategies and that if infrastructure cannot, in fact, build protection from floods in the Gangetic Plains, then efforts to provide enhanced monitoring and warning systems must be stepped up and more localized solutions explored. This message compliments what will be early efforts to develop a pragmatic approach to regional hydromet monitoring systems, perhaps in concert with national level investments in flood early warning systems. Local water institutions will also continue to be supported from smaller, localized tributary and flood management organizations to large basin agencies, such as the NGRBA being established in India, that are inherently multi-sectoral by mandate.

In addition to discussions on the substance and overall strategic direction of the SAWI Program, the year may also see a turning point in which a small and young Trust Fund grows roots. Governance arrangements will need to be debated and then stabilized, and staffing ramped up to support a growing program. New Donor Partners may come on board, and new commitments may be made by existing Partners. We hope this Annual Report and coming Annual Meeting accurately reflect the many important initiatives undertaken to date, and focuses the program on a clear path ahead for another formative year.

ANNEX 1:

ACTIVITY SHEETS

Details of Individually-Funded SAWI Activities

Activity Name: The Abu Dhabi Dialogue

TTL Name: Claudia Sadoff

Other SAWI Team Members: Sylvia Lee

Associate World Bank Project (if any): Not Applicable

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1. Background

The Abu Dhabi Dialogue Group (ADDG) is a partnership of senior members of government, academia and civil society from the seven countries that share the Rivers of the Greater Himalayas, namely Afghanistan, Bangladesh, Bhutan, China, India, Nepal, and Pakistan. The ADDG maintains the Abu Dhabi Dialogue, an informal consultative process maintained by the senior members from the seven countries that constitute the ADDG.

The Abu Dhabi Dialogue developed out of the 'First International Conference on Southern Asia Water Cooperation', a regional meeting of senior political, government, academic, and civil society members from the seven countries of Afghanistan, Bangladesh, Bhutan, China, India, Nepal, and Pakistan, convened in Abu Dhabi in September 2006 by the International Institute of Strategic Studies (IISS) with the support of the UK Foreign and Commonwealth Office. The recommendation of the meeting was for the dialogue to be sustained, focused on the rivers that rise in the Greater Himalayas, and facilitated by the World Bank.

Since its inception in 2006, the ADDG has met four times, and maintains ongoing communication in between these high-level meetings. The ADDG emphasizes the importance of cooperation to acquire the knowledge necessary to identify 'common solutions to common problems' related to changes impacting on the water resources in the region. The 10-year vision of the ADDG is:

"A cooperative and knowledge based partnership of states fairly managing and developing the Himalayan river systems to bring economic prosperity, peace and social harmony, and environmental sustainability from the source to the sea."

The ADD has followed several 'rules of the game', including: non-representative and non-formal participation, no focus on particular disputes, no attribution, and no requirement for a consensus outcome. The Dialogue sessions were designed to share global experience on international waters and benefit-sharing, and to achieve constructive convergence.

This convergence on dialogue and cooperation on the rivers of the Greater Himalayas was considered important by the ADD because of the scale of the problem and the magnitude of its impact. Over 1 billion people live in these river basins and many more – almost half of the world's population – live in

countries that depend on the economic production these rivers support. These populations are growing and, due to economic development, their water demand is growing even faster. But climate change and global temperature increase are altering the hydrology of these vital basins. For example, data confirm that the Himalayan glaciers, which contain the largest body of ice outside the polar regions and provide critical dry-season and long-term water storage, are retreating faster than those in any other major mountain range. Increased precipitation is also predicted in the region, with higher variability and extremes, resulting in greater flood and drought shocks. Predicted sea level rise will also have very major impacts in the delta regions of these basins. The biggest concern, however, is that there is little certainty over predictions and no consensus over observed changes. The lack of data is so serious that there is a blank spot ('no data') in the Intergovernmental Panel on Climate Change (IPCC) AR4 report. Reasons for this are the limited density of hydro-meteorological stations, the lack of regional cooperation in observation network design and management, and the absence of any pooling of data, knowledge and research. Given the scale of uncertainty and the unprecedented risks posed to future livelihoods and growth of such a large proportion of the world's population, the absence of cooperation on the Rivers of the Greater Himalayas poses a very serious challenge to the region.

In accordance with the consensus vision, the ADD agreed to three specific sets of actions: to maintain and expand the Dialogue, and to conduct coordinated research and training activities, and to catalyze a cooperative investments in the region. The World Bank was requested to provide support and, in turn, committed to doing so and to building a development partnership with other donors to support these actions.

2. Description of related World Bank Project (if applicable, or other donor/govt Project)

Early discussions are on-going on the development of a regionally inter-operable hydromet monitoring system.

3. Description & Outputs of SAWI Activity

4th Abu Dhabi Dialogue

The ***4th Abu Dhabi Dialogue on the Rivers of the Greater Himalayas: Practical Steps to Achieving a Knowledge-Based Partnership of States*** was held in Abu Dhabi from October 22-23, 2009. Participants from Afghanistan, Bangladesh, Bhutan, China, India, Nepal and Pakistan engaged in discussions ranging from the preliminary design of the Ganges Strategic Basin Assessment, to examples of state-of-the-art regional hydromet technologies, to the structure and direction of the Abu Dhabi Knowledge Forum. Key outcomes of the Meeting follow.

The broad outlines of the Knowledge Forum were agreed by the ADDG members. The Knowledge Forum will remain a platform to encourage data sharing and collaborative research in the region. There are to be two major components: (i) a Small Grants program – to support collaborative research

partnerships that include at least two countries in the region; and (ii) inclusive, regional Knowledge Forum Meetings – providing researchers in the region a platform to share knowledge, both the work produced with the support of the ADD small grants as well as relevant own-financed research.

The Knowledge Forum will be guided by the Knowledge Committee (ADKC). One ADDG member from each country is part of the Knowledge Committee. The ADKC will provide guidance on specific themes and topics to be discussed by the Knowledge Forum to ensure that the research will have policy relevance.

The World Bank was requested to explore the possibility of a cooperative regional project. Data sharing remains an important gap that might help catalyze greater regional cooperation. ADDG members suggested that a regional hydromet system should be explored. In the future, regional hydropower and other water resources projects could be explored.

Abu Dhabi Knowledge Forum Small Grants Program

The purpose of the grant is to facilitate collaboration among knowledge institutions from different countries, sharing the Rivers of the Greater Himalayas, and support them to work together in a collaborative manner. The grant can be used to initiate new knowledge generation, to expand current (national) project activities across boundaries, or to disseminate knowledge within the region.

Activities shall outline how they will contribute to *knowledge generation and dissemination* among the countries sharing the Rivers of the Greater Himalayas. The proposal shall highlight how the proposed activities will contribute to increased *collaboration across borders* in the region. The activities shall involve knowledge institutions from a *minimum of two countries*, with a preference for more.

As discussed during the 4th Abu Dhabi Dialogue, ICIMOD will administer the Small Grants Fund. They will issue calls for proposals, convene a selection committee consisting of ICIMOD and World Bank representatives, manage the flow of funds, and monitor outputs. The Abu Dhabi Knowledge Committee will determine priority topics and themes for the grants in order to ensure that research undertaken is policy relevant, and be given the opportunity to provide 'no objections' to the selection committee's recommended list of proposals. In turn, the knowledge and information gathered and generated by the grants program would be reported back to the full ADDG for possible policy considerations. Also as discussed, Abu Dhabi Knowledge Committee members and affiliated institutions will not be eligible to apply for the Small Grants Fund to ensure that the selection of grant recipients remains impartial.

It is expected that the Fund will be launched in the 2010 calendar year.

National Level Abu Dhabi Forum

A Workshop on Capacity Development of Transboundary Water Management was held 15-17 June 2010, Lijiang, China. The workshop was conceived in response to a request from ADDG members. The workshop was sponsored by the World Bank (SAWI) and the Swiss Agency for Development and Cooperation, and organized jointly by the World Bank and the Center for International Transboundary

Water and Eco-Security of Tsinghua University. The workshop involved over 40 high level participants from relevant Chinese agencies, and explored state-of-the-art technical and institutional approaches in transboundary water management.

Participants agreed that a significant knowledge gap remains for effective management of China's transboundary rivers and proposed the following activities as a way forward:

- A similar workshop should be held next year, with an enhanced focus on international legal frameworks and benefit sharing on transboundary waters.
- A seminar should be held on water resources development and cooperation on the Lancang-Mekong River, with participation from upstream and downstream riparians.
- Additional physical data and information should be collected, particularly in higher altitudes and in the cryosphere; new physical and economic models should be developed to better understand the dynamics of Chinese's transboundary rivers.

4. Challenges & Next Steps

Maintaining interest high level engagement from countries, especially China and India will continue to be challenging. The team needs to continue to work closely with ADD counterparts throughout the year to maintain relationships.

ADDG members had a divergence of opinions on the speed of ADD institutionalization from immediate formalization with governments to maintaining status quo. To ensure that the ADD remains inclusive, participants agreed that institutionalization should remain a long-term vision.

5th Abu Dhabi Dialogue is tentatively scheduled for December 15 – 16 in Bangkok, Thailand.

Activity Name: Good Environment Practices in Hydropower Projects

Team Leader: Rohit Mittal

Other SAWI Team Members: Tapas Paul, A.S. Harinath, Pyush Dogra, Kwawu M. Gaba

Associated World Bank Project (if any): Rampur Hydropower Project

1. Background

The abundant renewable hydropower resources in the mountainous regions of South Asia are a potential solution to the region's chronic energy and water shortages, which are an obstacle to individual countries achieving their growth potential. The hydropower potential of Bhutan, Nepal and India is estimated at around 200,000 MW, of which less than 20 percent (mainly in India) has been developed so far. The countries in the region have more than 400 million people without access to electricity and face significant energy and peaking shortages (especially in India and Nepal).To meet the energy demands, these countries have designed ambitious hydropower development programs – Bhutan plans to add 10,000MW of hydropower capacity by 2020 (compared to 1400 MW at present), India plans to add 45,000 MW over the 10th and 11th plan (compared to 36,000 MW added over the last 50 years) and Nepal plans to add 10,000 MW by 2020 (compared to about 600 MW at present). In addition to energy generation, the hydropower projects also contribute to freshwater storage by collecting snowmelt and rainwater, which can also meet the drinking or irrigation water requirements. Storage of water also replenishes the aquifers and reduces vulnerability to floods and droughts.

While hydropower can play an important role in the energy and development strategies of the country, sustainable development of such projects are inherently challenging. One such challenge is to assess the environmental and social impacts associated with the hydropower projects and adequately mitigating these impacts. Hydropower development in the region has seen improvement in understanding and addressing these environment and social impacts, through comprehensive environmental and social impact assessments, consultation with civil society, supporting local area development programs, etc. The proposed study aims to (i) identify and document some of such best practices of environment and social management in hydropower sector in the three countries (ii) understand factors that influenced some projects to perform better than others in this area, and (iii) disseminate and promote adoption of such good practices widely across the sector.

2. Description of related World Bank Project (if applicable, or other donor/govt Project)

Government of India (GoI) has requested the Bank to help support development of its hydropower sector. In particular, the GoI requested Bank's support for development of 412 MW Rampur Hydropower Project in 2005 and subsequently for 444 MW Vishnugad Pipalkoti Project and 775 MW

Luhri Hydroelectric Project in 2006. The government envisages that the Bank's engagement in the hydropower sector in India, beginning with the Rampur hydropower project, will provide experience of good practice for hydropower development, targeting support at about 10 percent of the 16,000 MW of hydropower capacity it intends to develop over the next five years during the Eleventh Five Year Plan. Specifically, through a partnership with a few developers in specific states, the Bank can help institute suitable international technical and sustainability practices in the Himalayan region, the home of much of India's untapped hydro resources. In parallel, the Bank can also help strengthen the institutional foundation for the government's plans of scaling up development of 100,000-150,000 MW of India's renewable hydropower potential by 2030.

The Bank approved a US$ 400 million IBRD loan support to the Rampur Hydropower Project in September 2007 and the project is presently under implementation. The development objective of the project is: (i) to improve the reliability of India's Northern Electricity Grid through the addition of renewable, low carbon energy from the Rampur hydropower project; and (ii) to improve the effectiveness of Satluj Jal Vidyut Nigam Limited (SJVN) with respect to the preparation and safe implementation of economically, environmentally, and socially sustainable hydropower projects. The Vishnugad Pipalkoti and Luhri Hydro Electric Project are presently under preparation.

3. Description & Outputs of SAWI Activity

The primary objective of this grant financing is to identify, analyze and document good practice examples that recognize the environmental and related social practices in the hydropower sector in the South Asia region, across India, Nepal & Bhutan. The grant will finance the following activities:

(1) a study to identify the good practices in environmental management in hydro power projects in South Asia (Bhutan, Nepal and India) and the related social practices. The study will include desk research, site visits, discussions with project developers and to be followed by collation and analyses to determine the causal factors responsible for implementation of these good practices;

(2) Documentation on each of the identified and verified good practices, and potential for replication in upcoming hydropower projects in the region; and

(3) Initial dissemination of the good practice documentation.

4. Challenges & Next Steps

The work on the activity has started recently after completion of the procurement process. Overall there is no significant challenge/ risk related to the activity. One small risk is that the identified good practices may have marginal shortcomings, which might make it possible for critiques to question the practice itself. This, at best will be a dampener. This small risk will be mitigated by careful verification at site, as well as analysis to understand the causal factors. If no clear candidate good practice emerges from the

initial stage of the study, further work will concentrate on how to use the elements of good practices to construct a framework for designing and implementing true good practices. In terms of the next steps, the aim would be identify ways for scaling up this activity possibly, under a next phase and this will call for additional resources.

Activity Name: Regional Cooperation to Reducing Technical Barriers to Sustainable Hydropower Development in South Asia
TTL Name: Raghuveer Sharma
Other SAWI Team Members: Pravin Karki
Associate World Bank Project (if any): Not Applicable.

1. Background

The vast hydropower resources contained in the mountainous regions of South Asia are a potential solution to the region's chronic energy and water shortages, shortages which are an obstacle to individual countries achieving their growth potential and will be a constraint to sustaining the growth which countries have achieved. The hydropower potential of Pakistan, Nepal and Indian Himalayan mountains is estimated at 200,000-250,000 MW, equivalent to the total currently installed power generation capacity in the region (split as follows - India – 150,000 MW; Pakistan – 20,000 MW; Bangladesh – 5,000 MW; and Nepal – 650 MW). Of this potential, only about 20 percent has been developed (about 33,000 MW in India, 600 MW in Nepal and the balance mainly in Pakistan with a small amount in Afghanistan). Preliminary studies suggest that at least half of the remaining potential (about 100,000 MW) is economically viable and could be targeted for early development. To meet the energy demands, several countries in the region have designed ambitious hydropower development programs – India 50,000 MW by 2020 (doubling current hydro capacity), Nepal 10,000 MW by 2010 (compared to about 600 MW at present), and Pakistan 15,000 by 2015. In addition, Bhutan's Vision 2020 aims at total electrification by 2020. Hydropower also contributes to freshwater storage by collecting snowmelt and rainwater, which can then be used for drinking or irrigation. By storing water, aquifers are replenished and vulnerability to floods and droughts reduced.

This vast potential notwithstanding, there are several significant barriers to hydropower development in the Himalayas. These include: Social, Environmental, Financial and Technical. Of the technical challenges, three are the most significant – Geotechnical, Tunneling and Sediment Management.

2. Description of related World Bank Project (if applicable, or other donor/govt Project)

n/a

3. Description & Outputs of SAWI Activity

Report entitled "Regional Cooperation to Reducing Barrier to Sustainable Hydropower Development in South Asia"

4. Challenges & Next Steps

The report is now being finalized and related work on tunneling issues is being explored.

Activity Name: Ganges Strategic Basin Assessment (SBA)

TTL Name: Claudia Sadoff

Other SAWI Team Members: Nagaraja Rao Harshadeep, Sylvia Lee

Associate World Bank Project (if any): Not Applicable.

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1. Background

The Ganges is the most populous river basin in the world. It rises in the Himalayan border regions of China, Nepal and India and runs 2,500 km to Bangladesh and the sea. It is characterized by three unique natural features: monsoon rains, the Himalayan mountain range, and vast plains; it is a complex interplay of monsoonal runoff, glacier and snow melt, and groundwater resources.

The Ganges presents both great opportunities and great challenges for its 500 million inhabitants. The basin has vast hydropower and agricultural resources and provides important navigational services. But the river is destructive as well, devastating floods, for example, are routine. In addition, populations and water usages are growing and putting additional pressures on the river system, water quality is diminishing, and climate change is likely to intensify the monsoon, uncertainty and hydrological variability.

All countries in the basin benefit from the Ganges and suffer from its extremes. The best options for managing and developing the Ganges – for sustaining the river ecosystem, capturing its potential benefits and mitigating its mounting costs – would benefit from enhanced regional information systems to manage the variability of the Ganges.

2. Description of related World Bank Project (if applicable, or other donor/govt Project)

Early discussions are on-going on the development of a regionally inter-operable hydromet monitoring system.

3. Description & Outputs of SAWI Activity

The objective of the **Ganges Strategic Basin Assessment** is to build knowledge and to gain a better understanding of the dynamics of the Ganges River Basin from a regional perspective and to consider how current and future World Bank projects along the Ganges River might impact an upstream or downstream riparian.

The centerpiece of this regional research/technical assistance work will be the development of a set of nested hydrological and economic river basin models that will be used to examine alternative scenarios across a range of Ganges futures. The models will be used to examine alternative scenarios across a range of Ganges futures. The models could be used to reflect the development of various infrastructures on the river and different infrastructure operating rules, for example to maximize hydropower generation, maximize flood control, and/or ensure environmental flows; as well as climate shocks that would simulate both current levels of variability and future climate change.

Early results of the models suggest that ***upstream storage development (constructing dams in Nepal)***:

- ***Will reduce high flows (flood peaks) in tributaries rivers of the Ganges, but is unlikely to significantly reduce flood events in India or Bangladesh.*** The volume of flows that could be captured, even with full development of all of the largest known dam sites in Nepal, is only equivalent to about 10% of the annual Ganges River flow. In contrast, storage on the Murray-Darling in Australia (a system of comparable size) is about 150%, and on the Nile storage is equivalent to some 200% of annual flow. This means that the potential impact on high flows/flood peaks on the main stem of the Ganges would be negligible.

  Even within the tributaries, a decline in high flows/flood peaks would not directly diminish flooding. Most of the tributaries that would support large dams in Nepal are entirely embanked, and these embankments are virtually never over-topped. The immediate cause of most flood events are heavy rainfall in numerous, smaller unembanked tributaries simultaneously, and the failure (breach) of embankments on larger tributaries. The impact of upstream water storage even within tributaries is therefore much less valuable for flood control that is commonly believed.

- ***Will augment low flows to India and Bangladesh, but the best use of the additional flow is unclear*** Upstream dams can capture high flows in the wet season and release that water in the low season. The model suggests that low flows could be significantly enhanced, perhaps even doubled in the driest month or two each year. The values that could be derived from these enhanced low flows will depend on agricultural productivity (which is currently very low) and the value of ecosystem services including the buffering of salinity intrusion in the mouth of the river.

- ***Provide significant hydropower benefits to Nepal*** The models confirm the high value of hydropower benefits available in Nepal.

- ***Not help dilute water quality challenges in India*** The confluence of the rivers that could bring significantly enhanced low flows into the Ganges system lie downstream of the highly polluted stretches of the river in India.

The impact of climate change in the basin remains very unclear. While the 23 Global Circulation Models (GCM) agree that temperature will likely increase in the basin, they do not agree on the direction of precipitation change.

Some ***possible policy implications*** of the model results include:

- Explore soft options to address flooding, including real time hydromet and early warning systems
- Encourage planned conjunctive use of surface and ground water in Eastern Uttar Pradesh & Bihar
- Improve on the climate change knowledge and data gap

An initial set of consultations were held in Bangladesh, India and Nepal in August 2010. Although some of the results were surprising, there was keen interest and support for the Ganges SBA.

- **In Nepal,** participants were hesitant to fully accept the results as they differed markedly the conventional wisdom, but felt that flood monitoring and forecasting activities should begin immediately.

- **In Bangladesh,** there was general acceptance of the results and strong interest in championing efforts toward regional hydromet and flood early warning systems.

- **In India**, the team was unable to meet with government representatives because DEA declined to grant clearance.

4. Challenges & Next Steps

The main challenges in the Ganges Basin are long-standing, and deep rooted suspicions and sensitivities with regard to transboundary issues remain. During the dissemination phase of the Ganges SBA, the team plans to have an extensive program to discuss the details of the models with relevant stakeholders, including technical staff who may be interested in delving into the modeling details.

- **Through December:** Finalize Study
- **December 2010:** Expert Group Meeting
- **January 2011:** Decision Meeting
- **Spring 2011** Dissemination Phase

Activity Name: Social Dimensions of Climate Change in the Ganges Basin

Team Leader: Bhuvan Bhatnagar

Other SAWI Team Members: Anna O'Donnell, Teresa Serra

Associated World Bank Project (if any): n/a

1. Background

The Ganges River Basin covers an area as large and as geographically varied as South America, and spans four countries: rising in the Himalayan border regions of China and Nepal, and running 2,500 km through India into Bangladesh to the Bay of Bengal. The Ganges River is a monsoon river system; around 80 percent of the annual precipitation in the Basin occurs in three short months—from July through September—and the timing and intensity of this rainfall combines with glacial runoffs from the Himalayas to recharge aquifers and groundwater complete eco-hydrological cycles, revive fish populations, sustain biodiversity, and feed agricultural production. However, the timing of these events is in delicate balance with human needs, and slight variations in river flows can be destructive, causing devastating floods, or long periods of drought. The impacts of this variability on the over 400 million people of the Ganges Basin are diverse, depending in part on physical location and exposure to extreme events. But everywhere in the Basin, these impacts are also embedded in social structures and institutions, with the poor and socially marginalized facing the greatest risk to water variability, and with the least recourse to recovery.

In addition to the high levels of variability that exist, global climate change models estimate that the region's average annual temperature will rise from 2.3 C to 4.8 C (depending on location) between 1980 and 2040. This is expected to lead to more erratic weather patterns, including rainfall, which could increase frequency and intensity of floods and droughts in the region. In addition, sea level rise and extreme weather events like cyclones and floods compound the development challenges of the Sundarbans, which is the largest single mangrove system in the world. The increasing volatility and unpredictability of rainfall and weather events are expected to exacerbate the deterioration of livelihoods in the Basin, with a particularly detrimental effect on those living below the poverty line and who are otherwise socially vulnerable.

In order to better understand the human dimension to water variability in the Ganges Basin, the South Asia Region's Social Development unit has initiated a multi-year study that aims to provide key inputs in the short term to ongoing Bank work, as well as to provide an overview of how key social vulnerabilities intersect with physical vulnerabilities in the Basin. This work focuses on five key themes: (i) equity, inclusion/exclusion; (ii) displacement and conflict; (iii) impact mitigation/compensation; (iv) the relevance of social capital at the local level; and (v) the effectiveness and accountability (i.e., the governance) of public sector programs. The first two themes relate predominantly to social impacts, while the latter three are about responses. The Ganges SDCC Program uses these themes to contribute

to better understanding the social implications of changes in water variability within the Ganges River Basin.

2. Description of related World Bank Project (if applicable, or other donor/govt Project)

As a follow up to the recent World Bank South Asia Region's Regional Climate Change Shared Principles Paper, the Social Development Unit established a multi-year initiative to better understand the social dimensions of climate change, and to contribute to ongoing World Bank projects and analytical work by elucidating the social dimensions of climate vulnerable sectors, most notably the water sector. In the first phase of this work, the Social Dimensions of Climate Change program will focus on identifying the human dimension of water variability in the Ganges Basin through micro-level quantitative and qualitative analysis in key sites along the Ganges Basin that will be complemented by a Basin level desk review of relevant studies and papers, and work done by other donors, as well as governments and local NGOs. Thus, the analytical work completed in the next two years as a part of the broader Social Dimensions of Climate Change program will look for key themes and commonalities with respect to the social dimensions of water variability in the Ganges Basin as whole.

However, in the short term, the outputs of various aspects of the analytical work will also feed directly to ongoing analytical and operational work in the region. For example, qualitative and quantitative work in the Sunderbans (in both West Bengal and Bangladesh) will coordinate closely with and contribute to ongoing Non-Lending Technical Assistance programs (Climate Change Adaptation, Biodiversity Conservation and Socio-Economic Sustainable Development for the Sundarbans Area of Bangladesh and the Climate Change Adaptation, Biodiversity Conservation and Socio-Economic Sustainable Development for the Sundarbans Area of India) on both sides of the border that aim to develop a comprehensive socio-economic and biodiversity development program that recognizes the inter-linkages of the Sunderbans to both countries.

Micro-level analysis and fieldwork in the state of Bihar as well as in the cities of Allahabad and Kanpur is also expected to contribute to informing the design of programs under the Bihar Rural Livelihoods Project ("Jeevika") as well as the National Ganga Clean Up Project, respectively. Analysis done in both flood- and drought-prone areas of Bihar will provide information and recommendations on introducing coordinated community-based adaptation initiatives under ongoing project assistance. In Allahabad and Kanpur, interviews conducted with focus groups and key informants in these sites have been provided to the task team to better inform a communication and outreach program for a project that will address issues of pollution in one of the holiest stretches of the Ganges.

Finally, the results of the micro-level analysis will also inform the broader Ganges Strategic Basin Assessment by (i) providing a human dimension to understanding the impacts of water variability in the Basin; (ii) identifying key intersections of poverty and water variability; (iii) mapping how households currently respond to floods and low flows in the Ganges Basin; (iv) shedding light on the effectiveness of public sector strategies in response to water variability events; and (v) raising awareness of and better understanding the social implications of projected changes in water availability.

3. Description & Outputs of SAWI Activity

The main objective of this grant is to support analytical work on the social dimensions of water variability in the Ganges Basin. This analytical work aims to develop a better understanding of (i) the potential social impacts of hydrology regimes and local economic conditions – whether resulting from policy/investment decisions or climate variability/change – and (ii) the effectiveness of current coping and adaptation strategies, at household and community levels, with a particular focus on early warning systems and other community-based measures.

To date, the SAWI trust fund has assisted in the delivery of the following:

(1) The design of micro-level analysis in the Ganges Basin to investigate the social dimensions of flood, drought, low flows, water quality issues and salinity intrusion in the Basin. The aim of this work is to establish themes and commonalities in understanding how physical vulnerabilities are embedded within key social institutions, as well as how "soft" responses (both coping and adaptation initiatives), most notably community-based early warning systems, could be strengthened. The data collection for this analysis has already begun, and has been completed in flood and drought prone areas of Bihar (Madhubani, Muzzafarpur, Kosi area for floods, and Gaya for drought), as well as in the Sunderbans area of India (state of West Bengal) and on the topic of water quality in Allahabad and Kanpur. Additional fieldwork is ongoing or planned in the drought-prone area of Rajshahi-Godagari Upazila in Bangladesh, the flood prone area of Rajbani Upazila in Bangladesh, as well as the Bangladesh Sunderbans area.

(2) The targeted design of project-specific recommendations for ongoing analytical and operational work in the World Bank. These briefs are based on the field work conducted or to be conducted) and highlight key social dimensions and issues that are relevant to the project's design.

4. Challenges & Next Steps

The overriding challenge to this work has been to demonstrate the value of addressing key social concerns in the Basin in a systematic and holistic way. The SAWI funding has been instrumental in providing the means for sound and comprehensive analytical work to be done on the social dimensions of water variability and quality on a Basin level that demonstrates the utility and necessity of including the social perspectives in regional water agendas. By looking at the social dimensions on a Basin level, this study intrinsically recognizes the linkages that people in different countries have in accessing and using a shared river system. Continued support for this work would allow for the analytical work to be completed, including all of the micro-analysis in Bangladesh, as well as a further site, tentatively planned for Nepal. The analytical work will not only continue to contribute to ongoing technical assistance and operational work in the region, but will also highlight key lessons learned from other countries in the region, specifically on the topic of early warning systems and community-based adaptation ideas that could be shared on a cross-national platform.

Activity Name: Institutional Development for the National Ganga River Basin Program in India

Team Leader: Sanjay Pahuja

Other SAWI Team Members: Genevieve Connors

Associated World Bank Project (if any): The National Ganga River Basin Project

1. Background

The river Ganga has significant economic, environmental, and cultural value in India. Rising in the Himalayas and flowing into the Bay of Bengal, the river traverses a course of more than 2,500 km through the plains of north and eastern India. The Ganga basin (which also extends into parts of Nepal, China and Bangladesh) accounts for 26 percent of India's landmass, 30 percent of its water resources, and more than 40 percent of its population. In addition, the Ganga is one of India's holiest rivers and has a cultural and spiritual significance that far transcends the boundaries of the basin.

The Ganga river is under extreme pollution pressures and faces significant threats to its biodiversity, environmental sustainability, and both the quantity and quality of its flows. Due to increasing population in the basin and poor management of urbanization and industrial growth, river water quality has significantly deteriorated, particularly in the dry season. The primary sources of pollution are untreated sewage and industrial wastewater. At present, only one-third of the sewage generated in the main-stem towns and cities is treated before being discharged into the river. While the immediate cause is the inadequacy of wastewater collection and treatment infrastructure, the issue is intrinsically linked to poor management of water supply and sanitation at the level of Urban Local Bodies. Almost one-fourth of the pollution load in the Ganga is estimated to be of industrial origin, where the key problems are inadequate capacity for treating industrial wastewater and the poor state of the pollution monitoring and regulation institutions. Non-point source pollution from agriculture and livestock as well as poor solid waste management also contributes to pollution. In addition, substantial abstraction of water, primarily for irrigation, has led to low flows and associated poor water quality in the critical middle stretch of the river. The Ganga basin now accounts for 40% of all polluted river length of India.

To address these issues, the Government of India established the National Ganga River Basin Authority (NGRBA) in February 2009 by notification under the Environment (Protection) Act of 1986. It was created in view of the urgent and stated need to: (1) ensure pollution abatement in the Ganga by adopting a river basin approach, and (2) maintain minimum ecological flows. The Authority is chaired by the Prime Minister and consists of Ministers from the Central Government, Chief Ministers of the 5 primary basin states (i.e. Uttarakhand, Uttar Pradesh, Bihar, Jharkhand, and West Bengal), and 9 non-official members from the academic community and civil society who experts in related fields. The Authority combines regulatory and development functions and has the potential to be a transformative institution for true multi-sectoral river basin management and quality and quantity improvements in the Ganga basin.

2. Description of related World Bank Project (if applicable, or other donor/govt Project)

In June 2009, the World Bank received a formal request from the Government of India to support the new Ganga program under the aegis of the Ministry of Environment and Forests (MOEF). The Bank has committed to supporting the GoI in moving this important agenda over the long–term, including building and strengthening the NGRBA into a world-class executive. Since then, the MOEF and the World Bank have been working closely together in the preparation of a possible project to support NGRBA and related priority investments designed to meet the objective of no discharge of untreated municipal and industrial water into the Ganga by 2020 ("Mission Clean Ganga"). The proposed project will likely be the first in a series of World Bank operations comprising long-term and programmatic support for the NGRBA program. The NGRBA program will need to be structured and phased over time so as to optimally balance investments with institutional development and reform, while maximizing water quality gains.

The Development Objectives of the proposed Project are: (i) to establish and operationalize central and state level NGRBA institutions, capable of planning and implementing a multi-sectoral river water quality improvement program in a basin context; *and* (ii) to reduce pollution loads into the river in selected investment locations.

The key indicators of project success will be:

- Central and state-level NGRBA institutions established and operational;
- Design of the long-term and comprehensive NGRBA program; and
- Reduction of pollution loads entering the river.

3. Description & Outputs of SAWI Activity

The main objective of this Grant is to support the Government of India in delivering a well structured National Ganga River Basin Program, and in particular to support the analytical work on institutional development needed to improve the resilience and engagement of the program.

In particular, the SAWI Trust Fund has supported the delivery of two specific activities:

(1) A workshop on the "Global Experiences with River Cleaning and Basin Management" held in New Delhi in April 2010, and co-hosted by the Ministry of Environment. The aim was to share experiences from international rivers, including Indian rivers, that have been successfully cleaned or improved, and to engage a wide array of stakeholders in discussion on these issues. Speakers were brought from the Sabarmati River in Ahmadabad, the San Antonio River in Texas, and the Murray Darling in Australia. Participants and Panelists also included members of Central Government and of the five basin states, and key engaged members of civil society, including the 9 expert members of the NGRBA. The Minister of Environment inaugurated the workshop.

(2) A targeted TA program on institutional development, including the services of consultants hired as experts on river basin management, on Indian bureaucracy, government workings, and institutional design who can advise on these issues.

4. Challenges & Next Steps

Engaging with the Government on a major basin management and clean-up program is extremely complex, particularly when operating in a new institutional environment. SAWI funding has been instrumental in enabling the Bank to engage on these difficult issues and on the creation of new institutions, which will when established be transformative in scope. No basin organization of this scale exists in India today, much less for an international South Asian river. However, in the years ahead, more work will needed to support the operational units of the NGRBA at both the Center and in the Basin States, and it must be recognized that these institutional reform efforts take time, often many years. Immediate next steps include continuing the technical assistance and support for the creation of the NGRBA basin organization and dissemination of global knowledge and best practice, including for example through study tours of key decision-makers to similar rivers and appropriate clean-up initiatives, like the Danube and the Rhine in Europe.

Activity Name: Study and Technical Assistance Initiative on Groundwater Management in India

Team Leader: Sanjay Pahuja

Other SAWI Team Members: n/a

Associated World Bank Project (if any): n/a

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1. Background

India is the largest groundwater user in the world, accounting for more than a quarter of the global groundwater abstraction. More than 60 percent of irrigated agriculture in the country is dependent on groundwater, with the crop water productivity of groundwater-irrigated farms being almost twice that of surface water-irrigated farms. The significance of groundwater for domestic water supplies is similarly marked, with 85 percent of the rural water supply schemes in India relying on groundwater sources. Groundwater is therefore vital for poverty reduction and economic growth in India, with a large fraction of the population relying on the resource directly or indirectly for livelihoods. There has been a phenomenal growth in the exploitation of groundwater over the last 4 decades, largely through the construction of millions of private wells, aided by cheap drilling and pump set technologies, as well as public subsidies for electricity. However, aquifers in many parts of the country are now reaching unsustainable levels of exploitation, and continued overexploitation of groundwater will have serious social and economic consequences for the country.

2. Description of related World Bank Project (if applicable, or other donor/govt Project)

The World Bank Study and Technical Assistance Initiative on Groundwater Management in India was conceived with two main objectives: (a) To identify management strategies for promoting sustainable groundwater use in India, within a systematic, economically sound, and politically feasible framework; and (b) To provide focused technical support for enhancing the outcomes of groundwater management interventions under the World Bank-financed projects in participating states. It was recognized that the conventional command-and-control approaches as well as the classically prescribed economic approaches were impracticable for managing groundwater overexploitation in India, due to sheer scale of the problem, and the political sensitivities attached to it. Attention was therefore focused on developing a "Plan B", involving pursuit of pragmatic approaches that could make incremental improvements largely within the existing institutional framework, building political support for gradual and realistic institutional improvements at higher levels by first demonstrating successful interventions at local level.

The initiative was conducted from 2006-2009.

3. Description & Outputs of SAWI Activity

The SAWI support was instrumental in organizing technical and policy working sessions at various stages of the initiative, to discuss the emerging results and their implications. Two technical working sessions were organized with the groundwater and water resources departments of the participating Indian states, where the physical basis of findings were discussed and assessed for their relevance in various different groundwater settings of India. A senior policy working session was organized in the end, convened by the Secretary (Water Resources) of the Government of India, and chaired by the Member (Water), Planning Commission of India. The working sessions assessed the policy implications of the emerging findings and the political feasibility of the recommendations. Given the significant departure implied by the study findings from the traditional approaches recommended for groundwater management, these sessions provided the team with the opportunity to ensure that the study recommendations would be pragmatic, implementable and effective. These working sessions also were part of the capacity-building and dissemination strategy, with the participation of technical staff of the state groundwater management agencies, as well as senior state and central government officials charged with policy development and implementation of groundwater management programs in India.

4. Challenges & Next Steps

The report was launched in March 2010, with significant appreciation of central and state governments as well as broader set of stakeholders. India's Union Minister of Water Resources reading and personally launching the report is a sign of the government's support of its findings. The report and its preceding engagement had a significant impact on policy and action in state governments – with Andhra Pradesh funding replication and scaling-up of community management models recommended by the report; Punjab and Uttar Pradesh commencing separation of agricultural power feeders; and Govt of India's Department of Rural Water Supply preparing a multi-district program to replicate the groundwater management approaches for ensuring drinking water security. The report has also influenced global discourse on groundwater management, with coverage in the World Development Report, The Economist, Wall Street Journal (India edition) and numerous Indian publications.

The key challenge lies in the fact that the pragmatic solutions to groundwater management comprise varying set of interventions in multiple sectors, and are therefore not amenable to either typical centrally-funded or externally assisted programs. Addressing the needs of management therefore requires continued dialogue and engagement with state-level leadership, and this is also proved by the gains of the above initiative. The activity is now formally closed, and the challenge would be devise a mechanism for providing technical assistance and advisory support to the states which are continuing their requests for the same.

Activity Name: Improving water quality in the Dhaka watershed – promoting environmentally friendly practices in the textile industry through the global supply chain.

TTL Name: Catherine Tovey

Other SAWI Team Members: Siet Meijer, Pratibha Mistry, Khawaja Minnatullah, Shahpar Selim

Associate World Bank Project (if any): Dhaka Environment and Water (DEW) project

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1. Background

The Ganges-Brahmaputra-Meghna is one of the largest river basin in world and is home to 500 million people. In addition to periodic floods and droughts, this mighty river and its distributaries also face an increasingly severe degradation of the quality of these water resources due to dense population, increased urbanization and industrialization.

The capital city of Dhaka, Bangladesh, is of these water quality hot-spots. Greater Dhaka has a population of over 12 million people which is expected to double by the year 2025. It has also faced rapid industrialization and is Bangladesh's engine of growth, accounting for 40 percent of Bangladesh's GDP.

Untreated domestic and industrial effluent has resulted in severe environmental degradation of the Buri-ganga and 4 other rivers which flow through the Greater Dhaka area, and is also putting groundwater resources at risk. Surface water bodies, including rivers, canals and ponds, have very low oxygen levels which reflect the breakdown of organic waste, from both domestic sewage and chemical residues from industry. Shallow aquifers are showing signs of contamination by chemicals (mainly heavy metals) and dissolved solids, strongly indicating contamination from industrial sources. This environmental degradation threatens in turn ecosystem services, fisheries, agricultural productivity and economic growth.

A pollution assessment of the Dhaka watershed carried out by the Institute of Water Modeling in 2007 found that approximately 40 percent of the pollutant load in the Dhaka watershed is of domestic origin and 60 percent is from industrial sources. Over 7,000 industrial units produce more than 1.3 million m^3 of heavily polluted industrial wastewater daily from mainly textile, pharmaceutical, and tannery industries, which enters the drainage and river system without treatment.

While Bangladesh has a reasonably well developed set of environmental policies and legislations that provide a regulatory framework for industrial pollution control, the existing legislative and regulatory environment has failed to address growing industrial pollution concerns in part due to lack of enforcement and institutional inefficiencies. Given these institutional and governance constraints, the Government of Bangladesh is keen to promote a more pragmatic approach to tackling industrial pollution in the Dhaka watershed by combining its traditional command and control measures with

more innovative market based incentives to encourage industries to adopt pollution prevention and abatement practices.

The promotion of cleaner production measures offers one such promising market based incentive. Cleaner Production (CP) simultaneously promotes the continuous improvement of industrial processes, products and services while reducing water pollution / energy consumption at source. Moreover, a number of key pollution hot-spots areas in the Dhaka watershed have a significant proportion of industries which are linked to the global apparel supply chain, notably the highly polluting washing, dyeing and textile industries, where the bulk of production is destined for export to the North American, East Asian and the EU markets. International buyers for many of the leading apparel brands which actively source from Bangladesh (including Gap, Levis, H&M, Wal-Mart and Li and Fung) are increasingly concerned about "threats to brand" derived from rising consumer concerns regarding poor environmental standards and decreasing ability to control quality over complex supply chains. In order to safeguard against "threats to brand", the multinational corporations are looking for ways to promote better environmental compliance throughout their supply chains by establishing new buyer guidelines and monitoring further down their supply chains. They are particularly interested in improving the overall water quality in general and promoting cleaner production processes in particular.

The Government of Bangladesh (GoB) has expressed a specific interest in promoting green growth/environmental best practices in the textile industry by replicating the highly innovative China Responsible Sourcing Initiative led by the Natural Resources Defense Council (NRDC), an NGO based in the US, in partnership with multinational corporations (Wal-Mart, H&M, GAP and Li Fung) and local textile producing factories. ,

2. Description of related World Bank Project (if applicable, or other donor/govt Project)

The Dhaka Environment and Water Project, which will be presented to the Bank's Board end December 2010, is a 100 million USD IDA credit whose objective is to support the Government of Bangladesh develop an effective, sustainable and replicable model to reduce industrial water pollution in the Dhaka watershed. The project is housed under the Ministry of Environment and Forests, and is jointly implemented by the Department of Environment (DOE) and the Local Government Engineering Department (LGED).

The project has 3 components. Component 1 (USD 6.8 million) provides technical assistance to DOE to enhance its water pollution monitoring and environmental compliance. Component 2 (USD 48.9 million) seeks to support up to 1000 highly polluting textile factories in 3 industrial hot-spots in the Greater Dhaka area adopt cleaner production measures which help reduce pollution at source (including reduced chemicals, water and wastewater). This component will be carried out in close collaboration with leading international apparel brands as part of the SAWI supported Bangladesh Responsible Sourcing Initiative (see below). Component 3 (USD 32.8 USD) will finance the design, construction and operationalization of a Common Effluent Treatment Plant under an innovative public-private partnership model bringing together the Government, private operator and local factories/industrial associations.

3. Description & Outputs of SAWI Activity

Through its *Improving water quality in the Dhaka watershed* activity, SAWI funds are being used to co-finance a 500,000 USD World Bank Bangladesh Responsible Sourcing Non-Lending Technical Assistance (NLTA). The Bangladesh *Responsible Sourcing Initiative for the Textile Industry NLTA seeks* to promote cleaner production and pollution prevention in Bangladesh's textile industry, by simultaneously reducing the environmental impacts associated with industrial pollution in local watersheds and increasing the economic access to key global markets.

This activity, which has been formally requested by the Government of Bangladesh, will be jointly implemented by the World Bank, the IFC and the NRDC.

The objective of this activity is to encourage the Bangladeshi textile industry to adopt less polluting (and energy efficient) cleaner production processes through new partnerships between the suppliers of major multi-national apparel retailers and brands, Bangladeshi textile industry trade associations, and the Government of Bangladesh (GoB). This objective will be achieved through implementation of the following activities:

1. Survey 30 textile mills in Greater Dhaka to assess "typical" operations in Bangladesh [*completed*];
2. Detailed pollution prevention/energy efficiency audits and reports of findings for 5 of these local textile mills [*October-December 2010*];
3. Best practice report for Bangladesh textile industry that highlights key opportunities for reduced water pollution/green growth and provides estimate of cost and returns of each option; [*October-December 2010*];
4. Multi-stakeholder workshop in Dhaka to review and discuss RSI approach and findings with mills, senior management from selected MNCs, government and donors [*early 2011*]
5. Implementation of a communications campaign targeting textile factories and business associations [*mid 2011*];
6. Recommendations to MNCs on purchasing guidelines to require better water, chemical and energy efficiency in their supply chain [*mid 2011*];
7. Additional recommendations to MNCs to develop strategy to promote better water resources management awareness and practices (including calculation of water footprint) as a core part of their CSR internally and with their local supply chain [*on-going*]

4. Challenges & Next Steps

Next steps:

In 2011, the objective is to implement and complete the above Bangladesh RSI activity. Depending on achievements and demand, the RSI may be scaled up both within Bangladesh and beyond.

Several leading multi-national buyers are keen to expand their involvement beyond reducing water pollution through cleaner production – and are looking for opportunities for supporting better water resources management practices overall. SAWI's involvement will ensure that the broader water resources dimensions are kept at the forefront.

Moreover, SAWI's regional perspective will also help support the scaling up of this RSI initiative beyond Bangladesh. Textiles/leather production and attendant water quality issues are not confined to Bangladesh. Major buyers under the NRDC are also highly active in several other South (and East) Asian countries, notably India. These buyers are also very active in Pakistan further up the supply chain – with regards to cotton, and particularly organic cotton production – where once again the water footprint is very high (2000 liters of water for 1 T-shirt).

Activity Name: Bangladesh Rivers Information Project (BRIC)

TTL Name: Catherine Tovey

Other SAWI Team Members: Khawaja Minnatullah; Pratibha Mistry, Siet Meijer; Poonam Pillai

Associate World Bank Project (if any): Bangladesh Rivers Information Project (BRIC)

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1. Background

A country shaped by rivers. Water plays a significant role in every aspect of Bangladesh's economy. Bangladesh's 310 rivers constitute the lifeline for this densely populated landmass (1,200 inhabitants per square kilometers). Around 1,200 km^3 of freshwater flows through these rivers every year. During the monsoon, up to 70% of Bangladesh's mostly low-lying delta is highly prone to flooding. Yet behind this apparent abundance hides tremendous variability.

From abundance to scarcity: managing spatial and temporal variability. Although Bangladesh receives considerable freshwater, over 95% of all flows are concentrated in just three rivers - the Ganges, Brahmaputra and Meghna. Most of the water flows within just 5 months of the year, with limited infrastructure and space to store the water for the long dry season. These mighty rivers also carry heavy silt loads which clog distributaries and reduce fresh water availability during the dry-season. Both surface and groundwater water availability are further reduced through declining water quality in many areas. In the coastal belt, low flows and storm surges are resulting in increased saline intrusion, whilst urbanized areas are increasingly contaminated with anthropogenic pollution sources from domestic and industrial waste. Combined, this hydrological variability presents considerable water resource management challenges, which will only be exacerbated by climate change.

Bringing Bangladesh's hydrology network into the digital era. Bangladesh's existing hydrology network is ill-equipped to manage one of the most complex river systems in the world. Most of its hydrology network was established back in 1960-1980, with support from development partners. There has been little upgrading since. The overall network remains manually operated with old and poorly maintained equipment. This limits the ability of the BWDB to effectively provide reliable information to various stakeholders. To meet the tremendous challenge of managing its rivers in the 21st century, the existing hydrological network needs to be entirely modernized, optimized and automated in an integrated platform which directly builds onto the Government's *Digital Bangladesh* agenda.

Improving data collection and management to better support a comprehensive national water information system. There are currently more than 35 institutions across Bangladesh dealing with data

collection and monitoring. This makes it harder to process and disseminate relevant, accurate and just-in-time information to support the needs of decision-makers and other users alike. The mandating by the Government of Bangladesh of the Water Resources Planning Organization (WARPO) as custodians of a National Water Resources Database is an important first step. However, the primary data inputted into the database are not always reliable and suffer from extensive collection and processing time-lags. Since a large proportion of the dynamic time-series water data available to the national water resources database is collected by BWDB, the modernization of BWDB's hydrology data collection and processing will in itself be an important first step in enhancing the quality of the national database.

Water challenges impact heavily on the development agenda particularly in the Southwest Region. Bangladesh's economy is highly dependent on, and vulnerable to, the country's extremely variable water resources. The silting up of the Gorai River, the last remaining major channel in the Southwest, underscores the consequences of river sedimentation - with the livelihoods of 40 million people under threat due to lack of fresh and reliable water. Yet the Gorai proposed activities are not new in terms of the scope of water resources development in Bangladesh. Substantive feasibility studies were carried out ten years ago. However, those activities were not implemented due to divergence between the incoming and outgoing ruling parties, notably regarding the relative merits between the restoration of the Gorai and the construction of a full-fledged Ganges Barrage. Following this impasse, the situation in the Gorai and its dependant areas have worsened with increased sedimentation and salinity, threatening the living conditions of people, reducing economic opportunity and increasing the ecosystem fragility particularly on the sundarbans. Indeed, feasibility studies have shown that dry season low flows can be significantly increased through a sequenced intervention initiated with capital dredging works; followed by the construction of flow diversion and erosion protection structures at the mouth of the Gorai, and finally supplemented by continued (lower-level) maintenance dredging. There is now a renewed interest in government for restoring the Gorai, which offers a window of opportunity for action. Indeed, sustained and widespread benefits to the local people and ecosystems can be achieved by embedding these works within a broader long-term integrated basin planning framework, while maximizing the linkages and synergies with other regional initiatives in the Southwest, notably the construction of the Padma Bridge which will provide a direct road link from this cut-off region to the capital Dhaka. To achieve this, sound institutions overseeing the Gorai Basin will be necessary to support this integrated planning process, and will need to be gradually strengthened through a phased and long-term commitment.

Strengthening water institutions for better water resources management. Better infrastructure and hydrological equipment alone will not adequately respond to Bangladesh's considerable water resources management challenges unless the appropriate financial, human resources, accountability and decision-making systems are strengthened. Actions to enhance the incentives and performance of water institutions, including the identification of institutional shortcomings within line agencies, notably the BWDB, and the removal of existing barriers for their effective performance, would be much needed. Human resources and capacity gaps within the BWDB are a particular concern. Around 50% of posts remain unfilled, a situation that will only be exacerbated by the current wave of retiring staff. Adequate

replacements are often unavailable, with young and talented engineers lacking incentives to join and/or build careers as civil servants. A careful consideration of strategic staffing options and incentives will be required to ensure that this emerging generation gap does not threaten the effective management of Bangladesh's water resources.

Pursuing a parallel national and regional water resources management agenda. Given Bangladesh's situation as the lowest riparian country, occupying only 7% of the Ganges-Brahmaputra-Meghna river basin and receiving water from 57 international rivers, it inevitably faces numerous challenges associated with the greater watershed beyond its borders. In the long-term, achieving sustainable water resources management will require enhanced regional cooperation with riparian countries. However, this must be balanced against critical short-term needs. The GoB is therefore seeking to adopt a two pronged strategy; focused on short-term concrete actions at the national level combined with on-going discussions with riparian countries bilaterally and through regional platforms such as the Abu Dhabi Dialogue.

2. Description of related World Bank Project (if applicable, or other donor/govt Project)

In 2009, the World Bank received a formal request from the Government of Bangladesh to address national water resources issues within Bangladesh in an integrated manner. This request led to the preparation of the Bangladesh Rivers Information and Conservation Project. The project concept note for this proposed 180 million USD IDA credits was approved in March 2010 and is due to go to the Board in 2011. The project will be implemented by the Bangladesh Water Development Board.

The project objective is to help the Government of Bangladesh modernize its hydrology network and restore the productivity of the Gorai river systems. The project objectives will be achieved through the five following intermediate outcomes:

- Installation of modern tools and instruments to better monitor information and collect real time data on its rivers network;
- Consolidation of state-of-the-art knowledge on water resources information, planning and development through training and capacity building programs for targeted water resources institutions (Gorai River and Hydrology Units);
- Effective increase of flow availability on the Gorai through construction of required water infrastructure (flow divider, Gorai guide bundh and river training works);
- Increase of activities through a restored Gorai river system thus bringing potential benefits to stakeholders and contributing to the revitalization of the Southwest region;
- Operational flood early warning system with an effective dissemination of information to stakeholders leading to saving of lives and properties.

3. Description & Outputs of SAWI Activity

SAWI funds were used to put an expert team in place to shape the initial design. The Project Concept Note review was successfully completed in March 2010. The Requests for Proposals for the major feasibility studies have all been completed. Firms have been identified, and the 3 major studies are expected to be launched in October / November 2010.

4. Challenges & Next Steps

Next Steps: The preparatory studies will be completed by spring 2011, at which point an internal Quality Enhancement Review will take place. The project is expected to go to the Board by end 2011.

Challenges & opportunities: Although the BRIC project is national in focus, it also has a strong regional dimension.

(i) The BRIC team will work closely with the Ganges Strategic Basin Assessment team to review, under different scenarios, the economic costs and benefits of increasing dry-season flows in the Ganges at the mouth of the Gorai. This will also help formulate long term sustainable development options for the 40 million inhabitants of the Ganges Dependent Areas and the vulnerable Sundarband mangrove forests in the context of less predictable/plentiful dry season flows in the Ganges and its distributaries.

(ii) The BRIC team will also work closely with national and forthcoming regional hydromet projects, to ensure opportunistic (i) sharing of lessons learned in terms of upgrading hydromet networks and early warning systems, including at community level; (ii) harmonization of equipment and protocols and (iii) knowledge sharing and enhanced cooperation amongst counterparts.

Activity Name: Water Resources and Climate Change Activities in Nepal

TTL Name: Claudia Sadoff

Other SAWI Team Members: Stephanie Borsboom, Sylvia Lee

Associate World Bank Project (if any): Not Applicable

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1. Background

Nepal has one of the most unique geographies in the world, with an altitude of 70 m to the top of the world at 8,848 m in the span of less than 250 km. With such extreme geography, communities are often isolated and large variation in micro climates exist. With over 6,000 rivers flowing through Nepal, water resources present a valuable, yet untapped potential for economic growth and development. To date, only 1% of hydropower potential is developed and 40% of agriculture is irrigated. Climate variability and food security remains a constant challenge faced by Nepal. There are also severe municipal water scarcity and water quality concerns in Kathmandu and across the country. Climate change will add even more uncertainty to an already difficult situation.

With good water resource management and strategic infrastructure in place, Nepal can play a unique role in the region to provide "clean" energy source for Nepal and for export in the region, and can help alleviate some of the climate variability and food security challenges. The SAWI funded water resources and climate change program in Nepal aims to build capacity and knowledge with government stakeholders in water resources management and to advocate for mountain issues in global platform.

2. Description of related World Bank Project (if applicable, or other donor/govt Project)

N/A

3. Description & Outputs of SAWI Activity

<u>Water Resources Knowledge Base (GIS)</u>

WECS had requested the World Bank to support the development of a GIS-based spatial knowledge base of water resources in Nepal. This would facilitate rapid access to key data and information for improved understanding of water supplies and demands, risks and opportunities in the basins of Nepal. This will serve as a useful tool for decision-support as well as an advocacy tool for WECS to use in communicating

with the many stakeholders inside and outside government who need to understand the opportunities and weigh the trade-offs inherent in water resources development. A consulting firm was contracted and started their work in April 2010. The initial results of their work were presented during a workshop in Kathmandu in August 2010. The participants included a wide range of stakeholders. The initial results of the work demonstrated the knowledge base's great potential. WECS and the consultancy firm are planning for the final dissemination at the end of November 2010.

River Basin Modeling Capacity Building

The Water and Energy Commission Secretariat (WECS), the government body mandated to implement river basin management and to guard against conflicting uses of water within basins, has requested World Bank support for capacity building in river basin modeling. This is because WECS largely has no capacity to model basin-wide flows and withdrawals and therefore cannot easily assess how best to allocate water where there are competing demands. SAWI delivered a two-part course for key staff from WECS and other relevant government agencies in August/September and November 2009. The output of the course will not only be trained staff, but also two functioning basin models, the Babai and the West Rapti.

Workshop of Transboundary Water and International Law

Based on the mandate provided by the Government of Nepal, a Transboundary Water Cell has been established in the Water and Energy Commission Secretariat (WECS) to serve as the Government of Nepal's focal point for transboundary waters. SAWI supported a workshop on Transboundary Water Management and International Law held on June 7, 2010. Over 30 participants from different Ministries participated in this workshop focusing on Nepal's international rivers treaties. The main objectives of the workshop were to familiarize the participants with the history of international rivers treaties and international water law, the norms and common practices of international river negotiations and the relevant lessons for Nepal.

Summiteers Summit to Save the Himalayas

The Government of Nepal, with support from SAWI, hosted the *Summiteers Summit to Save the Himalayas* in Copenhagen as a Side Event to the UNFCCC's COP15 Meeting and to mark International Mountain Day. Himalayan summiteers gathered to raise awareness of the challenges faced by high mountains – where temperatures are rising fastest – in the context of climate change.

This event followed in the spirit of the Kathmandu to Copenhagen Conference, supported by SAWI August 31-September 2, 2009 and reported in the previous annual report, which was the first Ministerial-Level conference on climate change in South Asia. Following this event, the Prime Minister of Nepal announced the launch of the Mountain Initiative.

Mountain Initiative

Following the successful Kathmandu to Copenhagen Conference and the Summiteers' Summit to Save the Himalayas, the Prime Minister of Nepal continued to advocate for the needs of high mountain states in the global climate change discussions.

Since COP15 the Mountain Initiative has delivered two well-received side events at the UNFCCC meetings, and is planning a global, Ministerial-Level conference of mountainous countries in 2011. SAWI along with a consortium of development partners is providing support for these efforts.

River Conservation Act

The Government has indicated the need to develop a Nepal River Conservation Act to ensure the conservation and management of its 6,000 small and big rivers. The Nepalese legal framework governing rivers, including their conservation and sustainable use, highlights numerous difficulties, particularly with respect to the clarity of applicable regime, implementation, enforcement, cross-sectoral coordination at the national level, and management capacity at the local level. Many of the acts and regulations are rarely complied with and enforced, and many overlap on jurisdictional issues thus creating ambiguity.

Pending the Government's official request SAWI funds will be used to assess the existing policies, conduct basin wide consultations, organization of a National River Summit with key stakeholders and expert, and carry out systematic communication and advocacy campaigns.

4. Challenges & Next Steps

Nepal is currently in a politically fluid situation. Nepal has been without a government for the past two months and the completion of a new constitution has been postponed. No major infrastructure has been built in over a decade. There is very weak water management and development capacity.

In 2011, a new phase of the Water Resources Knowledge Base may be considered and the River Conservation Act is expected to be completed to coincide with Nepal's year of tourism.