SAWAS
South Asian Water Studies

SAWAS

South Asian Water Studies

Volume 2, Issue 2, January 2011

EDITORIAL

WATER GOVERNANCE CHALLENGES IN SOUTH ASIA

The water crisis emerging in South Asia is not the result of natural factors but has been caused by improper water resource management, and by pollution of both surface water and groundwater and the shortcomings in the working of the institutions which are meant to address these problems.

The intermittent natural factors such as drought and flood compound and exacerbate human failures. Urbanisation, agricultural intensification and climate change, are all contributing to greater competition to consume water resources. There is a variety of ways in which the current patterns of urbanisation and development impact access to water. In the absence of adequate institutional cover, the preemption of water sources for urban purposes places them out of the reach of rural population, thus adversely affecting rural quality of life and well-being.

The absence of a property rights structure for water leads to a situation where water access is insecure; furthermore, since rights to water are tied to rights to land, it follows that land acquisition also diminishes the access of water to a significant section of the population in the region. Thus the crisis of availability assumes that there is not enough water to meet the current and growing requirement and that water will become a limiting factor for economic and other activities.

However, without questioning current uses and method of distribution, and seeking answers for the question related to who makes the decision for whom, this crisis can not be averted. There are multifarious aspects of scarcity that require deeper assessment of these notions. Something is always scarce with respect to an implicit understanding of sufficiency (Jairath and Ballabh 2008). For example, for a poor woman, water scarcity reflects the constraint of her basic livelihood and absolute shortage of drinking water. In contrast, for a large land owner, water scarcity may mean shortage of irrigation water for cultivating water intensive crops like rice or sugarcane. Thus, augmentation of water supply need not necessarily solve water scarcity problem in such a situation where scarcity is created due to unequal access of the resources. The challenges of water governance assume importance from these perspectives.

Over the next two-three decades, in order to bridge the gap between existing institutions and the changing requirements of water governance, it is important that we recognise the fact that the more water may not be available and therefore, our focus should be diverted from capture and augmentation of water related services to the redistribution of water and creating institutional arrangement for sharing equally, and building a humane and just society. The current political economy of water reform in its entire manifestations advocating for big dams, interlinking of rivers and integrated water resources management or public and private participation within a neo-liberal paradigm may not resolve or even mitigate water crisis.

While it is not difficult to discern reasons for such a discourse, this even if successful will not lead to equitable sharing of water resources, the poor and marginalised will continue to be by passed.

The fact that water scarcity is eminent, we need to [i] increase productivity of water and [ii] deepen the democracy within the water sector. The question then therefore, is to break the institutional impasse created by the current political economy of the state and the dominant coalition through mobilisation of people, building leadership capacity within the water bureaucracy and re-energising the civil society organisations to meet the challenges of the water sector.

In this issue of SAWAS, we take a microscopic view of the above discussed issues in specific geographical contexts. Sarah Nowreen, M. Shah Alam Khan and Hamidul Huq examine the development of an IWRM framework in a small scale project in Bangladesh, through a study. The paper points out gaps in the existing framework practiced in the project.

In the paper, "Equity and Social Justice in Water Resource Governance: the Case of Bangladesh", A. K. M. Jahir Uddin Chowdhury and Golam Rasul use Bangladesh as a case study, to examine to what extent the concept of social equity has been integrated into water resource management.

In an analysis that elaborates on how we can save the vulnerable Ganges River, Nitin Kaushal and Madan Lal illustrates measures for sustainability of water resources being adopted by various governmental agencies.

In addition to these, the perspective paper by N. C. Narayanan and Sunil Thrikawala, questions the water scarcity mitigating impact of current aid strategy adopted by international donors under private – public partnerships. The answer to some these questions need not be final but a healthy reform in water sector requires open and transparent debate.

SAWAS will strive and continue to provide such a forum for debate without any prejudice and biases and invites scholars and practitioners to participate and contribute opinion ideas and scholarly work for larger audience.

Vishwa Ballabh
Professor(Economics),
Centre for Rural Management,
XLRI School of Business and Human Resources,
Jamshedpur, India
chief.editor@sawasjournal.org

PAPER 1

www.sawasjournal.org
volume 2, issue 2, 2011

SAWAS
South Asian Water Studies

DEVELOPMENT OF AN OPERATIONAL IWRM FRAMEWORK IN A SELECTED SMALL SCALE WATER RESOURCES DEVELOPMENT SECTOR PROJECT: In Bangladesh

Sara Nowreen
Graduate student (SAWA Fellow), IWFM, BUET, Dhaka, Bangladesh.
Email: sara.sohel@yahoo.com

M. Shah Alam Khan
Professor, IWFM, BUET, Dhaka, Bangladesh.
Email: msalamkhan@iwfm.buet.ac.bd

Hamidul Huq
Research Coordinator, Crossing Boundaries Project, IWFM, BUET, Dhaka, Bangladesh
Email: hamidulhq@gmail.com

Abstract

Considerable progress has been made for flood control, drainage and/or irrigation under the Small Scale Water Resources Development Sector Projects (SSWRDSP) of Local Government Engineering Department (LGED). However, this study conducted in the Mondolbari Drainage (MD) project, Tungipara, Gopalganj during 2008–2010 found that the project objectives (to enhance agriculture and alleviate poverty) have not been fully achieved mostly due to dysfunctional Water Management Cooperative Association (WMCA). LGED's IWRM unit (IWRMU) had the potential to resolve MD's major constraints to water use, which are (i) the existing institutional conflict between Bangladesh Water Development Board (BWDB) and LGED regarding the operation of non-functioning BWDB sluice gate, (ii) conflict between members of WMCA and local farmers with regard to termination of Aman, and (iii) contestation related to discontinue culture fish. Although, in 2008, IWRMU supported the construction of an embankment to ease culture fish, it did not adequately respond to (a) the demand of an additional new gate on an internal channel and (b) coordinate with BWDB for operation of the existing BWDB gate on another internal channel. Proper operation of both the proposed and existing sluice gates is currently a strong demand for both Aman and Boro rice. Firstly, frequency analysis was done during Aman cultivation to identify the decads of May when gate is needed to remain closed. Secondly, an unsteady flow analysis (using HEC-RAS) was performed to identify the decads of the Boro season when tidal tapping (by closing the gate) is necessary. Furthermore, a gate operation rule is developed through analysis of surface water, key informant interviews, resource mapping, institutional mapping and a series of FGDs with the stakeholders. Additionally, this study found that WMCA of MD is politically biased and its WMCA agenda are more inclined towards their economic gain neglecting the social impact they have. Promoting culture fish in the rice field is an example of this. Only a few powerful individuals are directly benefited from this. This power group has also diverted the project objectives in favor of culture fish and has been operating the gate accordingly. In doing so, it has completely ignored (i) the early flooding problem of young Aman seedlings, and (ii) the water requirements for Boro land preparation. In addition to these, genders are also deprived of from being benefited. The study has found that gates should remain closed especially during (i) the third decad of May for Aman, and (ii) the second decad of February and the first decad of March to tap tidal water for Boro. Finally, this study pointed out the gaps in the existing IWRM framework being practiced in MD project. This understanding and subsequent development of IWRM framework can be used as a model for SSWRDSP in general and in preparation of plans for further advancement of the IWRM road map of WARPO.

1.Introduction

Mono directive structural interventions have in general limited the scopes and opportunities for Integrated Water Resource Management (IWRM) in the South West region of Bangladesh (Halcrow and others, 1998). Since the operation and maintenance (O&M) of Bangladesh Water Development Board (BWDB) is generally non-participatory (Choudhury, 2005), to increase the participation level of the stake holders, Local Government Engineering Department (LGED) initiated Small Scale Water Resources Development Sector Projects (SSWRDSP). It aims to support the local government institutions in implementing small scale projects covering 1000 ha or less (LGED, 2000). SSWRDSP is a deviation from the traditional "top down" approach followed in the past investments in the water resources development sector (ADB, 2004). Here the attention is given towards the promotion of local governance and the transfer of water management to user groups is commonly referred to as the Water Management Cooperative Association (WMCA). It is guided by the assumptions that the WMCAs are non-partisan, non-political and homogeneous bodies, and perform the water management tasks as per the original design (Khanal, 2003). But as it seems, WMCA agenda are heavily biased towards their own economic gains neglecting the social impact they have and they are mostly controlled by the power group of the society (Rahman et al., 2007). As a result, additional complexities are created. Continuing culture fish in the floodplain water body system is an example of this. Most of the benefit, if not all, of this culture fish basically goes to the influential and wealthy farmers creating social issues like access and decision making complexities (Lewis, 1997). This results in an outright inequity and rising social and political tensions (Alauddin and Tisdell, 1998) and starts 'contestation' among the stakeholders.

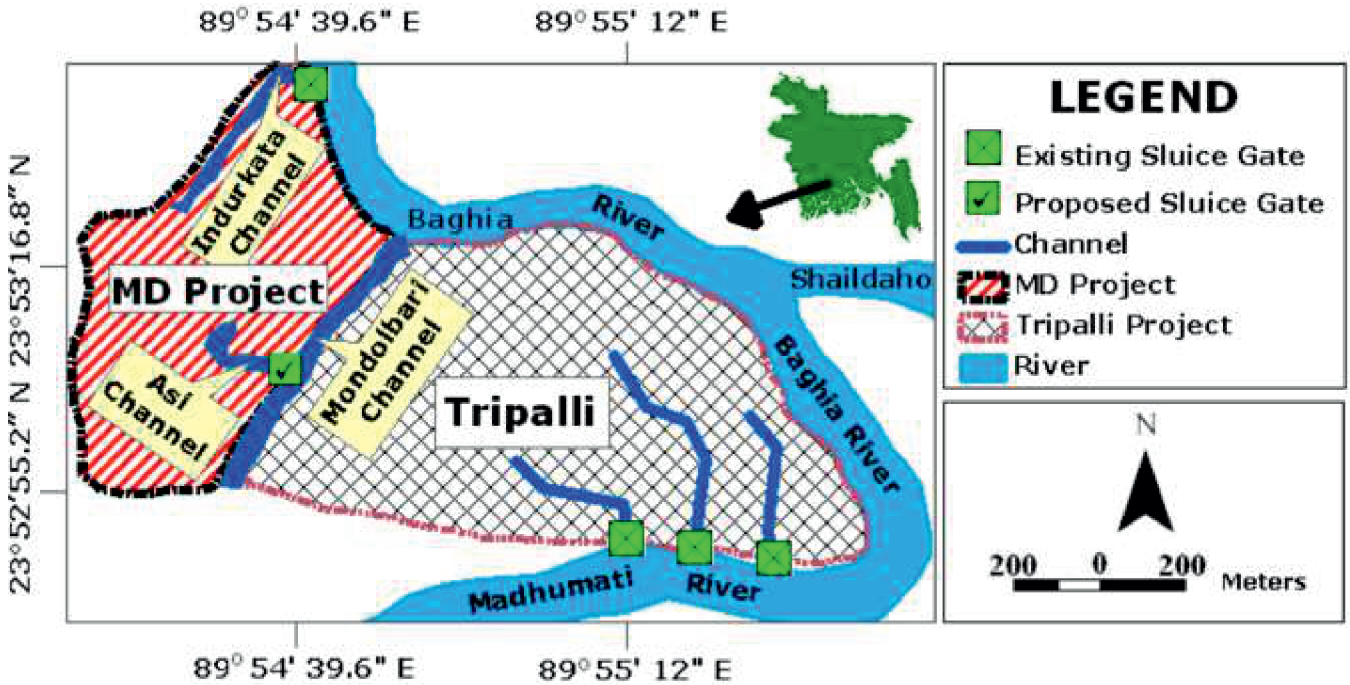


Figure 1: Location of the two project sites under consideration

The arguments and findings in this study are based on a detailed case study of two neighboring projects implemented in 1999, namely the Mondolbari Drainage (MD) and the Kakuibunia-Chinguri (referred to as Tripalli project henceforth) in the South West hydrological region of Bangladesh. Both projects were implemented under the first phase of SSWRDSP. The location of both the projects under consideration is shown in Figure 1.

1. Here, contestation is used to refer to a range of interaction patterns in water management including negotiation and struggle, and also to less explicit and longer term disputations and controversies. The idea is to convey that there tends to be something at stake in water resources management, and that the different individuals or groups involved have different interests (Mollinga, 2008).

The arguments and findings in this study are based on a detailed case study of two neighboring projects implemented in 1999, namely the Mondolbari Drainage (MD) and the Kakuibunia-Chinguri (referred to as Tripalli project henceforth) in the South West hydrological region of Bangladesh. Both projects were implemented under the first phase of SSWRDSP. The location of both the projects under consideration is shown in Figure 1.

In MD project, considerable progress has been made towards the development of its vast water resources for flood control, drainage and/or irrigation by both LGED and BWDB. However, during the study, it is observed that the project objectives have not been fully achieved. It may be noted here that LGED's IWRM unit (IWRMU), though established during SSWRDSP - 2, is providing support to MD project's WMCA, particularly in the Operation & Maintenance stage (O&M). But there is no clear directive on how IWRM will be implemented. Moreover, it is not clear how the existing conflict between BWDB and LGED with regards to the O&M of the presently non-functioning sluice gate on Indurkata channel, would be resolved. As will be clear from the later discussion in this paper, proper operation of this existing gate and the establishment of a new gate, demanded by the local people, are vital for Boro and Aman cultivation.

In addition to the above mentioned complexity, in MD project, the management arrangement of LGED is dysfunctional. Promoting culture fish by WMCA has restricted the local people's access to floodplain fisheries. This has jeopardized household nutrition, public health and general social well-being of communities, in particular, widow, single women and children and benefited only the influential power group which ultimately controls the WMCA. Moreover, as unfortunate as it seems, in reality, the implementing agency, LGED, also favors this power structure. Interestingly this power group by now has been able to divert the project objectives in favor of culture fish, completely ignoring the requirements for the Aman rice despite that the original objective of the project was to enhance agriculture (LGED, 2000). On the contrary, in the neighboring Tripalli project, where social or religious homogeneity (mostly Hindus) exists, culture fish were not continued. This decision was the reflection of the majority people's demand driven by better financial return of jute retting as well as social and religious obligations.

In this research, the contrasting scenarios of the two neighboring projects have been deeply and critically studied with a goal to identify and mitigate the problems and issues related to the current approach of SSWRDSP. Subsequently, this understanding has been used as the basis for developing an operational IWRM framework. Additionally, this paper raises questions on the ongoing approach of one-third women participation in the O&M and calls for a further shift towards more women participation in every stage of the whole process.

The contributions of this paper are as follows:

- Firstly, the potentialities of the water management approach that was or is practiced at the local level before, during and after the implementation of the MD project including the economic gains out of culture fisheries are identified (Section 4).

- Secondly, the constraints to water use that are experienced in the last couple of years are identified and analyzed (Section 5). These constraints include (i) the problems with rice cultivation (ii) the existing institutional conflict between BWDB and LGED regarding the operation of the existing BWDB sluice gate, and (iii) the contestation related to discontinuing culture fish.

- Thirdly, a frequency analysis to identify the vulnerable periods for Aman termination (Section 5.1) was done along with an estimation of the irrigable area for the dry season with the available volume of water measured by the Hydrologic Engineering Centers River Analysis System (HEC-RAS) software (Section 5.2).

2. This project is referred to as the Tripalli project by the local people because it involves three adjacent villages.

· Fourthly, social issues related to the existing contestations with regards to the gate operations are identified and analyzed (Section 5.4).

· Based on the above-mentioned socio-technical analysis, gaps in the existing operational IWRM frame work were identified. In the sequel, a common acceptable gate operation rule for the existing and a propose sluice gates were derived.

· Finally, based on the critical study and analysis of this research work, a number of recommendations for operationalizing IWRM framework have been presented in this paper.

It is believed that these findings on the potentials and constraints of operationalizing IWRM together with suggested recommendations will be the basis for further advancement of IWRM road map of WARPO (2009). Additionally, this study also attempts to find a feasible platform for handling the contestation which is existent in the current projects.

2. STUDY DESIGN AND METHODOLOGY

A comparative and interdisciplinary study has been conducted during the period 2008–2010. For this analysis, both primary and secondary data have been collected. Primary data has been collected mainly through village level Participatory Rural Appraisal (PRA), which includes key informant interviews (primarily) of member families of the WMCAs and the LGED officials and a series of FGDs (Focus Group Discussions) with the farmers, fishermen and women. These helped to understand the social and institutional dimensions related to (i) the existing institutional conflict between BWDB and LGED regarding the operation of the existing BWDB sluice gate, (ii) the conflict between members of WMCA and local farmers with regards to termination of Aman (iii) the contestation related to community decision making to discontinue culture fish, (iv) the deprivation of the poor and the marginalized gender classes, and (iv) the social effects of promoting culture fish by WMCA.

In parallel to the above works, historical tidal characteristics are analyzed for both Aman and Boro seasons from the secondary data, collected and gathered from Bangladesh Inland Water Transport Authority (BIWTA) and LGED. At first, frequency analysis during Aman vegetation helped to identify the decads of May when young seedling of Aman is vulnerable to early floods. Secondly, an unsteady flow analysis (using HEC-RAS) was performed to identify the decads of Boro season when the gate is needed to be closed for tidal tapping. Notably, in this paper, a feasible operation rule for the existing and the proposed sluice gates have been developed based on both hydrological analysis and PRA tools. Finally, through socio-technical analysis, this study pointed out the gaps in the existing operational IWRM framework of the SSWRDSP.

3. PROJECTS OVERVIEW

The original proposal of MD project was for a D (drainage) & WCS (water conservation structure) with the intention (i) to improve drainage by re-excavating internal channels and (ii) to provide irrigation by retaining water in channels by constructing a water control structure at the mouth of Mondolbari channel (LGED, 1999). Later, the project type was fixed to be Drainage; WCS was omitted as, according to LGED, there was no scope for flood control and local people needed the Mondolbari channel open for navigation.

On the other hand, Tripalli is a FCD (Flood Control & Drainage) project. It was developed with an intention to (i) prevent flood from the Baghia River by constructing embankments and regulators to facilitate drainage, (ii) improve drainage by re-excavating three small channels, and (iii) improve navigation by constructing a small boat pass. Now, flood water is controlled at Tripalli by three sluice gates. This Tripalli project passed each of the standard social, environmental and economic viability tests conducted by LGED. All residual adverse environmental impacts of the Tripalli project are expected to be insignificant.

Both of these projects are located within the boundaries of the 21,300 ha BWDB Tarail-Pachuria (TP) Project. This BWDB project was originally financed with a World Bank loan but funding was withdrawn when the project was about 30% complete because local people refused to give up their land for the proposed massive embankments. Currently, no funding for implementation is available.

MD project is dependent on the function of the Indurkata sluice gate (as shown in Figure 1) constructed under the TP project, where as, Tripalli project has no conflict with or dependency on current functions of BWDB. As a result, all three LGED sluice gates of Tripalli are well maintained by its WMCA where as one BWDB sluice gate of MD project is inoperable. The absence of any institutional conflicts (eg. between BWDB and LGED), the presence of religious homogeneity (e.g., mostly Hindus) and discontinuation of culture fish in the rice fields helped Tripalli project to be successful.

4. POTENTIALS OF IWRM PRACTICES IN THE MONDOLBARI DRAINAGE PROJECT

The National Water Policy (NWPo) of Bangladesh is considered as a first step towards the initiation of the IWRM process (Gupta et al., 2005). The goal of NWPo is stated as: 'to ensure progress towards fulfilling national goals of economic development, poverty alleviation, food security, public health and safety, decent standard of living for the people and protection of the natural environment'. According to the survey of Albert (2001), the principles and concepts of IWRM as presented in GWP (3 2002) are well-accepted by the majority people of Bangladesh. Respondents are of the strong opinion that the IWRM process could help find the solution to the water problems in the country. This study experienced similar findings. For example, changing of project concept from WCS to Drainage, considering the negative navigational impact it could have, can be considered as a remarkable step of Local Government Engineering Department (LGED) towards IWRM.

4.1 Practice before the project implementation

During interaction, the stakeholders confirmed that the installation of a one vent sluice gate at the mouth of the Indurkata channel was completed by BWDB in the year 1987/88 under TP project. In 1996, people placed a demand before LGED for another sluice gate since the area used to be inundated by both Indurkata channel and Asi channel. Due to this inundation, the study area also had the problem with broadcasting Aman.

4.2 Practice during the project concept development by LGED

During the project concept development through PRA, local inhabitants of Chinguria village strongly opposed the proposal of constructing a dam at the mouth of that Mondolbari channel as it serves as the cheapest way to transport paddy from the field to their houses. They also raised the issue that using the channel water for household cooking, bathing, etc. would not be possible, if that dam were constructed. So the concept of initial proposal was reviewed and revised by 'Techno Consult International Limited' based on an independent PRA, information and data supplied from the field and the results of standard social/technical analysis. Based on the above, it is fair to say that local people of this project are eager to get the most benefit out of its natural resources (e.g. water, land and related resources) and at the same time, LGED has the capability to make IWRM operational. With all these scopes and opportunities, this area is highly potential for practicing IWRM.

3. Global Water Partnership (GWP) defines IWRM as "a process which promotes the coordinated development and management of water, land, and related resources in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems".

4.3 Practice after the project implementation

In the MD project, currently the operation of that BWDB sluice gate is controlled by WMCA. With full support of local people, in the year 2007, WMCA first considered the possibility of utilizing seasonally flooded private lands for culture fishery. Economically, it was profitable though the net profit was lowered to 1,40,000 Taka. It is because WMCA had some incidence of fish flee due to the sudden cut of the temporary dam constructed at the mouth of Mondolbari channel by the TNO (Thana Nirbhahi Officer). To avoid this kind of incidence, IWRMU supported WMCA in constructing an embankment (8 feet wide and 16 -19 feet high) along that channel just in time for the spawning of culture fish in the subsequent year. According to the official record, production and profitability increased over the years. In the year 2008, even with a 35% loss of stocked fingerling, each share got a return of 1710 Taka from an investment of 1200 Taka. A total of 1350 kg fingerling were stocked having a value of 1,97,000 Taka and the total return received was 3,84,000 Taka. The local economy therefore has gained from both the direct benefits of the projects (increased production, profits, incomes, etc.) and from the indirect benefits that are transmitted through backward linkages, mainly from the supplier of inputs for the fish production.

There are four clearly identifiable groups of people who have gained directly from the project. These are the shareholder-landowners, the permanent staff of the project, the new fishers who get the opportunity to harvest fish and those involved in earthwork activities. It is claimed by WMCA that the output from agricultural land has increased, whilst input costs have declined. This is because, as the WMCA claims, no pesticides are required, and lower fertilizer doses are enough due to the residual impact of manure and feed used in culture fisheries.

So theoretically, existing water management system is economically successful benefiting an area of 103 ha with little negative impact on its cropping pattern. But social impact towards meeting National Development Goal, such as poverty alleviation, is yet to be explored.

5. CONSTRAINTS TO IWRM PRACTICES IN THE MONDOLBARI PROJECT

Although the majority people of Bangladesh accept the principles and concepts of IWRM, according to the investigation of Albert (2001), these, in reality, are not yet in practice. The National Water Policy (NWPo) itself is not sufficient; NWPo needs to be implemented, monitored continuously, and updated with varying natural and socio-economic condition. The water resources management sector is described as being fragmented (Gupta et al., 2005). Data collection is considered inadequate for planning and decision-making. The interview results reveal that land acquisition is perceived as 'complex, time consuming and cumbersome' in the water resources development process. Though sectoral planning with inter sectoral priorities are described as 'fair', their operation and management are described as 'weak'(Albert , 2001).

In the process of identifying the constraints to practicing IWRM at different stages (planning, design, implementation and O&M) of the MD project, this section points out the problems stakeholders were facing in the last couple of years. The constraints to water use are depicted according to two main seasons (Aman and Boro) of rice in a year in Sections 5.1 and 5.2. Afterwards, analysis on institutional conflict, social issues related to culture fish, elite capture and women involvement are described in Sections 5.3, 5.4, 5.5 and 5.6, respectively.

5.1 Constraints to water use during Aman Season

In both the projects, the main source of problems has been the early flood (LGED, 2007). Since Tripalli can fully operate their three (LGED) sluice gates, it can easily control their early flood whereas in MD project, the flood damages young broadcasted Aman. When Boro harvest is too late, it does not allow timely establishment of the deep water Aman (DW Aman) before the arrival of floods (Catling, 1992). Therefore, managing a DW Aman-Boro rotation becomes impossible. Now, the contestation related to the culture fish during the month of November (see details in Section 5.3) is the leading cause behind the late harvesting of Boro.

This delay early Aman broadcast increasing the possibility for Aman seeds to be inundated by early floods in the 3rd decad of May. The situation is aggravated even more when WMCA keeps the gate open during the 3rd decad of May to facilitate the proper spawning of fingerlings (as it has been doing since 2007). Clearly, whenever it comes to the issue of conflicting interest between WMCA (for culture fish) and common farmers (for Aman), the money wins since the BWDB gate operation has become very costly.

Again, when the culture fish was introduced for the first time in 2007, there was an incidence of severe Carp fish (T. melanopleura) attack on Aman. It has been alleged that Carp fish damaged the young seedlings either by uprooting or by eating rice plants. On one hand, WMCA did not compensate anything at all for such losses. On the other hand, since the complaint was serious among the stakeholders, in 2008, the elite groups or WMCA played a dirty trick: the gate was opened even earlier in May, during the broadcasting of Aman. It basically served two purposes as follows. Firstly, raising water level served better for spawning fish and secondly, entrance of saline water and early flood caused less broadcasting of Aman, which meant less possible complaints from Aman cultivators about any negative effect due to culture fish.

Again, the saline water intrusion in the field due to the early opening of the gate by WMCA is responsible for creating unsuitable soil and/or water conditions for the common farmers. As reported by the local people, saline water in the river becomes noticeable in the mid of January and highest concentration occurs in Mid April-Mid June. As a result, the opening of the gate in early May, results in the highest possible salinity intrusion in the soil. It may be mentioned here that, WMCA closes the gate in Mid June and finally opens the gate again around Mid October for fish harvesting.

Hydrological analysis

As part of this research, a hydrological analysis was performed to identify the period that is most vulnerable for Aman vegetation. The land elevation of the study area varies from 1.4 m PWD to 2.87 m PWD (LGED 1999). At first, to identify the most vulnerable decad for the early flooding, a trend analysis for the month of May was done (as shown in Figure 2) and afterwards, from DEM analysis the percentage of area inundated for different water depths was estimated (as shown in Figure 3).

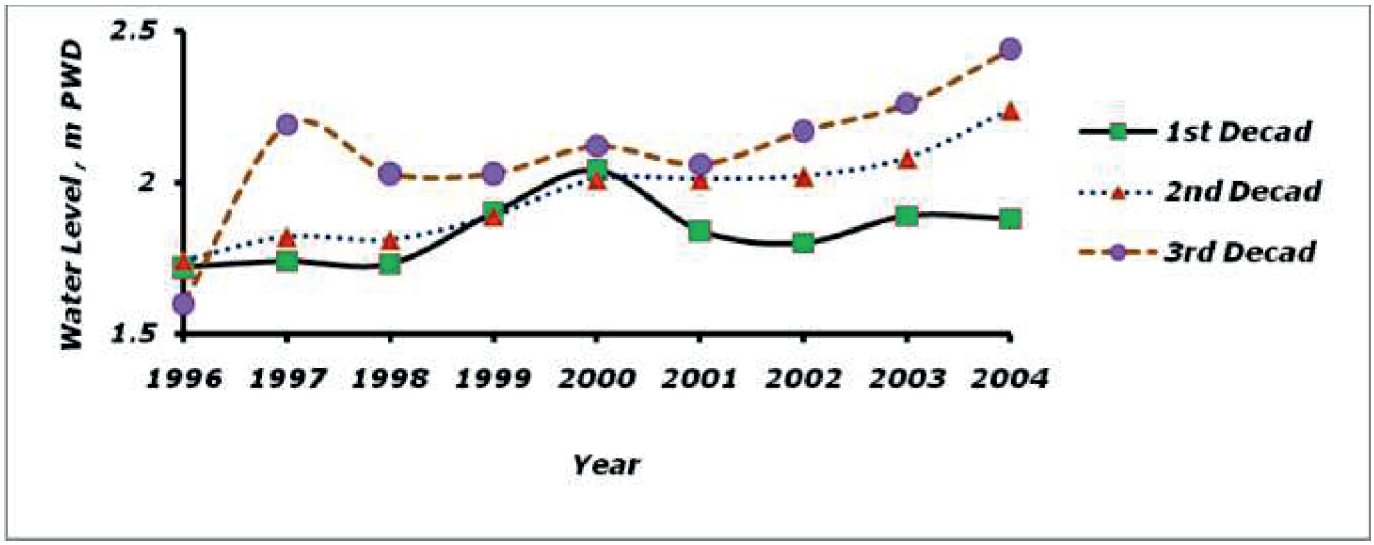


Figure 2: Average high tidal water levels in May.

As can be seen from Figure 2, the average high tidal water level always remains above 1.4 m PWD indicating that the possibility of flood always exists during the period (May) of broadcasting Aman. However, as can be identified easily, the worst situation occurs during the third decad coinciding with the period of the broadcasting of Aman (May 15 onwards) and making it the most vulnerable. Therefore, it is of paramount importance that the sluice gate is closed during this vulnerable period to ensure proper broadcasting of Aman. For the calculation of the flooded area at different water levels, annual runoff for the study area was estimated from mean annual monthly rainfall, mean evapotranspiration rate and mean infiltration during the period of 1999 to 2007. Annual runoff depth was found to be 96.66 mm based on the estimated mean infiltration rate of 4.66 mm/day. Figure 3 shows the percentage of area inundated for different water depths.

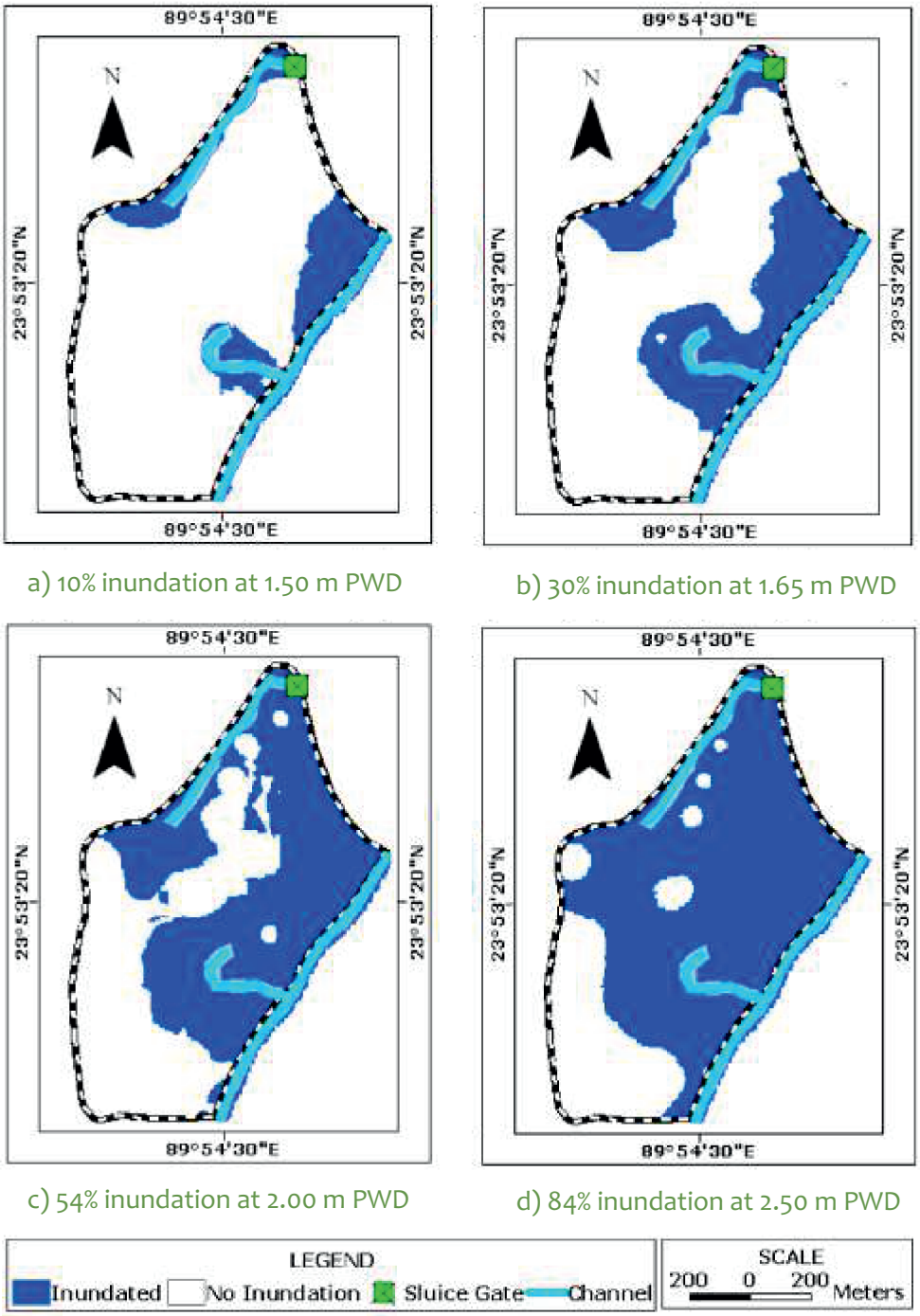


Figure 3: Inundated area for different water levels.

5.2 Constraints to water use during Boro Season

In both MD and Tripalli project, lands are irrigated using the surface water. Tripalli project is successfully utilizing their surface water potentials. However, the scenario in MD project is different. Here, for irrigation, the farmers depend on both Indurkata channel and Asi channel. The command area of Indurkata channel is 175 acres, 100 acres of which fall inside the project area. The rest of the project area is dependent on Asi channel. But due to the lack of a sluice gate at the mouth of the Asi channel Boro rice irrigation is facing difficulties (Figure 5). As can be easily noticed from Figure 4, only the spring flood can meet farmer's demand during this dry period. So to overcome this situation, the local people are trying to tap tidal water by constructing a temporary dam at their own cost. Although, WMCA is interested in increasing their command area (as most of the WMCA members are engaged in block managing) it has so far been unsuccessful in convincing LGED to fulfill its demand for a new gate. Nor did it show any interest ever in sharing the expenditures of the farmers for the construction of the temporary dam. The WMCA members, however, are ready to invest more money on culture fish during the wet season.

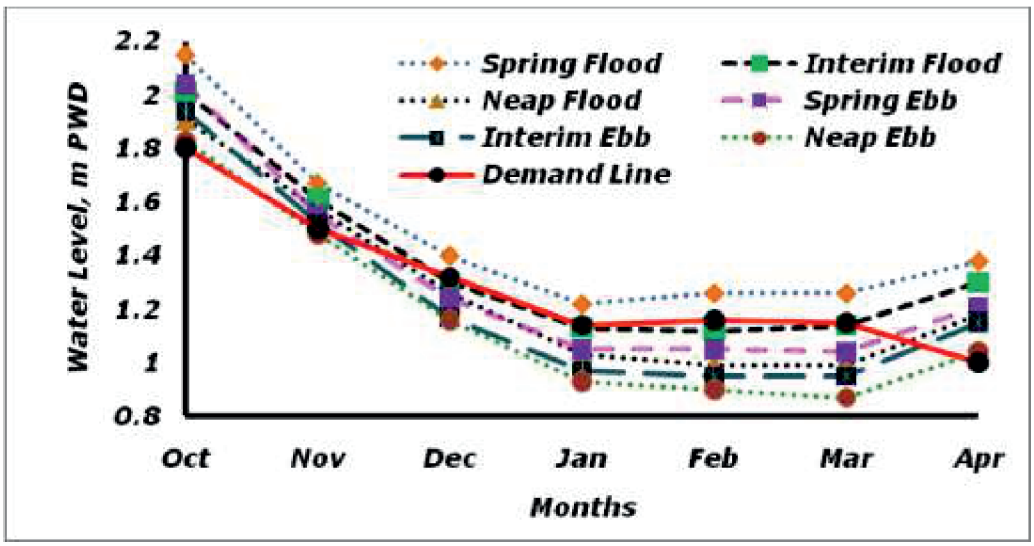


Figure 4: Water availability and demand during the dry period.

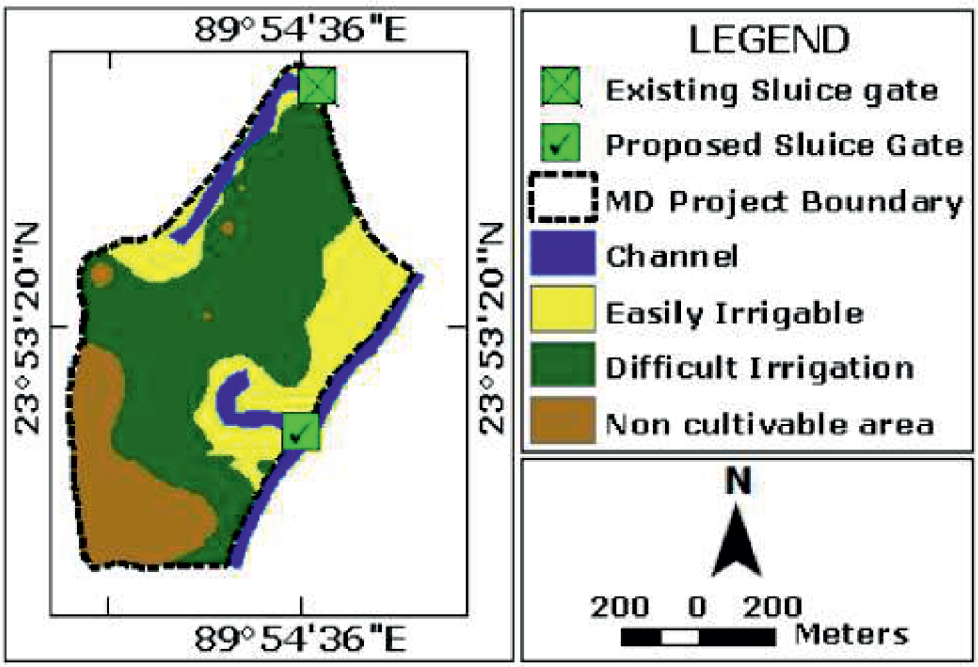


Figure 5: Command area dependant on tidal water tapping.

Hydrological Analysis

A hydrological analysis was performed to identify the period when the gate should be closed for tapping tidal water to facilitate Boro irrigation. Irrigation in the study area is totally dependent on surface water and hence a low lift pump is used for this. According to LGED (1999), the project was supposed to mainly benefit Boro crop production. But the irrigable area depends on the availability of water. To determine water availability during the dry season, at first, dry season water demand was estimated. Estimated water demand was then deducted from the water supply to get the excess amount of water available for use. Figure 6 graphically presents the excess amount of water in different decads as per the calculation. The usable amount of water is the lowest during the neap tide.

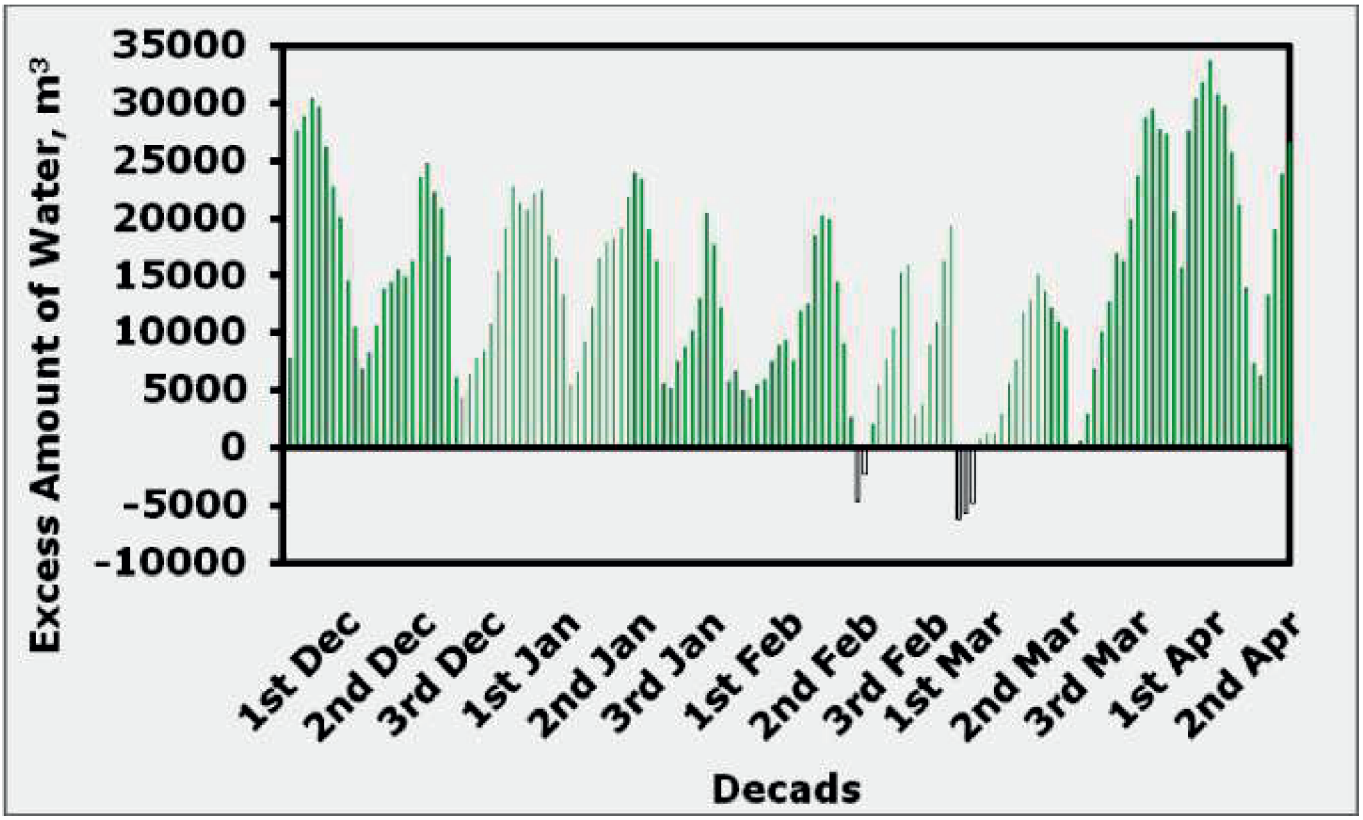


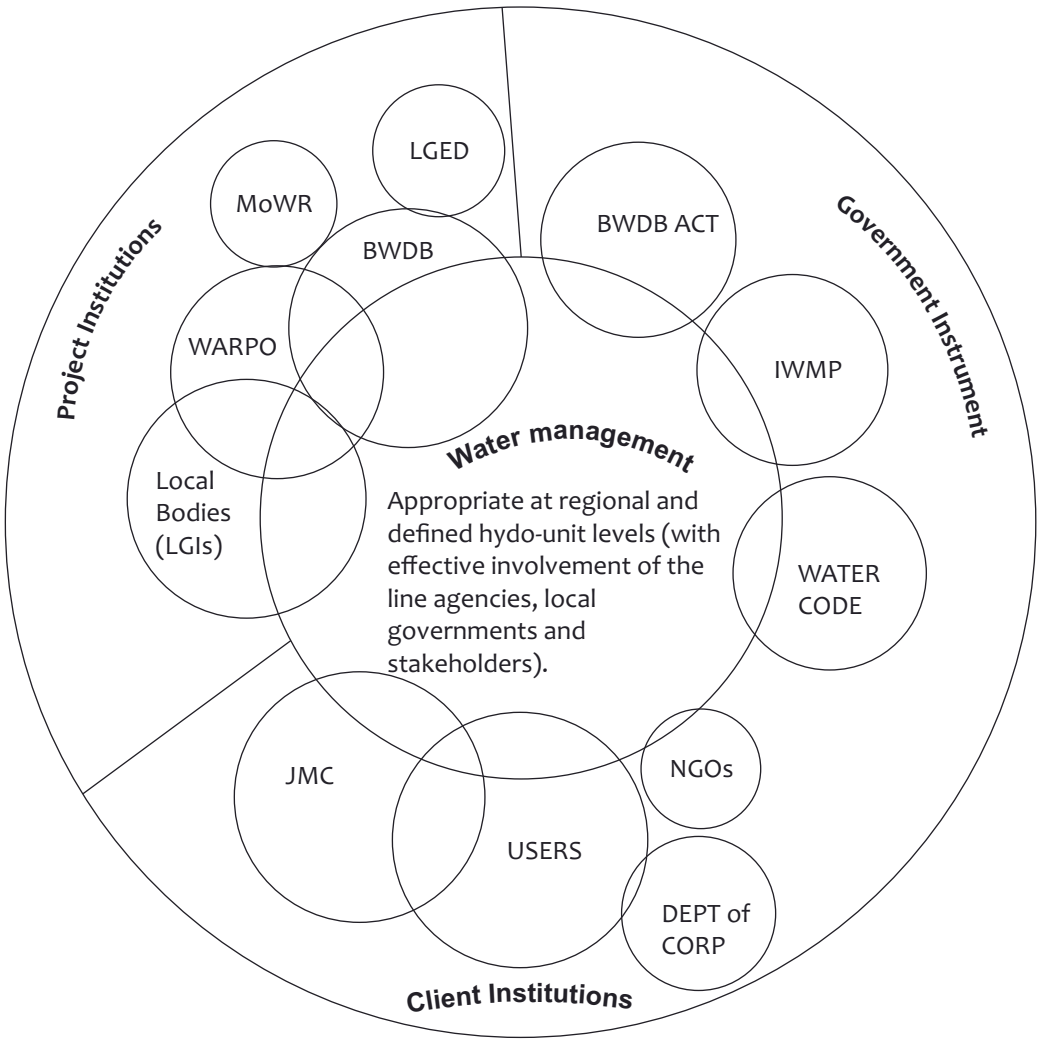
Figure 6: Estimated Excess amount of water during the dry period.

From Figure 6 it is clear that the worst situation happens when neap tide coincides with the highest demand (highlighted with red circle): the highest demand occurs towards the end of March and remains so until the 1st week of April. It is estimated that during the 1st decad of March and 2nd decad of February, respectively 60% and 67.27% of land can be served by the available amount of water and respectively around 6193 m3 and 7844 m3 water is required to irrigate the rest of the area. On the other hand, during the interim period before the neap period, water is available for irrigation and other purposes. In fact, during the same decads, just one day before the neap period there is 19337 m3 and 2582 m3 of excess water in the channel respectively. If the gate is closed during interim period and remain closed during neap period, the excess water can be stored to meet up the deficiencies in irrigation.

From the above analysis, it is clear that water is to be stored during the interim period (spring to neap) to meet up the demand during the dry season. Clearly, the gate operation during February and March at the transition period from spring to neap is very critical, implying that extra care is needed in the management of the gate.

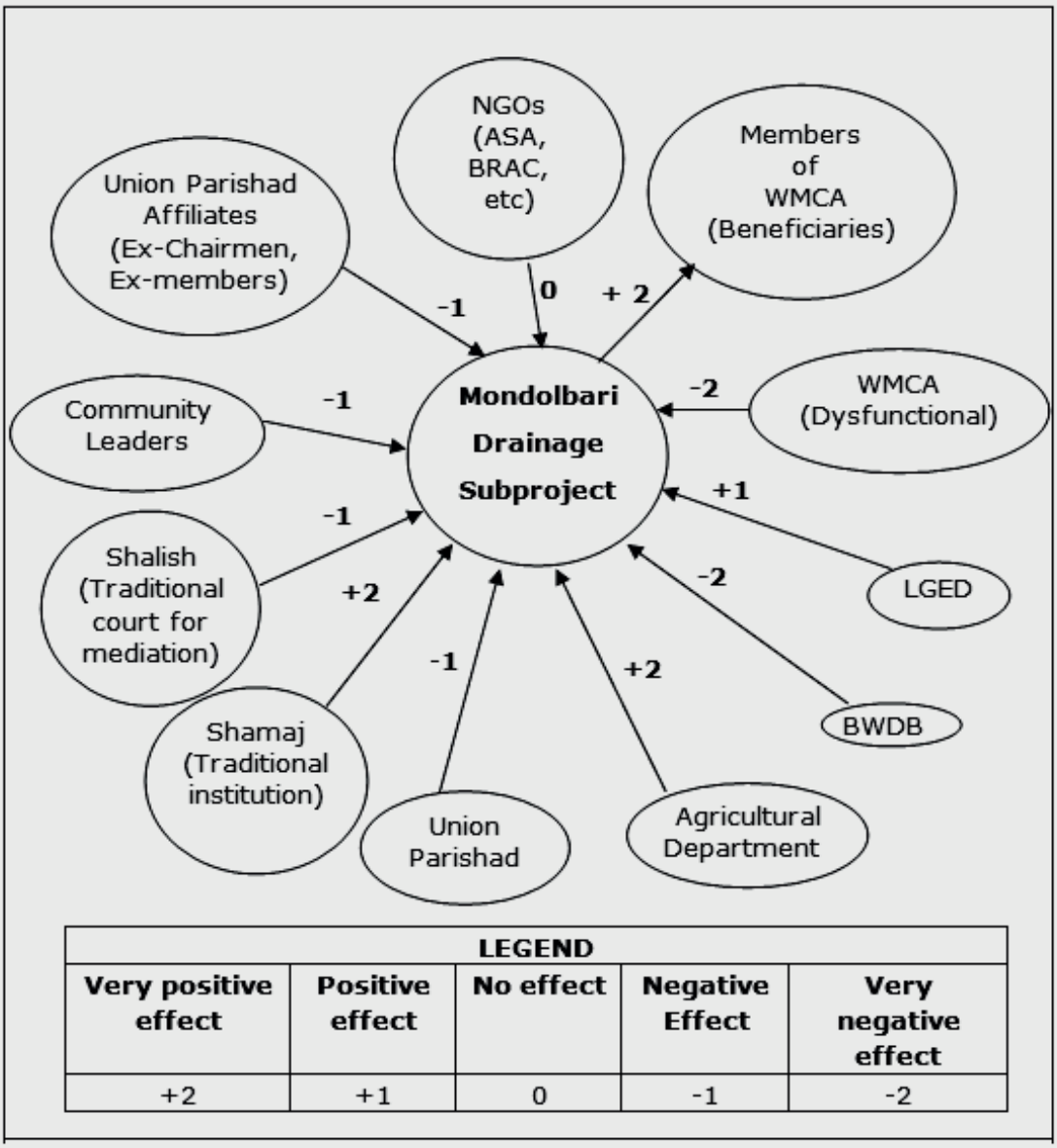
5.3 *Institutional Conflict*

Both of the MD and Tripalli projects are under South-west Area Integrated Water Resources Management Project (SWAIWRMP) of Bangladesh. Figure 7 shows the institutional arrangement theoretically SWAIWRMP has for its IWRM planning, implementation and management.



Source: SWAIWRMP (2004)Figure 7: The institutional arrangement for IWRM planning, implementation and management of SWAIWRMP.

Now, in the MD project, the situation is expected to improve by controlling the water with two sluice gates (one at the mouth of Indurkata channel and the other at the mouth of Asi channel) with the added condition of constructing an embankment along the Mondolbari channel. One sluice gate had already been constructed by BWDB 22 years back under TP Project, which is not fully functional at this moment. BWDB in this case as well emphasized on new construction rather than improvement of services, which led to inequitable service distribution with the poor suffering the most. Another, serious problem regarding this gate is the lack of the proper co-ordination among the two implementing agencies, namely the LGED and the BWDB. Inadequate levels of communication between these two institutional organizations had led to distrust, confusion and conflict. It results in low performance of WMCA as well as the whole physical system. Figure 8 shows the institutional map of the local level institutional arrangement, prepared in consultation with the local stakeholders, which practically exists at MD project (as opposed to the coordination scenario needed between BWDB and LGED in Figure 7). Here, the roles of the informal and formal institutions in management of MD project are shown.



LEGEND				
Very positive effect	Positive effect	No effect	Negative Effect	Very negative effect
+2	+1	0	-1	-2

Figure 8: Institutional Mapping of Mondolbari Drainage project

As has been mentioned above, the existing sluice gate needs proper maintenance. However, it is not clear who would do the maintenance and how. Similar to the constraints identified in WARPO (2009), BWDB in this case as well is reluctant to provide stakeholders with financial control over that Indurkata sluice gate. The lack of participation of the local people during the construction of the BWDB sluice gate failed to develop a sense of ownership amongst the users: despite their dependency on the sluice gate, they mostly do not see it as their responsibilities to repair or maintain it. It has been more than 8 years since the key of the sluice gate has been lost! Since then, it has become too difficult as well as costly to operate and maintain the sluice gate. Each attempt of opening or closing of the gate requires a labor charge of 200 Taka and as per WMCA claims, each year during culture fish, it has to spend an extra amount of 5000 Taka just for the opening and closing of the gate. Interestingly enough, although some users including WMCA are willing to pay for the repair and maintenance of the gate, they lack the proper authorization to perform any maintenance work on a BWDB sluice gate. On the other hand, BWDB has no future plan for this kind of maintenance possibly unless and until the structure is on the verge of a complete collapse. And if the infrastructure is not properly maintained, the benefits of the projects will decline over time even after the construction of the proposed (second) sluice gate.

This complex situation is further complicated by the policy of ignoring such conflicts as is clearly manifested by the following declaration of LGED (1999): "There is no interaction with BWDB project". As a result of the above conflicts the major problems of both early flood and water conservation still remain unsolved.

Contrary to the MD project, as already been mentioned, Tripalli has no dependency on BWDB for the operation of their sluice gates. As a result, this Tripalli project is successfully maintaining their three sluice gates without having any major conflicts.

5.4 Issues Related to Culture Fish and Gender

The practice of culture fish has imposed a number of constraints on different dimensions. This section focuses on a number of such issues and makes an effort to depict an accurate picture thereof based on the detailed case study on the involved projects.

5.4.1 Contestation

As has been discussed in the previous sections, the raising of the water levels, during mid May for the culture fish makes broadcasting of Aman very difficult. Even if some Aman is finally produced, the farmers face difficulties during uprooting Aman stubble and also during Boro land preparation as discussed below.
By mid-June, once the water covers the rice fields, natural and culture fish are widely dispersed in the expanse of water. Around mid-October, the water begins to slowly drain off the higher floodplain elevations into the lower lying areas such as channels, marking the start of the drawdown period (mid-October to December). With the water, the fish also move into deeper portions of the channels. The fish thus become concentrated and easier to catch which is highly desirable for WMCA. Aman harvest occurs in 2nd week of Augrahayan (October–November), and preparation for Boro planting begins with seedbed preparation in November. WMCA opens the gate to drain plots and concentrate the fish in the channel to catch, since fishing is very efficient in terms of catch per unit effort during this period (Shankar et al, 2005).

Now the farmers need the land wet for the easier cleaning of Aman roots. Therefore, the opening of the gate by WMCA and the resulting draining of plots (to facilitate fish harvesting) essentially dries up soil too much for uprooting Aman stubble.

On the other hand, the land should be saturated to make it properly prepared for the next crop, namely, Boro. As the start of the drawdown period is mid-October to December, dried up soil makes farmers more dependent on irrigation even for Boro land preparation increasing their cost of production. As always WMCA completely ignores the pleas of these affected farmer's and their demand for compensation. This results in serious contestation between the WMCA and the local farmers.

In the first two years of practicing culture fish, the profits were not equally and fairly distributed (see details in 5.4.3).Not all landowners of the flooded rice field were allowed to be included as members of the WMCA due to a pre-set limit (say, 500) on the number of members (see details in 5.5). As a result non members, majority of which were local poor and marginalized farmers, did not get any profit out of that fish cultivation. But they have a right to get a share of the benefit due to their ownership in that flooded land (see details in 5.4.2). Therefore conflicts did arise among the members of WMCA and the non-members. Additionally, none was allowed to catch or poach fish in their rice field during the flood season. Again, as has been indicated before, Integrated Water Resource Management Unit (IWRMU) of LGED also favors this power structure.

On the contrary, in the neighboring Tripalli project, when culture fish created problem with jute retting and caused less production of Aman rice, majority people who are 'Shudra' (agriculturist or agricultural laborer caste of Hindu) opposed the plan to continue it. This decision was the reflection of the majority people's demand driven by better financial return of jute retting as well as the social and religious obligations/homogeneity.

5.4.2. Limited Access to floodplain

As been discussed, by mid-June, once the water covers the rice fields, the land becomes a common fishing property. During this monsoon period fish catch from common property land, such as seasonally flooded private land, are one form of ecological subsidies to the poor people that keeps the balance between rural poverty and distribution of benefits (Ahmed, 1997). Marginal and landless involved in subsistence activities become subsistence fishermen, in spite of the fact that fishing efficiency (catch per unit effort) is lowest during this period. They catch fish primarily for home consumption and secondarily to supplement cash income (Thompson et al., 2002). The floodplain fish catch is the single most important source of animal protein, Vitamin A, essential fatty acids and calcium for rural people, particularly for nursing mothers, pregnant women and children of ages above two years (Datta, 2000). As a result, the most complex issue of access limitation arises due to the floodplain use for culture fish (Lewis, 1997).

This study has found that culture fish tends to exclude a large number of poor households. This exclusion adversely affects them through the attenuation of their common property rights over the floodplains. The result is fewer and fewer households having access to what previously were common pool fisheries. The consequences are a loss of direct access to animal protein for their household diet and loss of supplementary employment and income (Valbo-Jørgensen and Thompson, 2007). The local people are normally no longer allowed to use the fields for subsistence fishing and this promotion of the culture fish pre-dominantly benefits WMCAs. This means a direct transfer of benefits from the poor and needy to the rich and surplus. As a result, this results in with negative impact on equity and income distribution.

5.4.3. Distributional consequences of shares

Practice of culture fish is biased in all regards. Out of that floodplain, majority common people could have caught fish worth of 5000-6000 Taka in a year; but from culture fish, they got a net profit of 500-600 Taka from WMCA. As a result, although 75% of total revenue is kept recorded as shares for the co-operative in black and white, in reality they only receive 25% of it in cash. Initially majority people were in favor of culture fish. But WMCA has lost their support because of their unequal distribution of benefits. The resulting profit however, is not distributed directly to the commons and is only recorded in paper forms as shares to the cooperative. It increased inequality in the distribution of project benefits which was already positively skewed towards the rich. However, it is found that the primary source of income of dominating members of WMCA is business rather than agriculture and they have diversified livelihoods away from agriculture and have accumulated more financial capital. The non-poor distributional outcome of culture fish development in Bangladesh is also attested by other studies (ADB, 2005; Ahmed and Lorica, 2002; Toufiq and Gregory 2008).

5.4.4 . Social context

The practice of culture fish has affected the local people in a number of ways which include a number of social issues particularly related to gender. This section briefly focuses on these issues.

In the MD project, it was claimed that there were no professional fishers. So WMCA had no strategy for compensating the fishermen. But with the practice of culture fish, the universal access to the floodplain and its fish was restricted. As a result, the interest of the powerless ('lowers'), as categorized by Chambers (1995), was largely ignored and undermined by the powerful ('uppers') (Huq, 2001).

Straw and stubble of Aman plant have significance in the economy of the village (Catling, 1992). People have traditionally used the long rice straw collected from the harvested Aman fields as fuel. Another casualty of culture fish is the loss through the less production of Aman as well as less source of this cheap fuel which was used extensively by the poor.

To protect the flee of culture fish, WMCA, without even having any legal permission, is using bamboo net at the mouth of Asi channel, which is connected with the Mondolbari channel of the Tripalli project. This seems to threaten the livelihood of neighboring people who depend on the fish yield of the Mondolbari channel.

The retting of jute is incompatible with culture fish and as a result is not permitted in the areas brought under culture fish. Farmers who wish to rot jute in the MD project are small in number and they do not have any significant voice. Now for rotting jute farmers must go outside the project area, thereby increasing production costs and adding pressure on wild fish stocks in other areas.

5.5. Elite Capture

As has been reported by Béné and Neiland (2006), elite capture is probably the most frequent pitfall in decentralization reform, and MD project is one among numerous examples of how local elite groups have captured the benefits of decentralized projects for their own use and thus reduce considerable potential positive effects. In this project, LGED first handed over water management to WMCA in 1999. At first only a few people joined as members. Later, the project was captured by elite group who become member of WMCA. They decided to keep its number of members restricted to 500 with the intention of maintaining their influence. It has negatively affected the poor, deprived section due to the lack of adequate consideration of social impacts at the planning stage. Rich members of WMCA usually control the operation of existing sluice gate for flood control and drainage. This is how public good is used as private good by the more powerful (Rahman et. al, 2007). Each year decision making complexities towards opening of the sluice gate increase social and political tension among the stakeholders. In the year 2008, majority people's demand for saving Aman failed against the intention of powerful group for gaining more profit out of culture fish. In WMCA, the leadership lies within the hands of entrepreneurs rather than farmers. And culture fish, which is generally considered to be beneficial to the rural farmers, has been being used by the elite groups of WMCA members for their own benefit. And, this power group by now has been able to even divert the project objectives in favor of culture fish ignoring the slow drainage requirements for Aman rice despite that the original objective of the project was to enhance agriculture. That is how the local elites dominate local governments and maintain commercial and political links with centers of powers (Huq, 2001).

5.6. Involvement of Women

Most water resources development projects do not directly target the poor who constitutes the vast majority of the country's population (Halcrow and others, 1998). ADB (2004) focused more on the formation of labor contracting society (LCS) which is free from socio-political considerations to include only the poor and disadvantaged or destitute women. LGED argues that the landless and women can be benefited directly through including them in earthworks, labor intensive agriculture and fishing activities. Now its focus has shifted more on the formation of LCS groups and water resource development than on monitoring water resources management practiced in their projects. However, the beneficiaries said that women in the project area do not generally participate in field-level agricultural activities due to too much drudgery associated with the traditional agricultural practices and the cultural value system. Rather, they are busy with harvesting and post harvest processing home. So the involvement of women was less.

Key features of the Gender Action Plan include increasing the women's participation in water related governance. It requires one-third female members in operation and maintenance (O&M) Committees, in Project Implementation Committees, and in Water Management Associations representing women farmers, fisher women, landless women and women laborers (LGED, 2003). But in reality, this plan is making the women participation much lesser. Firstly, the limit of one-third women participation has only restricted further gender involvement and is not adequate in many contexts. Secondly, the involvement of women is of paramount importance in other stages of water management as well. In fact, such approach needs to be adaptive with dynamic nature of different water control dimensions so that complex problems of water management can be locally managed. A further shift is necessary at least in these two aspects to initiate and sustain local water management.

6. DEVELOPMENT OF AN IWRM FRAMEWORK

In order to successfully develop a sustainable IWRM framework, identification and prioritization of water resources management issues and challenges must be done through a consensus of the stakeholders. Following the above principle, the suggestions and recommendations of the stakeholders were taken into account and the gaps in the existing IWRM framework being practiced in MD project was identified. These gaps are presented in the table 1.

Table 1: Development needed in the operational IWRM framework of Mondolbari Drainage (MD) project.

Stage	Gap in Operationalizing IWRM
Stage	Complex problems of the project were not clearly specified.
	Dependency on BWDB project was ignored. LGED skipped the coordination needed with BWDB.
	Alternate option for water conservation was needed. For that, investigation was needed for the demand of local people for water controlling structures.
	Plan for drainage of channels was not enough.
	Investigation of social, technical and Institutional Issues were required.
Design	Function of all channels did not get their required and sufficient attention. In particular, flood water entrance or drainage through another internal channel (e.g., Asi at MD project) was completely ignored.
	Although water balance was vital, no analysis thereof was performed. In particular, the answers of following questions should have been sought: 1. How much water is drained through internal channels? 2. How much area is affected by the flood water entering through the internal channels?
Implementation	During the formation of WMCA 1. Sufficient time was not given. 2. Appropriate environment was not created.
O&M	Fairness was missing in the annual performance Audit
	Absence of proper monitoring of the O&M facilities and performance of WMCA.
	Problems of IWRMU: 1. Ignored the community demand for new interventions on the internal channel. 2. Adversely affected Aman cultivation by constructing an embankment as per WMCA demand for the ease of culture fish.
	Absence of the investigation of key social, technical and institutional issues.

The proposed IWRM framework also suggests (1) providing technical and institutional support for the new sluice gate, (2) operationalizing the socially acceptable gate schedule, (3) ensuring close coordination and cooperation among LGIs (Local Government Institution), (4) monitoring the maintenance of small scale water resources infrastructures, such as embankment and the existing sluice gate at local level by ensuring proper participation of the community as well as the local government institutions, and (5) taking care of environmental and social issues. But true IWRM can take place only where the necessary platform has been created.

To overcome the constraints mentioned in Section 5, a gate operation rule has been proposed based on detailed analysis of the crop calendar, fish life cycle, tidal cycle and the demand of local people of the study area. This rule is developed in a participatory way and is an attempt to maximize benefits from agriculture and culture fish. The proposed gate operation rule is presented in Table 2.

Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	
CLOSE WITH OPENING AT EACH SPRING FLOOD			OPEN	CLOSE	OPEN	CLOSE WITH OPENING AT EACH 10 DAY INTERVAL					OPEN	CLOSE

Sluice gate will remain closed for the whole month of May and will be opened in the first of June to allow the entry of flood water to raise the water level at channels. After spawning of fingerlings, the gate will be kept closed from mid June to mid November to stock the culture fish with 6-7 times opening with intervals for a day or more depending on the Oxygen requirement of culture fish stocked. By the 2nd week of October, the fish harvesting will have already begun and fish harvesting will end by the 2nd week of November. During the 2nd week of November, depending on the flowering stage of B. Aman, the gate will be opened for Aman harvesting. After the completion of the Aman harvesting, the gate will be closed again to prevent the draining of plots so that the farmers can prepare the fields for Boro. From December to March the gate will remain closed with opening during the spring or highest tide only; this will help in tapping the tidal water. This tapping of spring tides can meet up to 7 days of irrigation demand. After that week the gate will be kept open for next 3-4 days for the entry of natural tides. Again it will be closed to tap next spring/interim flood. And finally the gate will be open during mid April to harvest Boro and remain open until harvesting is completed. This round the year gate operational rule will be same for both existing and proposed gates of the study area.

7. CONCLUSIONS AND RECOMMENDATIONS

In this research, a critical review was made on various issues and problems related to the projects following the SSWRDSP approach. A detailed case study was undertaken on the two neighboring small scale water resources projects implemented in 1999, namely the MD project and the Tripalli projects in the South West hydrological region of Bangladesh. The conclusions and findings arising out of this interdisciplinary research work are summarized below:

1. Local people protested the initial construction plan of a dam as it could create navigational problem for the neighboring villagers. LGED reacted to this protest and changed their initial concept from water conservation to drainage accordingly. It is considered as an important step towards the operationalization of IWRM.

2. IWRM unit (IWRMU) of LGED has made a good progress by clearly pointing out a framework towards operationalizing IWRM.

3. Although IWRMU was established during the second phase of SSWRDSP, it is providing support to its 1st Phase projects like MD project, particularly in O&M.

4. IWRMU supported WMCA with the construction of the embankment needed for culture fish. However, culture fish restricted the access of the commons and caused contestation between WMCA and local farmers. Even the profit, made out of this fish culturing, was not distributed equally.

5. However, WMCA was successful in proving their good governance by showing its economic gain and its political background was a big support to influence LGED.

6. Now, the power group of the society mostly controls WMCA and it works in favor of culturing fish ignoring completely the rightful demand of the commons to discontinue it.

7. Institutional conflict exists between different implementing and controlling government agencies. This is evident from problems and issues in the operation and maintenance of the water structures owned by one institution in the project area of another.

8. B. Aman cultivation is the first priority to local people after Boro. But absence of a sluice gate on another internal channel, a dysfunctional WMCA and the above mentioned constraints are hampering Aman cultivation as well as Boro irrigation.

To utilize and exploit the full potentials and to overcome the above mentioned constraints, in this research work, the gaps in the IWRM framework implemented (particularly at the planning, design and O&M stages) have been identified. To achieve true success, the projects (both ongoing and future) need to do the following:

9. The demand of the local people should be given the highest priority as opposed to the demand of the power group controlling the WMCA (in the case study area, a new sluice gate should be constructed as opposed to a floodplain enclosure)

10. Proper coordination and co-operation is needed between implementing and controlling government agencies (e.g., BWDB and LGED within the study area) with regards to the O&M of the existing water structures.

11. Socially acceptable operation rules must be established for controlling different water structures, which consider the demand of both WMCA and the common people, and is vital for Boro and Aman cultivation.

7.1 Recommendations

In case of about 170 schemes out of the first 280 started in 1999, adequate time could not be given for people's participation and its institutionalization while forming the WMCA (Hossain and Islam, 2001). To avoid such problems, this paper concludes with a number of recommendations as follows:

1. Sufficient time must be given and the appropriate atmosphere must be created to ensure the proper participation of all stakeholders and the WMCA shall not be formed unless the required level of participation is achieved.

2. LGED has to be fair while doing annual performance audit and regular monitoring of (i) O&M of the facilities, (ii) performance of WMCAs.

3. Finally, effort must be made to fully explore the challenges of IWRM in SSWRDSP. Appropriate steps must be taken to implement the policies. IWRMU must monitor the maintenance of the completed projects on key technical issues by walkthroughs with WMCAs as well as local stakeholders. It must also investigate the key social/institutional issues regarding the functioning of the WMCA itself.

4. Implementing agencies must give required attention to the popular demand and carry out detailed analysis to investigate the justification of the demands and act accordingly. For example, the importance of both (the existing and proposed) sluice gates in the project area is clear from this detailed study and analyses that therefore, LGED should consider construction of new interventions (eg. a new sluice gate) and take proper measures to strictly follow the socially acceptable gate operational rules. Though WMCA will be responsible for gate operation, LGED needs to monitor it regularly.

5. After imposing any change to the existing system, an impact study has to be conducted. For example, a study on the impact of the proposed gate operation rule at the study area should be carried out after the installation of the gate control structures. Also, neighboring dwellers fear that the enclosure of floodplains will cause less availability of natural fish at their Channel. So, LGED should also do an impact study on biodiversity, in particular to identify potential negative effects of limiting access to seasonal fisheries.

6. IWRMU of LGED needs to co-ordinate policy-making, planning and implementation in an integrated manner with WARPO, BWDB, Ministry of Water Resources, Department of Cooperatives and other ministries/departments.

7. In case, the popular demand is not fulfilled, a fair compensation scheme must be in place. For example, in the study area, if WMCA keeps promoting culture fish, adequate compensation should be provided to poorer households and local people should be allowed to participate and get benefit from these projects. Again, it should not target maximizing the profit at the cost of terminating any crops practiced locally. Furthermore, an equitable distribution of costs and benefits should also be ensured. LGED must take appropriate steps to ensure this through regular monitoring.

It is well known that providing IWRM framework is not enough, however refined it ever might be; unless the framework is well implemented success will not be achieved. This study has pointed out the gaps in implementing IWRM with the intention of developing or improving the existing framework IWRMU follows. This study is believed to provide a better understanding of the practice of IWRM in future studies and is expected to be useful in implementing the IWRM road map provided by WARPO (2009).

REFERENCES

ADB (2005), Asian Development Bank, Operations Evaluation Department: an Evaluation of Small-scale Freshwater Rural Aquaculture Development for Poverty Reduction.

ADB (2004), Asian Development Bank, Project Completion Report on Small Scale Water Resources Development Sector Project in Bangladesh.

Ahmed, M. (1997), Socioeconomic and Policy Issues in the Floodplain Fisheries of Bangladesh, Open Water Fisheries of Bangladesh (Tsai, C. and M.Y. Ali, eds.), University Press Ltd, Dhaka, pp 89–98.

Ahmed, M. and Lorica M. (2002), Improving Developing Country Food Security through Aquaculture Development-lessons from Asia, Food Policy, Vol 22, Issue 2, pp 25-141.

Alauddin, M. and Tisdell C. (1998), Bangladesh's shrimp industry and sustainable development: resource use conflict and the environment, Asian Fisheries Science 11, pp 97–110.

Albert, X. (2001), IWRM in a water abundance-scarcity cycle regime: a case study of Bangladesh, Thesis No WM-00-11, AIT, Thailand.

Béné, C. and Neiland, A. (2006), From participation to governance: a critical review of the concepts of governance, co-management and participation, and their implementation in small-scale inland fisheries in developing countries, World Fish Center, Penang, Malaysia and the CGIAR Challenge Programme on Water and Food, Colombo, Sri Lanka.

Catling, D. (1992), Rice in Deep Water, Macmillan, London.

Chambers, R. (1995), 'Paradigm shifts and the practice of participatory research development', in Power and Participatory Development: Theory and Practice (Nelson, N. and Wright, S. eds), Intermediate Technology Publications, London.

Choudhury, G. A. (2005), Participatory Water Management Approach in Bangladesh, IHP-VI Technical Document in Hydrology No. 73, UNESCO Working Series.

Datta, A. (2000), Water for food and development - approaches and initiatives in South Asia (Mollinga, P. eds), Water and food security: Perspectives from Bangladesh. London Sage Publications, New Delhi, pp 108 – 117.

Gupta, A. D., Babel, M. S., Albert, X., and Mark, O. (2005), Water sector of Bangladesh in the context of integrated water resources management: A review, Water Resources Development, Vol 21, Issue 2, pp 385-398.

GWP (2002) Global Water Partnership, IWRM Toolbox Version 2.

Halcrow & partners Ltd., Mott Macdonald Ltd, and others. (1998), Social Impact Assessment: the inception report of NWMP, WARPO and Ministry of Water Resources, Annex A2, Vol 2, Dhaka.

Hossain, G. M. A. and Islam, M. N. (2001), Small Scale Water Resources Development Sector Project in Rural Bangladesh: "Perspective of People's Participation", Proceedings of the congress- international association for hydraulic research, conference 29, Vol A, pp 20-27.

Huq, H. (2001), People's Practices: Exploring contestation, counter-development, and rural livelihoods, Community Development Library, Dhaka.

Khanal, P.R. (2003), Participation and governance in Local water Management, Paper for Alternative Water Forum, Bradford Centre for International Development, University of Bradford, UK.

LGED (1999), Combined Summary Appraisal Report and Summary IEE report, Mondolbari Drainage project, SSWRDSP, Tungipara Thana, Gopalganj District.

LGED (2000), Capacity Development Plan of Small Scale Water Resources Development Sector Project, Dhaka, Bangladesh.

LGED (2003), Gender and Development Guidelines and Action Plan for Second Small Scale Water Resources Development Sector Project, Dhaka, Bangladesh.

LGED (2007), District Water Resource Assessment, Gopalganj, SSWRDSP, Dhaka.

Lewis, D. (1997), Rethinking Aquaculture for Resource-poor Farmers: Perspective from Bangladesh, Food Policy, Vol. 22, Issue 6, pp 533-546.

Mollinga, P. P. (2008), Water, politics and development: Framing a 'political' sociology of water resources management. Water Alternatives, Vol 1, Issue 1, pp 7-23.

Rahman, A., Rahman, T. and Rahman, T. (2007), The Role of Organizations in the Growth of the Rural Non-Farm sector in Bangladesh: the case of LGED, Discussion Paper Series No. 11, University of Manchester, England.

Shankar, B., Halls, A. and Barr, J. (2005), The Effects of Surface Water Abstraction for Rice Irrigation on Floodplain Fish Production in Bangladesh, Int. J. Water, Vol. 3, No. 1, pp. 61–83.

SWAIWRMP (2004), South West Area Integrated Water Resources Management Project, , Annex F- Institutional Agenda, Final report, TA 4079 BAN.

Thompson, P., Roos, N., Sultana, P. and Thilsted, S. H. (2002), Changing Significance of Inland Fisheries for Livelihoods and Nutrition in Bangladesh, J. Crop. Prod., Vol. 6, Issue 1–2, pp 249–317.

Toufique, K. A. and Gregory R. (2008), Common Waters and Private Lands: Distributional impacts of floodplain aquaculture in Bangladesh, Food Policy, Vol 33, Issue 6, pp 587-594.

Valbo-Jørgensen, J. and Thompson, P.M. (2007), Culture-based Fisheries in Bangladesh: a Socio economic Perspective, FAO Fisheries Technical Paper, No. 499, Rome, FAO, pp 41.

WARPO (2009) Process development for preparing and implementing integrated water resources management plans, ADB RETA, project no 39119.

SAWAS
South Asian Water Studies

PAPER 2

www.sawasjournal.org
volume 2, issue 2, 2011

SAWAS
South Asian Water Studies

OVERVIEW OF WATER ALLOCATION PRACTICES IN UTTAR PRADESH AND UTTARAKHAND WITH A SPECIFIC REFERENCE TO FUTURE DEMANDS

Nitin Kaushal
Senior Manager – Water Resources and policy, Living Ganga Programme, World Wide Fund for Nature- India.
Email: nkaushal@wwfindia.net

Madan Lal Kansal
Consultant, Living Ganga Programme, Living Ganga Programme, World Wide
Fund for Nature- India.
Email: msalamkhan@iwfm.buet.ac.bd

Nitin Kaushal and Madan Lal KansalAbstract

Ganga river basin is the lifeline of the whole of northern and central India. It feeds the requirements of the region in many ways, including irrigation, drinking, and industry etc. However, this river is also one of the ten most vulnerable rivers in the world. The key reason for its vulnerability includes over-abstraction and pollution. This paper explains various stresses and challenges the river faces, especially the ever-increasing population and changing water requirements thereby leading to ever-enhancing demand for water for fulfilment of various purposes. Further, this paper elaborates what is ideally and practically possible for saving this valuable natural resource. In addition to this, the paper also illustrates the situation 'as-is' in water sector and measures being considered and taken by various governmental agencies.

Acknowledgements

The authors are thankful to Mr. Ravindra Kumar, Senior Staff Officer in State Water Resources Agency (SWaRA), Government of Uttar Pradesh and Mr. Phanish Kumar Sinha (Retired Associate professor UP-WALMI) for their inputs and contribution for this paper. The authors also appreciate support and valuable inputs made by Dr. Sejal Worah – Programme Director, WWF – India and Dr. Suresh Kumar Rohilla.

INTRODUCTION

World oceans cover about three fourth of earth's surface. According to the UN estimates, the total amount of water on earth is about 1400 Million Cubic Kilometres which is enough to cover the earth with a layer of 3000 metres depth. However the fresh water constitutes a very small proportion of this enormous quantity. About 2.7 percent of the total water available on the earth is fresh water of which about 75.2 percent lies frozen in Polar Regions and another 22.6 percent is present as ground water. The rest is available in lakes, rivers, atmosphere, moisture, soil and vegetation. What is effectively available for consumption and other uses is a small proportion of the quantity available in rivers, lakes and ground water. The crisis in water resources development and management thus arises because most of the water is not available for use and secondly it is characterized by its highly uneven spatial distribution. Accordingly, the importance of water has been recognised and greater emphasis is being explored on its economic use and better management.

Further, with the increasing global water consumption, the situation in India is likely to aggravate colossally. A recently released study indicates that, in India, the water demand is growing annually by 2.8 percent to reach a whopping 1500 Billion Cubic Meters while supply is projected at 744 BCM, i.e. just half the demand. As a result, most of India's river basins could face severe deficits by 2030 with some of the most populous river basins facing the biggest absolute gap.

It's a well known fact that water is the basic need of mankind. From time immemorial, rivers have been considered as one of the main places for civilization throughout the world, this is chiefly due to the fact that rivers fulfil almost all requirements. However, this often leads to the degrading state of rivers. It is in this context, the paper will discuss current water allocation and future requirements for an ecologically healthy river, in this case, the Ganga. Further, an analysis of current water allocation practices in upper stretch of river Ganga vis-à-vis future water needs, the existing institutional arrangements and legal framework would also be beneficial for overall understanding of the problems.

Structure-wise, this paper discusses about water resources of River Ganga, its availability for various purposes, the water allocation scenario with specific reference to future demands. It also reviews concerned laws and policies to benefit from, and finally the recommendations to have positive gains in regard to water resources allocation and management.

Ganga river basin: Brief overview

The Ganga basin is a part of the composite Ganga-Brahmaputra-Meghna basin draining 1,086,000 square kilometers in China, Nepal, India and Bangladesh. To the north, the Himalaya or lower parallel ranges beyond form the Ganga-Brahmaputra divide. On the west the Ganga basin borders the Indus basin and then the Aravali ridge. Southern limits are the Vindhyas and Chota Nagpur Plateau. On the east, the Ganga merges with the Brahmaputra through a complex system of common distributaries into the Bay of Bengal. The Ganga river basin is the largest one in India in terms of catchment area constituting 26% of country's landmass (8,61,404 sq km) and supporting about 43% of its population (448.3 million as per 2001 census). The annual surface water potential of the basin has been assessed as 525 km^3 in India, out of which 250 km^3 is utilizable water. There is about 580,000 km^2 of arable land; 29.5% of the cultivable area of India. Its Catchment

lies in the states of Uttar Pradesh (294,364 km^2), Madhya Pradesh (198,962 km^2), Bihar (143,961 km^2), Rajasthan (112,490 km^2), West Bengal (71,485 km^2), Haryana (34,341 km^2), Himachal Pradesh (4,317 km^2) and Delhi (1,484 km^2), as well as the whole of Bangladesh, Nepal and Bhutan. Several tributaries rise inside Tibet before flowing south through Nepal.

The basin comprises of semi-arid valleys in the rain shadow north of the Himalaya, densely forested mountains south of the highest ranges, the scrubby Shivalik foothills and the fertile Gangetic plains. Central highlands south of the Gangetic Plain have plateaus, hills and mountains intersected by valleys and river plains. The important soil types found in the basin are sand, loam, clay and their combinations such as sandy loam and silty clay.

The river Ganga, originating in the Himalayas, is one of the world's major river systems with an iconic stature. The Ganga river basin is one of the most fertile basins in the world. The river runs for 2,525 kilometers from its source 'Gangotri' in the Himalayas to the Sunderbans Delta in Bangladesh. Glacier melt provides for a year round constant flow from the higher reaches, while the monsoon season brings peak flows from July to October. However it is the precipitation that is more significant flows in river Ganga.

Although the river as a whole is vulnerable to many threats, but the upper stretch (mainly from Gangotri to Varanasi) faces numerous challenges ranging from over-abstraction (for irrigation, domestic and industrial use) to sewage and industrial pollution. This stretch is often referred as 'critical stretch' and that is despite the fact that, this river has immense pertinence in terms of cultural and spiritual values. Infact this river is the lifeline for the people residing in its basin.

Web-note from Ministry of Water Resources website
A Report by McKinsey in collaboration with World Bank affiliate International Finance Corporation

The water availability in the upper Ganga river stretch is affected chiefly due to two aspects:

3. The scenario of water availability in upper Ganga stretch is overwhelming and this has led to creation of quite a few major irrigation systems. Infact the historical Upper Ganga Canal, constructed in 1870, which is considered to be an engineering marvel, takes off from this stretch of river Ganga. Further, other canals like Lower Ganga, Madhya Ganga, Parallel Upper Ganga and Eastern Ganga all takes off from this same stretch. While commissioning of these systems, it was envisaged that they will be meant primarily for subsistence agriculture, whereas in reality and in due course of time these systems are mainly used for water loving crops like – sugarcane and paddy as the water has been in abundance. The problem gets further aggravated by the fact that, the area under cultivation has increased tremendously and further put pressure on the canals for supplying additional water. Various canal systems on river Ganga in totality withdraw about 43000 cusec of water in kharif and 19000 cusec of water in Rabi. Most of the irrigation canals on this stretch of the river are run-of-the-river schemes, where large scale abstractions of water take place.

2. The geographical area of Uttar Pradesh is about 7% of the country's total area whereas it supports about 16% of country's population. If we compare population density of 1971 and 2001, it has increased by more than 100% i.e. from 300 to 689, whereas the average population density for India is 324. This has led to a sharp increase in water demand from the domestic and industrial sectors; it further puts pressure on available water resources. The upper stretch of the river provides drinking water to Delhi (200 cusecs) and many western and central Uttar Pradesh's cities like – Meerut, Ghaziabad, Kanpur, Varanasi etc. Further, these cities are also industrial towns, so industrial demand of water is largely met by the very same source. In addition to this, certain power plants like NTPC, Reliance Power Plant, Harduaganj Power Station also gets water (in tune to about 300 cusecs) from similar source, which further puts pressure on water availability.

Though these development has brought lot of wealth to the area, especially the western and western-central Uttar Pradesh, but this has also put pressure on water delivery from this river stretch and over a period of time, this stretch has become so water starved (especially during the lean season) that there is very less water available for the river itself, i.e. for maintaining its own ecology and health.

2.2 Water Rights on Ganga Water

The rights of Uttar Pradesh and Uttarakhand would be regulated by the rights of India on the Ganga. Crucial one among the treaties is the Ganga Water Treaty dated 12.12.96 between India and Bangladesh for sharing Ganga waters at Farakka Barrage. Article VIII of this treaty calls for cooperation in finding solutions to the long term problem of augmentation of flow in river Ganga. Further, clause II of Article II stresses that, efforts must be made by upper riparian (states/state) to protect the flows at Farakka.

The factors mentioned in the previous section pose a serious challenge to maintain the required flow in the river for the downstream station.

There is another angle to view this issue, although it has been reported that since Ganga River is largely fed by precipitation and less by snow and glaciers melt, so overall the quantum of water availability is likely to increase under a climate change scenario. On similar lines, as per an estimate by the Ministry of Environment and Forests, the annual rainfall in Ganga Basin would be 150 cm (2071-2100) as compared to current 134 cm (1960-1999) and similarly the annual flow would be 543 km^2 (2071-2100) as compared to current 482 km^2 (1960-1999). But during the summer months i.e. April-May-June, the pinch will be severely felt. So in wake of this assumption, treaties, like the Farakka ones will require to be renegotiated.

Web-note from Ministry of Water Resources website
A Report by McKinsey in collaboration with World Bank affiliate International Finance Corporation

Since the upper stretch of River Ganga passes through two states namely Uttarakhand and Uttar Pradesh, so a description of both states will be beneficial to understand the situation 'as-is' at the ground with respect to water resources, its usage and the response of the respective governments. However it is to be noted that, it's the state of Uttar Pradesh which is more crucial for discussion at this juncture, as the demand and supply side is much more prominent in this state.

1. UTTARAKHAND

Agriculture is of critical importance in Uttarakhand for human sustenance, because it supports 75–80% of the population. Uttarakhand has a land area of 55845 km² of which 80% is hilly and the remaining 20% is plain land. Total cropped area accounts for around 23.5% of the total land area. The net area sown is around 14.5% and is under pressure to sustain a population of more than 50 million, almost 80% of which is rural. Only 11% of the total area is irrigated (in the hill areas), with the rest of the sown area being rain fed, where farmers often grow three crops in two years.

Traditional irrigation methods in the hill area have made use of the topography of the region – the steep slopes – and have relied on gravity for watering the fields. These irrigation canals dug along the contours of the fields to maintain the flow of water are locally called guls, whose length is 17,526 km as against 8,238 km length of 'Canals', showing the predominance of traditional irrigation systems. Unlike the hills, where agriculture is subsistence oriented, in the plains, it follows market economy, and has given impetus to ancillary industries depending on agro-products such as sugarcane mills and rice mills. The area irrigated by major and medium schemes amounts to a mere 6.97%. The area irrigated by Minor Irrigation amounts to about 93.02%.

2. UTTAR PRADESH

The state of Uttar Pradesh, most of whose area falls in the Ganga basin is endowed with bountiful water resources, but is now feeling the scarcity due to competing demands for various purposes. Tables 1 show a comparative sectoral allocation of water averages (in percentage) for the state. With relatively higher demands from other sectors; the availability of water for irrigation sector is likely to reduce progressively to about 70% to 75% in future.

Sectors	Uttar Pradesh	
	2001	**2050**
Irrigation	96	79
Domestic	3	12
Industry and Power	1	9
Others	-	-
Total	**100**	**100**

Table-1: Sectoral Allocation by Year (Source: SWaRA, UP)

2.1 Water Availability

The indo-gangetic plains are known to be resource rich, both in terms of water availability and the land fertility. The annual rainfall ranges from 39 cm to 200 cm with an average of 105 cm. About 80% of the rainfall occurs during the monsoon months, i.e. between July to September/October. Thus, there are wide fluctuations in the flow characteristics of the river because of these large scale temporal variations in the precipitation over the year. This puts pressure especially during the lean season, i.e. from December to June.

3. Executive Summary, Theme Paper on Efficiency of Water Resources System by India Water Resources Society 2004
4. SWaRA – State Water Resources Agency, Uttar Pradesh Irrigation Department, Government of Uttar Pradesh
5. Having Command Area above 20,000 Hectares
6. SOURCE: Inception Report, study on Problems and Prospects of Water and Energy Use Efficiency in Agriculture in Upper Ganga Basin

Upstream / Downstream Obligations and Allocations – the 'as is' scenario

A flowchart (Figure–1) illustrating inter-sectoral water allocation vis-à-vis demand supply mechanism is given below.

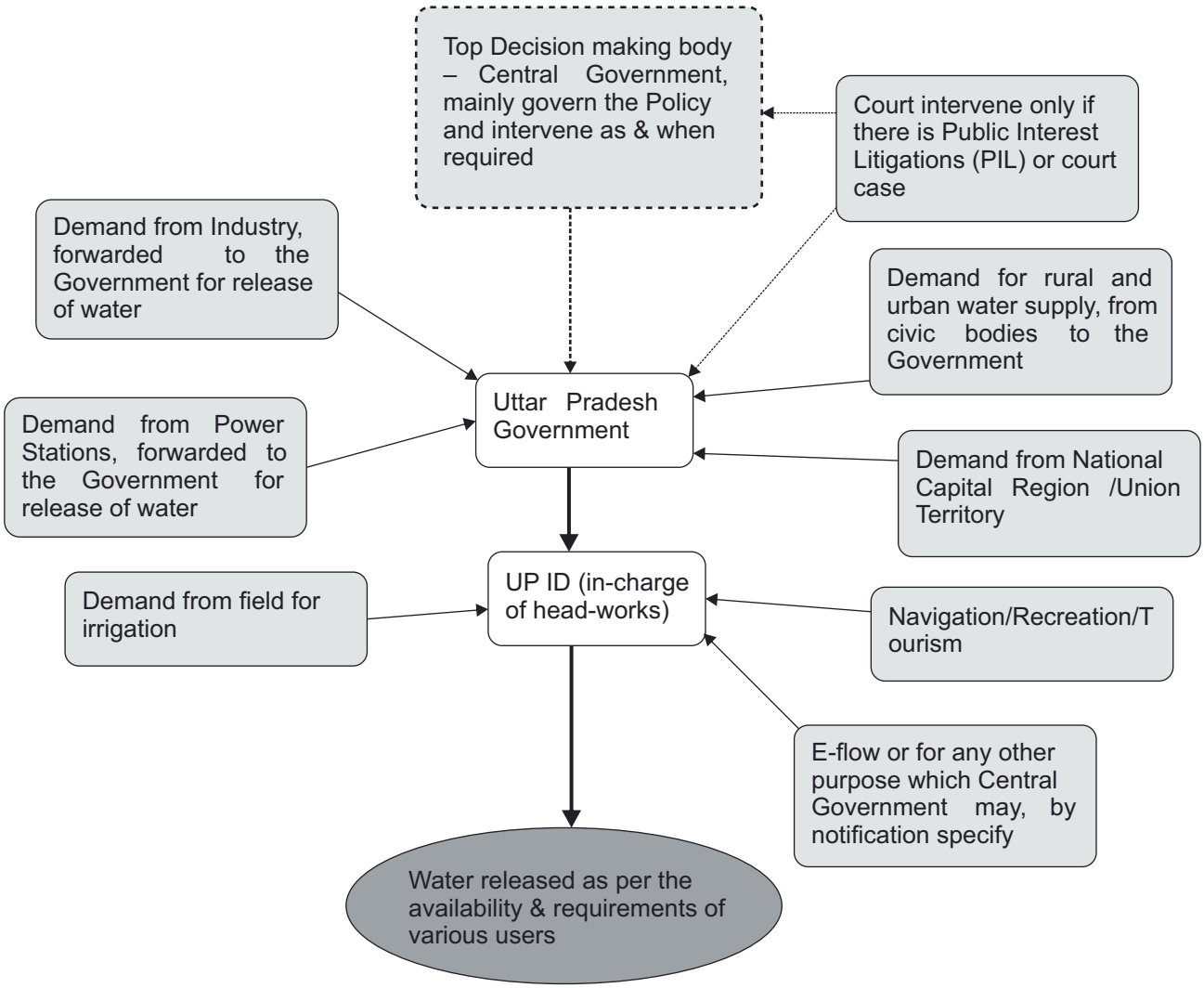


Figure-1: Flowchart illustrating Inter-sectoral water allocation practices vis-à-vis demand mechanism

By and large the allocations are made as per the chart illustrated above, however there are certain other drivers which locally influence water allocation within irrigation sector; this includes demand from local politicians and other powerful people for their particular area. The percentage of such practices is not high, however with a view to have ideal water allocation scenario, the same is required to be addressed, as they are key contributors for inequitable water distribution and quite often water abusage as well.

The current process of water allocation may not require too many modifications, except for due allocation for environmental purposes; however it's the quantum of sectoral water allocation that requires considerable renegotiations, given the fact that the water allocated for irrigation sector is above 60% of the total allocated water.

The information available on irrigation efficiency obtained in various major and medium projects is very scanty. Irrigation sector is the major consumer of water, so even a marginal improvement in the efficiency of water use in this sector will result in saving of substantial quantity of water, which can be utilized for maintaining Environmental Flows in rivers, especially in Ganga as major chunk of water from this river is diverted for irrigation. It is to be stressed that, the thrust should not be on providing more water for irrigation but it should be on improving the existing levels of efficiency in irrigation, so that the saved water can be used elsewhere, preferably for meeting the environmental requirements of the river. The efficiency obtained in this sector is generally in the order of 35-40% in surface water and 65-70% in ground water. These are considered to be very low and there is sufficient scope of improvement. So the need is to have higher water efficiencies for agricultural production, i.e. "More Crop Per Drop". The NCIWRDP, constituted by Government of India has in its report advocated that, it should be possible to achieve 50-60% efficiency in surface water irrigation and 70-75% efficiency in ground water irrigation by 2025 and 2050 respectively.

Current levels of water loss in irrigation are critical for the improvement of the overall scenario. At present, the canals are under performing and canal water use efficiency is as low as 30-40%. Improvement of about 10-20% is feasible and achievable with minor adjustments and focused sensitization of farmers. Even 10% improvement in canal and ground water efficiencies may yield substantial flow to the order of 2.7 BCM/year in the river Ganga.

On the other hand, in the times to come there is a likely possibility that additional water will be required for (i) drinking and domestic (to feed ever-growing population), (ii) industrial (to meet increasing industrial demand, an evidence of the same is a recent development that, the GoUP has come out with a Government Order which provides overriding water priority for industries against irrigation) and (iii) environmental needs (growing level of awareness related to river health issues and diminishing levels of water quality and quantity in the river). Since, the water available is almost finite, so the curbing could be chiefly from the allocation of irrigation sector.

The farm level irrigation efficiency is largely affected due to following aspects:

1. Absence or malfunctioning of control structures
2. Absence of metering
3. Lack of vigil on the canals and diversion structures
4. Lack of awareness (among farmers) in regard to quantum of water to be applied for the crop
5. Lack of extension services with regard to information dissemination about less-water requiring varieties, improved seeds, hybrid varieties etc.

Institutional Issues – *the 'as-is' scenario*

The present institutional arrangement in Uttar Pradesh, for the water resources sector is highly disintegrated, loosely coordinated and highly governmental and bureaucratic with very little effective participation of stake-holders other than the Irrigation Department. However the state has now initiated thinking towards broader water sector reforms in its own ways. These measures will help but not in a significant manner until there is absolute dedication and will to achieve the same.

The Major and Medium Irrigation Schemes and Flood Control works are with Irrigation Department (Civil) whereas Major, Medium and Minor Lift Pump Canals are being maintained by the Irrigation Department (Mechanical) and operation is with the civil engineering wing. The Irrigation Department currently employs about 5000 regular employees.

8. SOURCE: Inception Report of Study on "Problems and Prospects of Water and Energy Use Efficiency in Agriculture in Upper Ganga Basin"

Private minor irrigation schemes are looked after by the Minor Irrigation Department. Domestic water supply is dealt with by UP Jal Nigam, Jal Sansthan & local bodies. The Land Development and Water Resources Department undertakes soil and water conservation schemes and manages Command Area Development. The Ramganga and Sharda Sahayak Command Area Development Authority are supposed to take care of construction of the tertiary canal system, i.e. field channels (gul).

Under a recent development the state tube-wells have been transferred to the village Panchayats. The Uttar Pradesh Panchayati Raj Act, 1947 and as amended in 1963 empowers the State Government to require any Gaon (Village) Panchayat to construct, repair or maintain any small irrigation project and regulate the supply of water for irrigation purposes. The Act also provides that the Gaon Panchayat will have control over all waterways other than canals (as defined in the NICD Act, 1873) situated within their jurisdiction and not being under the control of State Government. However, their maintenance work is still being carried by the Irrigation Department (Mechanical). It is envisaged that, with this move the level of stakeholders participation will enhance.

Internal coordination amongst departments in Uttar Pradesh

State Water Board

A State Water Board has been constituted with a mandate to devise water policy for the state and to decide sectoral allocation priorities. It was constituted in 1996 under the chairmanship of the Chief Secretary with the Engineer-in-Chief, Irrigation Department as its member secretary. The State Water Board prepared the State Water Policy in 1999. However, the policy needs revision in the fast changing scenario of competing demands and hence the role of the State Water Board becomes more imperative for coordinating and implementing water allocation priorities.

State Water Resources Agency

The mandate of State Water Resources Agency (SWaRA) includes – allocation of water for various uses, preparation of river basin water plan, formulation of State Water Policy, preparation of water laws and implementation of SWP. The SWaRA was created in 2001 under the chairmanship of the Principal Secretary, Irrigation, GoUP

.

State Water Resources Data and Analysis Centre

As a depository of data related to water and related statistics at state level, a data centre is created within SWaRA which stores raw data obtained from various state and central agencies and analyses them in a river basin context.

Uttar Pradesh Water Management and Regulatory Commission

With a view to ensure proper utilization and regulation of water resources of the State, the government has enacted the 'UP Water Management and Regulatory Commission Act 2008'; however the Rules and Regulations are being framed. It is envisaged that this Act will facilitate and ensure judicious, equitable and sustainable management, allocation and optimal utilization of water resources for environmentally and economically sustainable development of the state.

The Uttar Pradesh Water Management and Regulatory Commission (UPWMRC), which is an entity with constitutional authority was recently formed, and will have representation from associated fields, like irrigation, agriculture, finance, economics etc. Whereas the State Water Resources Agency (SWaRA), is a functional entity and does all the background work including – data collation, analysis and research for the commission and for the board.

At the moment there has been some teething troubles in the coordination and consensus building among these entities, however on a positive note it is hoped that in the times to come, both these entities will contribute towards larger water sector reforms in the state. Currently the UPWMRC is engaged in revising the water charges for the users, including irrigation, industry and others. The SWaRA is helping the commission with this task. The water charges have not been revised since 1998, so this is a crucial task being undertaken by the commission with the help of SWaRA.

Review of policies, legislations and IMO

The Government of India has drafted the National Water Policy (1987 and reviewed in 2002) under the aegis of the National Water Resources Council and the same has been accepted by the states and Union Territories. It stipulates optimization of efficiency of utilization in all the diverse uses of water and an awareness of water as a scarce resource. The policy further prioritize various water uses, which are -

i) Drinking
ii) Irrigation
iii) Hydro-Power
iv) Navigation
v) Industrial and other uses etc.

Within the above broad parameters, the state of Uttar Pradesh, while recognizing water as a State subject, has adopted these guidelines in the State Water Policy, 1999. The State Water Policy is not very clear, when it comes to priority for domestic use, sanitation, health & hygiene and environment & ecology. However, Policy recommends that the water allocations in an irrigation system should be done with due regard to equity and social justice. The policy also suggests for adoption of rotational water distribution system and supply of water on volumetric basis for removing disparities in the availability of water between head and tail reaches. In addition to this, the Policy further calls for ensuring of ecological and environmental balance while developing water resources and therefore stresses the need for a minimum flow in the natural streams, which fails to serve the very purpose. The policy accepts that, the present status has a substantial scope for qualitative improvement in this field. In this regard thrust needs to be given to:

i. Improvement of command areas (such as leveling of fields, improvement and maintenance of water courses etc.)
ii. Adoption of improved irrigation and agriculture practices using appropriate technology to ensure optimal use of water for agriculture production. This should also aim at adoption of appropriate cropping patterns

Though the water requirement of industries used to be very small compared to other sectoral demands in earlier years, the rapid industrialization is changing the scenario. As the industries are location specific, so the demand of water is also required to be location specific. Keeping this in view, the state government of Uttar Pradesh has amended their State Water Policy vide notification dated August 5th, 2004, to the extent that, it now has overriding priority over irrigation sector. Yet no effective mechanism is in place in UP to measure and monitors the quantity of water used by industries. In many ways this shows the changing attitude and priorities at the government levels.

While reviewing other relevant legal provisions as contained in the existing UP Irrigation Manual of Orders (IMO) and Northern India Canal and Drainage Act, 1873 being followed, it has been observed that the major Irrigation Acts which are now over a hundred years old, are based on social concepts so as to provide basic day-to-day necessities of life and do not consider farmer's involvement either important or desirable.

Irrigation administration was retained in the hands of technocratic bureaucracy which preferred to distance itself from the farmers and continues to do the same even today. The new enactments and statues in post independence India have followed the same tradition occasionally recognizing the importance of farmers but never giving them authority, power or resources to deal with irrigation administration in the ways farmers may deem fit.

Various irrigation related Acts, namely NICD Act (1873), Bengal Irrigation Act (1876) and the Bombay Irrigation Act (1879) do not provide for farmers' participation in irrigation management. These laws have guided State Irrigation Legislations in various states. The existing irrigation acts in most states, do not provide for the transfer of funds to water users for undertaking repairs. Nor do they encourage the mobilization of collective efforts and group initiatives in irrigation management. Farmers have everywhere remained dependent on State Government and the irrigation bureaucracy for supply and maintenance. All authority is vested in the department. A designated officer of the Irrigation Department is vested with large powers. Thus, decision-making rests with the irrigation bureaucracy and not with water users. Even in the matter of settlement of disputes, farmers have little say. Decisions affecting farmers are imposed rather than developed in consultation with them.

Department officers are not accountable to water users with regard to the supply of water, and the timings and the changes, are decided primarily by them. There is a lack of transparency in the management of the irrigation systems. Whether water will be released and when, correlation between water deliveries and farm requirements and, stoppages which affect water users are often not known to them. Decisions in these matters lie with the Irrigation Department and contrary to claims, farmers are usually not consulted. Non-existence of proper and strict Warabandi/Osrabandi at tertiary level is leading to inequitable distribution of water and loss of efficiency. Practically, this has led to widespread disagreement and disobedience among the farming communities and thus leaves with little hope for support from them.

Any move of future allocation of water resources is bound to be futile if it doesn't take into account field realities and local dynamics. For instance – if there is a thought that allocation for irrigation will be reduced then it will not succeed until the farming community is made aware about its necessity and also about various means of improving efficiency levels at the farm. This will also involve effective extension services. At the moment there is no such window of opportunity. On an optimistic note, such a move could be the UP PIM Act of 2009 which is currently being enacted in pilot areas in Uttar Pradesh and will be enacted throughout the state at a later stage. More about this will be discussed in last section of this paper.

Another one step forward in regard to water resources management is the move by the state government to come up with State Environment Policy 2006. The Section 6.2.4 of the policy calls for the adoption of integrated approaches by various authorities and departments for the management of water resources. Under this Section, which is on 'Strategy'; the historical, social, cultural, religious, drinking, irrigation and industrial value of rivers is recognized. It also recognizes necessity of due consideration for mitigating the impacts on the aquatic and terrestrial biodiversity and livelihood of individuals from the multipurpose river projects. The Policy also calls for the constitution of a river authority.

The word warabandi originated from two vernacular words, wara and bandi, meaning `turn' and `fixation' respectively. As such, warabandi literally means `fixation of turn' for supply of water to the farmers. Osrabandi is a synonym of warabandi. Under this system of management, the available water, whatever its volume, is equitably allocated to all farmers in the command irrespective of location of their holdings. The share of water is proportional to the holding area in the outlet command and allocated in terms of time interval as a fraction of the total hours of the week. Whereas the term warabandi is commonly used in Haryana, Punjab and Rajasthan, this system of water distribution is usually referred to as osrabandi in Uttar Pradesh.

=Irrigation Distribution system and its inherent anomalies

Design and operation of the conveyance and distribution systems is in such a way that, inequity and indiscipline prevail in the command. The systems are designed to run either at full discharge or at partial discharge. The cross-regulators and head-regulators are so designed, that the off taking branch can draw full supply even when the flow in parent channel is in having partial supply. In the secondary system, this leads to various manipulations in the head reaches i.e. the head branches take larger share of the parent channel and much higher shortages are passed on to the lower branches. So the operation of the system is fundamentally dependent upon the two factors, i.e. method of water allocation and method of water distribution adopted for the system and water control within the distribution system.

In the north and north-western states of India i.e. Uttar Pradesh, Uttarakhand, Punjab and Haryana, the Supply Based System is generally followed. In this system, the available supplies are distributed amongst all stakeholders in proportion to the size of their land-holdings catering to the requirements of rotational cropping patterns with liberty of discretional use. They are even allowed to supplement their requirements from other sources like wells and tube-wells. For operation at secondary canal levels and for equitable distribution of water in proportion to the size of land holdings, each unit of culturable commanded area is allotted a fixed rate of flow of water known as 'Water Allowance'. It may be defined as the number of cusecs of outlet capacity authorized per thousand acre of culturable irrigable area. The 'Water Allowance' therefore not only defines the size of outlet for each outlet area, but also forms the basis for design of distributing channels in successive stages. Its value is often a compromise between demand and supply and is decided keeping in view factors like type of soil, normal crops that are to be grown in the area, rainfall, climate, intensity of irrigation desired to be achieved and availability of water in a normal year. The carrying capacity of distributaries and water courses is designed on the basis of the 'Water Allowance'. Outlets from the distributaries are ungated and are designed to take their authorized discharge in full supply conditions in the distributary, which usually operates as a unit either full or nil, which means that all outlets will draw their share simultaneously and automatically (being ungated) when the distributary runs full.

Competing demands for drinking, irrigation, industry and power generation necessitate rotational running of various canal systems during periods of lean flow. Whereas, it is easy to prepare an operational schedule for storage project where the quantum of available supplies is more or less known, the preparation of such an operation schedule on the run-off the river schemes is based on experience of the previous years. An operational schedule for storage projects inter-alia include supply of water for irrigation on a fortnightly basis with the provision that supplemental irrigation may become necessary depending on the rainfall in the catchment area. In this case, the schedule is prepared for Rabi (hot weather) supplies at the end of the monsoon (usually by the 15th of October), when approximate water available for the year is known. However, for run-of-the-river schemes like those on the river Ganga, irrigation withdrawals will depend on crop requirement and availability of water in the river. During the period of lean availability it may not be possible to run all the channels simultaneously even if there is keen demand on all of them. Under these circumstances, it becomes necessary to demarcate various channels of the system in a group or set of groups at a time and keep the remaining channels closed. This process of rotation is called 'Rostering'. In cases when supply matches demand all groups could run at full supply simultaneously. This Roster is prepared before the start of each season indicating weekly running of channels commencing from each Monday in the form of a Regulation Order. A register of actual running of channels is maintained and any variation from roster is clearly indicated with reasons. If due to some reason such as a breach the canal has not been able to run then it is made to run for the remaining days of the week so that each irrigator get his/her due share. Regulation Orders are prepared in such a way that each irrigator gets at least one irrigation in a month.

Discussion with the officers of UP Irrigation Department revealed that, although roasters are prepared on all systems of Ganga Canal, the operations in the field are not very meticulous, because of non-existence of any dependable system of operations at tertiary level i.e. at outlet level especially in the command of Lower Ganga Canal System.

The distribution system in other parts of North India, for instance in Punjab, Haryana and Western Uttar Pradesh where operation at tertiary level i.e. below outlet is managed by the cultivators through an equitable system of water distribution known as Osrabandi/Warabandi which is a system of water distribution according to a pre-determined schedule specifying the day, time and duration of supply to each irrigator in proportion to the size of his land holdings in the outlet command. Since timings of supply of water are fixed taking in account various factors like – land-type, standing crop and capacity of channel, the seepage losses in water courses and field channels, it enforces some rationing in the period of shortage. The system attempts to match available supply with demand and hence such system is working more or less satisfactorily. The UP Irrigation Department has designed the system of distribution on this very principle, keeping in view the following –

1. Within the minor canal command area, an unregulated free flow system will convey water to all the water course outlets which common chaks (about 30-60 ha CCA) with all outlets operated simultaneously during the weekly allocation period.

2. At the same time each farmer has been allowed to select his crops and cropping patterns supplementing his requirements with available private groundwater.

Although, the system is working more or less satisfactorily in the areas served by Upper Ganga Canal System in Western U.P, yet in spite of these specific provisions, it has not been implemented in the spirit is which it was envisaged, resulting in mismanagement, and wastage of water at various levels. Problem of head-enders taking excess water at the cost of tail-enders is more and more acute. This is partly because of weak motivation at various departmental levels coupled with the lack of political will in the area.

Cropping pattern

It is a well known fact that, water requirement for irrigation is a derived demand. The key determining variables include: requirement for food production, requirement for non-food production, efficiency of water use and production per unit of land.

Food sufficiency and to some extent export of food and non-food agricultural produce is essential for the country from both strategic and socio-economic considerations. Necessity for food self-sufficiency has always remained a key factor with authorities/commissions set-up from time to time. It rests mainly on four fundamental arguments –

1. unreliability of imported food grains for a large country like India
2. potential of augmenting food supply by improving existing low yields
3. foreign exchange constraints in case of large scale imports
4. income and employment considerations for the large workforce available in India, which is dependent on food production

The case of augmenting exports, particularly of the so-called commercial crops rests on comparative advantage this country has in production of several non-food agricultural commodities due to its diverse climate and land resources. Consideration in estimation of water requirement for irrigation is self sufficiency in food production at state/national level, where growing demand for better diet has increased the domestic demand for "thirsty" crops, namely – rice, wheat and sugarcane. About 66 – 71% of water usage goes for this purpose, thus tremendously increasing the absolute gap between demand and supply. Efforts to bridge this will mainly include (i) additional focus on water conservation and (ii) improving water use efficiency. Although water use efficiency is important, yet some losses are inevitable which in the upper reaches of river basin are returned to the system lower down as base-flow or recharge of ground water aquifers for further use.

On the Ganga system, three cropping zones can be distinguished, i.e. the sugarcane (western), the intermediate and the southern zone. Thought the cropping pattern varies significantly but it is seen from the statistics that the sugarcane crop is predominant in the head reaches of the system, whereas wheat and rice takes predominance in intermediate and southern zones. The historic reason for this pattern lies in the amount of irrigation water diverted in different areas.

The farmers with the introduction of irrigation have shifted from the traditional low value, low productivity and low irrigation water requirement crops to higher value high water requiring crops of proven stable productivity. Such typical shifts have resulted in skewed irrigation demand due to concentration of high water requiring crops in certain pockets, typical examples of this are – adoption of Cereal-Cereal; Rice-Wheat rotation in Northern India, especially in Punjab and Haryana and concentration of sugarcane in Western Uttar Pradesh. In addition, the farmers in order to take advantage of early market, cheap and early availability of labour, assured uninterrupted irrigation and subsidized/free electricity tends to advance the sowing of crops to high evaporative months escalating water demand further.

Way Forward

As has already been established, there is a wide gap between consumption and availability of water resources. Therefore additional efforts will be needed to bridge the gap. Concerted efforts are needed to use water more efficiently in three major areas of consumption i.e. agriculture, industry and municipal/domestic.
It is almost impossible that, irrigation sector will continue to enjoy the lion's share of water allocation in the future, so it has to mend its ways and means to ensure efficiency at all levels. The irrigation sector is the one with maximum scope of improvement; therefore key interventions are required for this specific aspect, which are as follows

1. *Legislations to facilitate Irrigation Management Transfer*

It is imperative that the Irrigation Acts and Rules must be amended to incorporate new social contract so as to legitimize a relationship of equals or a partnership between the Irrigation Bureaucracy and the Water Users. Provisions for the formation of farmers' bodies' i.e. WUAs or Farmer Organizations should be the hallmark of these laws so that the Participatory Irrigation Management (PIM) initiative becomes practicable.

From last 10–15 years, the government has recognized the vitality and necessity of farmers' involvement in operation and maintenance of canals and its associated systems. It is evident from the fact that, many Indian states including Andhra Pradesh, Madhya Pradesh, Orissa, Rajasthan, Maharashtra and Gujarat have come up with specific PIM legislations for their respective states. Further, some other states, including Karnataka has made necessary amendments in their prevailing Irrigation Acts. Despite all that, the development in this regard is not so impressive. However, it appears that in the times to come, the role of user's entities i.e. Water Users Associations will be fully recognized and they will be accordingly mainstreamed and strengthened. The farmers must be enabled to take the responsibility for system operations, maintenance and water distribution, be suitably empowered and given the financial resources and technical know-how relevant to their area of jurisdiction. This will help in improving the irrigation efficiency which in-turn may enable saving of supplies for Environmental Flows and for other developmental purposes.

The state of Uttar Pradesh has taken one step forward in that direction by enacting 'The Uttar Pradesh Participatory Irrigation Management Act, 2009'. For implementation of this Act, its Rules and Regulations have also been prepared. It is anticipated that, the Irrigation Department will be able to enforce this Act containing provisions of PIM in Sharda Sahayak Irrigation System of the state which falls under the project Area of World Bank funded Uttar Pradesh Water Sector Restructuring Project (UPWSRP) and complete Warabandi/Osrabandi accordingly.

This pilot project is expected to act as a model for further implementation in other canal command areas of Madhya Ganga and Lower Ganga Systems. This Act is required to be implemented in its true spirit, as it has been noted at many instances, the envisaged outcomes are difficult to achieve due to various reasons, including – department's reluctance and lack of support for its implementation, lack of awareness among the farmers about their rights and responsibilities. It looks like a moon-shot, but if at all it becomes effective then many issues are likely to get resolved.

2. *Conjunctive use of water*

Surface water and ground water are an integral part of available water resources. However, planning for their use has generally been in isolation resulting in sub-optimal utilization. Both the resources should therefore be developed in integrated and coordinated manner and be used conjunctively. The net output in the conjunctive mode is much more when compared to the net output when each source of water is used separately. Conjunctive use of both resources should be considered an alternative to tide over water scarcity during drought years. Large evaporation from carry over storage substantially reduces the effective availability. Ground water resources provide evaporation free carry over and can supplement the surface supplies whenever shortages are experienced.

The, development of eco-friendly strategies for conjunctive use of surface and ground water will optimize the use of water and also mitigate the problem of water logging to a large extent besides promoting sustainability of crop production in the given water endowments.

Discussions with Irrigation Department officers informed that, as an effort to ensure water adequacy, the concept of 'conjunctive use of surface and ground water' in a harmonious manner is being developed by SWaRA in a pilot project area, so that if found successful and workable, it could be adopted in command areas of other canal systems, where a large number of shallow irrigation tube-wells have been installed.

Under this initiative, the department is planning to come up with a Roster, which, in addition to usual canal running time-period (i.e. quantum of water availability through canals), will also have indicative water requirement from tube-wells (shallow ones). This will give farmers a clear idea about water availability through canal and required supplementing through the tube-wells. It is being contemplated that, administrative block-wise assessment of groundwater availability be made in the command of each distributary system and while preparing rosters, one or two rounds of watering will be exclusively done by groundwater depending upon field requirements. In this manner, groundwater utilization will get further impetus because during this period farmers may get assured and reliable supply of power in the irrigated areas. It will provide a range of possibilities viz.

Availability of adequate water supplies when supplemented by groundwater at any point of time.
To give late watering during lean flow periods for the maturity of crops.

3. *Crop diversification and integration of other practices*

The Green Revolution that made the country self-reliant in food and provided the food and nutritional security, has also ushered in second generation problems i.e. degradation of natural resources, decreasing total factor productivity and depleting of water resources apart from the salinisation of soils and nutrient deficiency in soil. This can be overcome by growing of different crops in a particular sequence in the same piece of land in a given period of time.

Diversification of crops, where the system of raising of crops plays a significant role, is therefore, one of the many challenges in the process of increasing the efficiency of water resources system. In the present scenario, agriculture in our country is at the threshold of diversification of crops and multi-cropping options. These broadly include crop rotation, mixed cropping, double-cropping etc. which will prove useful in the long run.

It is noteworthy that for sustainable agriculture integration of agriculture with pisciculture, poultry farming and animal husbandry in the same land will be useful because animal and poultry waste will act as organic manure on which microbes would work for decomposition and help in this integrating of crop residues thereby reducing the use of chemical fertilizers. Thus, the major advantage of these types of diversifications would be reduced erosion, improved soil fertility, increased yield, reduction in need of nitrogenous fertilizers in case of legumes and reduced risk of crop failure. These genetic diversifications and location specific varieties are essential for achieving sustainable production.

In response to the demand for commercialization of agriculture, there is a need to shift the focus from routine food grain system to newer cropping systems to meet the ever-increasing demand of pulses, oilseeds, fodder, fibre, fuels, spices, fruits and vegetables, medicinal and other commercial crops and make agriculture an attractive and profitable business.

Besides, care has to be taken for the problems being created on account of climate change due to Global Warming. Under climate change scenario, the impact of a rise in temperature would also enhance rate of Evapotranspiration (ET°). Increase by 10C in temperature may cause the duration of wheat and rice reduced by a week. This in turn will reduce yield by 4 to 5 quintals per ha (M.S. Swaminathan, 1991). A recent study done at the Indian Agriculture Research Institute (IARI) on the impact of the global climate change on Indian agriculture indicates the possibility of loss of four to five million tonne in wheat production with every rise of 1°C temperature throughout the growing period. According to another finding by Sinha and Swaminathan (1991) – showed that an increase of 2°C in temperature could decrease the rice yield by about 0.75 ton/ha in the high yield areas; and a 0.5°C increase in winter temperature would reduce wheat yield by 0.45 ton/ha. This will result in reclassification of currently favourable high potential wheat production area as heat stressed lower potential, short seasoned growing environment area in the years to come. Because for each °C rise of mean temperature, wheat yield losses are likely to be substantial thereby causing shortfall of food production.

To overcome the same, we may either have to increase cropping area (which is already reeling under stress) or switch to adaptable technologies which will mainly consist of initiatives like selection of varieties of wheat, rice, potato and other crops that are climate resilient. The second option appears to be more pragmatic. Considerable genetic variability exists in these crops for tolerance to high temperature besides the advantage of shorter growing period and high yield. Farmers will have to be educated about these crucial aspects.

4. *Enhancing irrigation water use efficiency*

It has been observed that irrigated agriculture, where the water delivery system is mostly supply-driven rather than demand-driven, results in over and under irrigation not matching with crop needs at different growth stages and hence results in sub-optimal efficiency. This is a severe deterrent to sustained agriculture which is a system of raising crops of greater human utility by utilization of existing resources with better efficiency without disturbing, imbalancing or polluting the environment. It is only possible through appropriate cropping and farming systems, using resources judiciously.

Since agriculture is the main concern for improving water use efficiency, there is a need to adopt a package of well known measures, such as drip and sprinkler irrigation, to control present flood irrigation wherever feasible, especially in water scarce areas having conditions are conducive to their application. Actual field studies indicated that, water saving to the extent of 25–33% and increased yield upto 35% can be achieved with sprinkler system in comparison with normal surface irrigation method. Similar savings are possible in drip system also. Low cost technology in drip system without pressure releases should also be encouraged. Even the system could be used in conjunction with canal systems.

10. Climate Change to Impact Indian Agriculture: IARI, The Financial Express dated 28th January 2008

Full utilization of created facilities and better design and proper operation and maintenance of the existing water distribution practices would considerably help in improving supply side efficiency. Increase in irrigation efficiencies is achievable by 20% as recommended by the NCIWRDP; this alone can generate deemed additional resource equivalent to present utilization by all other sectors.

This has become all the more important today in the light of national policy of economic liberalization. Thus, keeping all these aspects in view and as envisaged in the National Water Policy, allocation in any irrigation system should be done with due regard to equity, timeliness, efficiency and social justice.

1. *Other aspects*

Given the fact that, there are numerous industrial units along the bank of river Ganga, there is a need to factor in the incentives for those industrial units which undertakes concerted efforts for water saving and management (like–zero balance and positive balance) at their unit level. On the other hand, overriding priorities to industry (for water) over irrigation should be provided with extreme caution, so that there is no abusage of water at that level and tough punitive measures should be followed in such events.

Off-stream uses are mostly irrigated agriculture, withdrawals for industrial and domestic water supply and for Thermal and Nuclear power generation. On the other hand, the in-stream uses which relate to the water flowing through the natural stream to sustain in-stream water values at an acceptable level is equally important. Quantum of in-stream uses relate to sustenance requirements of fish and other aquatic life, outdoor recreation activities, navigation, hydroelectric power generation, water quality maintenance and eco-systems. In a situation of scarce availability, it becomes necessary to determine the priorities of allocation among various uses in a rational manner, so that they can co-exist and be addressed together.

Maintaining of ecology and overall health of river Ganga is equally important for biodiversity and socio-cultural requirements. The current water allocation practice has a reactive approach in this regard and the government machinery acts as per the eventuality or as per directives from the judiciary. This approach needs amendment in terms of adopting a proactive mechanism to address these expectations from the river, well in advance so as to protect collapse of any ecosystem associated with the river.

To sum up all this, it is essential to make refinements in water allocations, including explicit consideration of water quality & ecology related demands. Similarly, the share of Ganga River for meeting the downstream flow obligations also needs to be ensured.

REFERENCES

CADA (1991) Command Area Development Authority, Ministry of Water Resources, Government of India, Farmers Participation in Irrigation Water Management.

Development Centre for Alternate Policies, New Delhi (2008), Impact of Irrigation and Minor Irrigation under Accelerated Irrigation Benefit Program (AIBP) in state of Uttarakhand.

Govt. of Uttar Pradesh (2007) Uttar Pradesh Development Report, Vol.2, Chapt.11.

Govt. of Uttar Pradesh (2009) Uttar Pradesh Participatory Irrigation Management Act, 2009.

Govt. of Uttar Pradesh (2004) Uttar Pradesh State Industrial and Service Sector Investment Policy.

Govt. of Uttar Pradesh (2000) Uttar Pradesh Reorganization Act, 2000.

Govt. of Uttar Pradesh (2006 & 2010) Uttar Pradesh State Environment Policy.

Govt. of Uttar Pradesh (1999), Uttar Pradesh State Water Policy.

Govt. of Uttar Pradesh (2008) Uttar Pradesh Water Management and Regulatory Commission Act 2008.

Govt. of India (1873) The Northern India Canal and Drainage Act, 1873 and its amendments.

http://www.financialexpress.com/news/Climate-change-to-impact-Indian-agri-IARI/266207/

http://www.slideshare.net/soumyashree85/global-climate-change-its-impact-on-indian-agriculture-presentation

http://mowr.gov.in/index2.asp?sublinkid=403&langid=1&slid=298

http://en.wikipedia.org/wiki/Ganges_Basin

IWRS (2004) India Water Resources Society, Theme Paper on Efficiency of Water Resources System.

McKinsey (2009) McKinsey & Company, Charting our Water Future – economic framework to inform decision making.

NCIWRDP (1999) National Commission for Integrated Water Resources Development Plan, Integrated Water Resource Development - A Plan for Action.

NRCD (2009) National River Conservation Directorate, Ministry of Environment and Forests, Government of India, Status Paper on river Ganga – state of environment and water quality.

SWaRA (2008) State Water Resources Agency – Government of Uttar Pradesh, Uttar Pradesh Water Plan Framework.

Uttar Pradesh Irrigation Department (2006) Irrigation Department – At a glance.

Walter W. Immerzeel, Ludovicus P. H. van Beek, Marc F. P. Bierkens (2010) Climate Change Will Affect the Asian Water Towers.

World Bank (2001) Uttar Pradesh Water Sector Restructuring Project – Project Appraisal Document.

WWF – India (2010) Inception Report, study commissioned under Living Ganga Programme on 'Problems and Prospects of Water and Energy Use Efficiency in Agriculture in Upper Ganga Basin'.

SAWAS
South Asian Water Studies

PAPER 3

www.sawasjournal.org
volume 2, issue 2, 2011

SAWAS
South Asian Water Studies

EQUITY AND SOCIAL JUSTICE IN WATER RESOURCE GOVERNANCE: THE CASE OF BANGLADESH

A.K.M. Jahir Uddin Chowdhury
Professor, Institute of Water and Flood Management
Bangladesh University of Engineering and Technology (BUET), Dhaka-1000, Bangladesh

Golam Rasul
Head, Economic Analysis Division, International Centre for Integrated Mountain Development (ICIMOD)
Kathmandu, Nepal

Abstract

Water is of paramount importance to sustain life, development and the environment. Its governance has profound implications on the society, economy and environment. Traditionally, the focus of water management projects has been on optimizing economic benefits overlooking the distribution of benefits and costs among different socio-economic groups. Theories of social justice and equity underscore the need for ensuring social justice in water resource management. Using Bangladesh as a case study, this paper examines how and to what extent the concept of social equity has been integrated in water resource management. Analysis revealed that the governance of water resources in Bangladesh is biased towards structural solutions of flood control and irrigation through a centralized approach that ignores the other uses of water such as drinking and sanitation, fisheries, navigation, and ecology, and ignores the costs borne by the rural poor. Often, the access to water resources and the costs and benefits of water resources project is distributed unequally. While the rich get more access to water resources, the poor bear the cost. Recommendations are made to promote equity in water resource governance.

Acknowledgement

The authors are grateful to Garrett Kilroy and an anonymous reviewer for their useful comments. The views expressed in the paper are those of the authors, and are not necessarily related to the organizations to which they are affiliated.

1. INTRODUCTION

Water is of paramount importance to sustain life, development and the environment and its governance has profound implications society, economy and environment. Availability of water is the key determinant of economic growth and social prosperity. Water, however, is a finite resource and its use for one purpose reduces its availability for other purposes. Competing water needs have triggered conflicts between disparate water users such as commercial and subsistence, rich and the poor. Rural poor, who depend heavily on public water bodies such as rivers, streams, khals(natural channels of water), beels(permanent backwater lakes in the floodplain), for sustaining and well-being, often been marginalized and even deprived in access to public water bodies in the process of water resource development such as construction of dam, irrigation canal, flood control structures (Tiwary and Phansalkar, 2007; Phansalkar, 2007). It has also been the bone of contention between different sectors and different regions such as domestic and agriculture, agriculture and industry, agriculture and fisheries, upstream and downstream, rural and urban areas, and fisheries and flood control. Increased demand for water stemming from population growth, increased economic activities and ecosystem services on the one hand and the problem of water management in flood control situations on the other have posed a significant challenge for the planning and allocation of its uses among competing demands and call for attention to the distribution of benefits and costs among different stakeholders of the society (Syme et al. 1999; Meijer, 2007).

1. A few of the most important projects are Teesta embankment project, Kurigram project, Brahmaputra right bank embankment projects, Haor projects, Chalan beel projects, Monu river projects, Pabna irrigation projects, Ganges-Kobadak project, Dhaka-Narayanganj project, Meghna-Dhonagoda project, Chandpur irrigation project, Polder scheme and coastal embankment project (Thompson and Sultana, 1996).

Water resource development and management is critically important for Bangladesh due to its geographical location, low-lying topography and socio-economic condition. Water resource management in Bangladesh can be traced back to pre-colonial Bengal. Water management has been institutionalized since 1959, when the then East Pakistan Water and Power Development Board Authority (EPWAPDA) was established and assigned the responsibility for water resources development (Alexander et al., 1996). EPWAPDA and subsequently, the Bangladesh Water Development Board (BWDB) undertook many projects to control floods and build drainage for irrigation. By June 1990, BWDB had constructed 7,555 km of embankments and 7,907 hydraulic structures under 437 projects (Thompson and Sultana 1996:1).

All these projects were developed and implemented under the auspices of the central planning authority. The focus of water sector activities has been on flood control, drainage and irrigation to support the agriculture sector. Despite increasing emphasis on incorporating social justice, there has been no systematic study on how social and environmental aspects are being incorporated in water management projects in Bangladesh (Thompson and Sultana, 1996; Ahmad, 2003).

Water management activities, however, generally involve converting natural environment to built environment through construction dam, polders, irrigation canals, dyke, embankment and other water control structure to create favorable hydraulic conditions (Few, 2003). Such structures alter the water regime and helps to bring increased control for irrigation, flood control and other purposes, they also modifies the natural environment of floodplainsecosystems, which provides various goods and services for local people (IUCN, 2000; MEA, 2005). Regulation of river flow through engineering structures also sometimes changes the property right, which impose restriction on access to water and related ecosystem services, on which the poorest people depend for sustenance and well-being.

Altering floodplain ecosystems therefore has serious implications on different socio-economic groups as benefits and costs of water resource development project often distribute unequally to different sections of society. Poor people often disproportionate bear the cost of floodplain modification, which has raised serious equity and fairness questions (Shiva, 2002; Chowdhury et al., 1997; McLean, 2007; Phansalkar, 2007; Venot and Clement, 2010). Unequal distribution of benefits and costs not only affects livelihoods of poor people but often enhance inequities and disparities among different socio-economic groups, and accelerate social conflict (Mokorosi and Zaag, 2007). It is, therefore, necessary to assess the impacts of water resource development projects on different socio-economic groups.

Despite growing concern little attention, however, has been paid on equity aspects in water resource development in many South Asian countries. As a result, there is unequal distribution of benefits and cost among different social class and caste that often lead to increase conflict even strong resistance towards water resource development projects (Tiwary, 2006). The Narmada Bachao Andolan (NBA) in India is a glaring example of such resistance, which forced the government to drop implementation of the Sardar Sarovar water resource development project (Phadke and Patankar, 2006). It is therefore important to examine the governance and equity issue in water resource development.

1. Floodplains are wetland ecosystems that are periodically inundated by the lateral overflow of rivers and lakes (Junk, Bayley, and Sparks, 1989). Floodplain ecosystems support diverse aquatic habitats.
2. Three different property rights regimes private, public (state) and common property exists, which defines the rights of access, withdrawal, management, exclusion, and transfer of resources (Schlager and Ostrom, 1992). Most of the floodplain water bodies are common or public property resources, where everybody of the community has access to such ecosystem goods and services. Altering of water regimes through water resource development project often limit or restrict the uses. For example, constructing an irrigation canals may limit the uses of fresh water only for those who are members of irrigation committee or paying fees for irrigation management. And, thereby restrict the use of fisheries or other subsistence uses.
3. The concept of water governance refers to a 'systems that are in place to develop and manage water resources, and the delivery of water sources, at different levels of society' (Rogers and Hall 2003). Water governance from local context refers involving different stakeholders in the entire process of management, planning, decision-making, and implementation of water resource management project (Laban, 2007). Also see Franks and Cleaver (2007) for importance and framework of water governance.

Against this backdrop, the present paper examines how and to what extent the concept of social equity has been integrated in water resource development projects in Bangladesh and how the benefits and costs of water resource development projects are distributed among the different sections of the society.

This study is based on both primary and secondary information. The secondary information was drawn from various sources including government reports, books and journal articles. The primary information was collected through diverse means including field observation, group discussions and key informant interviews. Information collected from the different sources was triangulated to check their validity. The author's long research experience in the water sector was also useful. The paper is organized in five sections. While the context of water management and equity aspects is discussed in this section, the second section provides a conceptual understanding by reviewing key literature on floodplain ecosystem, human well-being, and different notion of environmental and social justice. The third section, offers a brief account of the context of water resource management in Bangladesh and socio-economic condition of people. The fourth section presents the result of this study and offers some explanations on the findings. The fifth and final section draws a conclusion and suggests recommendation for promoting social justice and equity in water management.

2. RELATIONSHIP BETWEEN WATER MANAGEMENT INTERVENTION AND HUMAN WELL-BEING: A CONCEPTUAL UNDERPINING

Understanding the distribution of benefits and costs of water resource development and how it influence the different socio-economic group is fundamental to aid decision making and enhance social justice in water resource management (Thompson and Sultana,1996; Meijer, 2007; Walker, 2010). Growing evidence suggests that water resource development through structural measures often alters natural environment, hydrological regime of floodplain wetlands, subsequent changes in the ecosystem health and functions and resulting availability of ecosystem goods and services (Bayley, 1995; Chowdhury and Salehin, 1997; McCartney, 2009). Embankments, dams and other structures obstruct natural corridors for the flows of energy and species thereby reducing aquatic habitats and hence biological diversity and often obstructing navigation routes (Chowdhury and Salehin, 1997; Islam, 2001; McCartney, 2009). As a result, the natural functions of floodplain ecosystems are undermined that affects ecology, environment and human beings (Bayley, 1995; Chowdhury and Salehin, 1997; Tockner and Stanford, 2002; McCartney, 2009).

Different socio-economic group are likely to experience different effects and may face different levels of benefits and cost from a particular project. It may affect their initial water access and use rights, entitlements and affect their well-being differently (Klasen, 2002; Meijer, 2007; Venot and Clement, 2010; Walker, 2010). While an irrigation project may increase the water availability during the dry season for irrigation, it may reduce water for fishing or other subsistence uses and affect fishing community (Meijer, 2007).

This is a question of justice and fairness; how the typical water management projects alter the relationship and ecosystem functions and services and how it affects different socio-economic groups? Scholars concerned with distributional and procedural justice attempted to define the notion of social justice. Rawls (1971) established a moral theory of justice which provides a basis for assessing the distributional and procedural outcome of policy decisions. From Rawls's perspective social goods and are to be distributed equally unless an unequal distribution of these goods advantages the least well off. Rawals's notion of justice is consistent with the principles of environmental justice, which concerns the distribution of environmental benefits enjoys and bears burdens by the different stakeholders (Baxter, 1999). The proponents of environmental justice insist that the distribution of costs and benefits from development intervention that impact on environmental resources assets should be recognized in social theory of justice.

Social theories of justice, equity and fairness underscore the need for ensuring social justice in water resource management and have developed several doctrines that accentuate the need for ensuring equity and social justice in water resource management (Syme et al., 1999; Tisdell, 2003). The equity concept implies that water allocation among the competing users should be based on this overriding criterion of Social justice. It also implies protection of water rights and access to safe drinking water, as it is a basic human need. UN General Assembly recently declared safe and clean drinking water and sanitation as a basic human right (UNGA, 2010). According to Phansalkar (2007) equity in access to and use of water and the distribution of the impact of water resource development intervention can be understood in four connotations: social equity, spatial equity, gender equity, and inter-generational equity. Social equity refers to equity between different groups of people living broadly in the same locale. Spatial equity refers to equity between people living in different regions (Saleth and Dinar 2004). Gender equity refers to equity between genders in regard to share in labour costs, efforts in access to and use of water and share in its beneficial uses and products. Inter-generational equity refers to equity in enjoyment of natural resources, including water, across generations of people (Divan and Rosencranz 2005). The decisions should be fair and free from bias and should ensure social justice in the distribution of social costs and benefits of water management projects. This theoretical framework has provided the basis of analysis for rest of the paper.

3. SOCIO-ECONOMIC FEATURE AND WATER GOVERNANCE IN BANGLADESH

3.1 Geographic and socio-economic features of Bangladesh

Major portion of Bangladesh is formed by deltas of three large rivers the Ganges, the Brahmaputra and the Meghna. The three large rivers meet inside Bangladesh and the combined out-fall discharges to the Bay of Bengal. Approximately 7% of the total area of 1.74 million sq.km. of the three river basins lies in Bangladesh. Numerous tributaries and distributaries of the three large rivers and extensive floodplains is the main physiographic feature of the country.

Unconsolidated floodplain sediments occupy about 80% of Bangladesh while tertiary hill areas in the east occupy about 12% and pleistocene terrace areas in the north-central (NC) and north-west (NW) occupy about 8% (Brammer, 1996). It is mostly a deltaic country characterized by a dense network of rivers (Fig.1), khals (floodplain channels) and wetlands, which provides multitudes of services to the population such as drinking, irrigation, fishing, transporting and other economic, ecological, aesthetic, and social services.

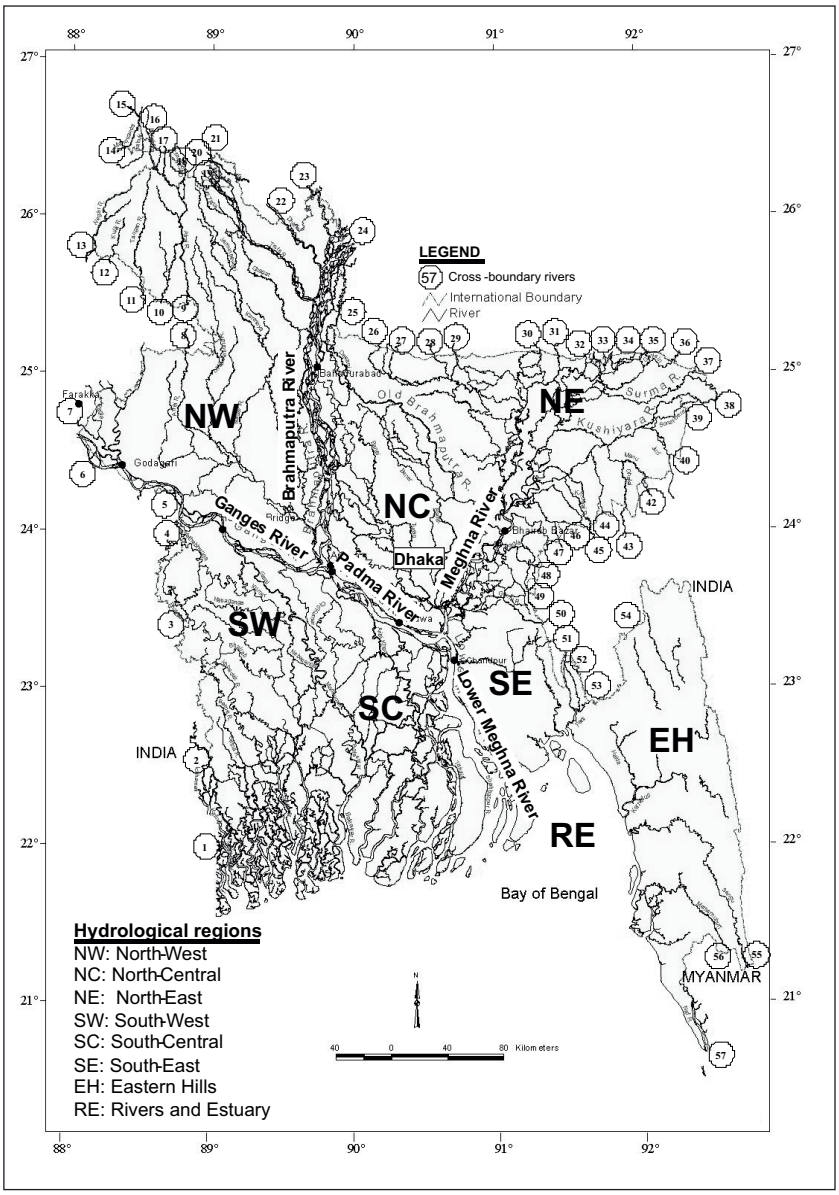


Figure 1: River system and hydrologic regions of Bangladesh

Bangladesh is predominantly a rural and agricultural country. Over three-quarters of its population live in rural areas (Table 1) and agriculture still accommodates almost two-thirds of the country's total labour force, which is about one-quarter of its gross domestic product. It is the most densely populated country in the world (over 150 million in an area of 147,570 km2). About 50% of its people live below the national poverty line and over one-third of its population lives on just below US$ 1 a day. A large section of the rural poor is dependent on natural water bodies in floodplains and in hilly watersheds for their livelihood. Their subsistence is based on food production, fishing, harvesting wetland plants, plying country boats and other activities dependent on water resources. The socio-economic well-being of rural people in Bangladesh is therefore largely interlinked with floodplain ecosystems; thus, underline the significance of ensuring social justice and equity in water allocation and water resource governance.

Table 1: Key Socio-Economic Indicators of Bangladesh

Indicators	Status
Population in 2008 (million)	160
Rural population as % of total population in 2008	73 %
Gross national income per capita in 2008 (US $)	520
Income of top 5% (2005)	26.93 %
Income of lower 5% (2005)	0.77
Population below national poverty line (survey year 2005)	National 40.0%, rural 43.8%, urban 28.4%
Population below US$1.25 a day (survey year 2005)	36.08 %
Poverty gap index (%)	National 9, rural 9.8, urban 6.5
Population below the minimum level of dietary energy (2004-2005)	30
Malnourished children	43 %
Human development index (HDI) rank in 2007	146
Human development index value in 2005	0.520
Population without access to safe water (2002)	75 %
Population without access to sanitation (1995)	36%
Life expectancy at birth (yrs) in 2008	66
Infant mortality rate in 1,000 live birth (2008)	43.0

Source: World Development Indicator 2010 and SAARC, 2010

3.2 Water resource development in Bangladesh

Before partition of the subcontinent in 1947, there had been little national scale government-led water sector development in the present Bangladesh. Small-scale public investment in water resources development, however, can be traced back to the pre-British period, when small reservoirs were constructed from local infrastructure to reduce the adverse impact of flood and to ensure water for irrigation during dry seasons. The national scale water sector development started in 1959 after the establishment of EPWAPDA following the recommendation of the Krug Mission after a devastating flood in 1954.

.

The EPWAPDA was responsible for the planning, design, operation and management of all water development schemes. In 1964, it prepared a 20-year Water Master Plan, which designed a strategy of massive flood control and drainage to be followed by irrigation. Emphasis was laid on the construction of embankments and polders over much of the country. Following independence in 1971, the EPWAPDA was restructured and responsibilities concerning planning and management of water resources was handed over to the newly created BWDB. The BWDB became the national focal point of water management and took many initiatives for water sector development. However, the orientation of water sector development has remained almost exclusively aimed at achieving the goal of increased agricultural production to achieve national self-sufficiency and inclined to seek structural engineering solutions. As a result, the focus of water sector activities has been on flood control, drainage and irrigation to support the agricultural sector. The role of water in other sectors, such as domestic water supply and sanitation, fisheries, navigation, industrial use, hydropower, ecology and nature and disaster management, remained mostly neglected (Ahmad, 2003). However, the 1999 National Water Policy (NWP), for the first time, recognized the role of water in poverty alleviation and called for inclusive water management, taking into consideration the national goal of poverty alleviation, along with other goals (Ministry of Water Resources, 1999). The policy was further revised in 2000 and approved by the government. The stated goal of NWP is "to ensure progress towards fulfilling national goals of economic development, poverty alleviation, food security, public health and safety, a decent standard of living for the people and protection of the natural environment". To facilitate the implementation of the NWP, the government approved a 25-year National Water Management Plan (NWMP) in 2004. The plan provides guidelines to develop programmes for better management of water resources in the country. The main elements of the NWMP, among others, include the multi-use approach to water (not just flood protection but also irrigation, drinking water and other uses) and an emphasis on 'soft' approaches instead of just hard engineering approaches.

4. Social Justice in Water Governance in Bangladesh

4.1 Water management projects and rural livelihoods

There are about 800 implemented small-scale and large-scale water management projects that are dependent on surface water system. Bangladesh Water Development Board and Local Government Engineering Department are implementing agencies for large scale and small scale projects respectively. Most of the projects are intended for creating favorable environment for agricultural growth. Area covered by flood control projects is nearly two-thirds of the country while that by dry season irrigation projects is nearly one-third of the country. As explained earlier, due to the socio-economic and geographic features of Bangladesh, livelihoods and well-being of rural people are heavily linked with the water availability in general and floodplain ecosystem services in particular as floodplain ecosystems provide a variety of goods and services and supports a variety of livelihood activities in rural Bangladesh. Like other South Asia countries (see for example, Shiva, 2002, Tiwary, 2006), water management projects in Bangladesh focused on maximizing economic benefits and are generally biased towards construction of infrastructure to control water for flood control and irrigation (Rogers et al., 1994). Poorly planned infrastructure aimed at flood control and irrigation for agriculture with limited inputs from local people often ignores the other uses of water, particularly those on which the subsistence of poor people are based such as, in fisheries, navigation industries, forestry, domestic water requirements and sanitation, livestock, poultry, horticulture, and other human and environmental services (e.g. Halcrow and Others, 1998; Meijer, 2007; Khan, 2010). Water resource development planners often fail to appreciate the contribution of ecosystem services provided by the floodplains to different socio-economic groups. The loss of these beneficial uses causes economic hardships on the section of society that relies on them for their subsistence. As a result, such projects affect the lives and livelihoods of poor people who live on traditional occupations like farming, fishing, and cattle breeding.

The key implications of mainstream water management projects are:

Impact on subsistence food production: Bangladesh has extensive floodplain wetlands that harbor and support a wide range of aquatic plants and bio-diversity. Some of the products of the floodplain ecosystem utilized by the people living in floodplains were listed by Khan (1997). Wetland plants are harvested by the rural poor as a source of supplementary food. Wetland plants are also harvested for firewood, thatching, mat-making, livestock fodder and medicinal use. Further, these plants provide vital nutrients for open-water fisheries. In Bangladesh, floodplains are largely modified by the water control structures (Sultana and Thompson, 1997; Craig et al., 2004). The construction of irrigation canals and the intensive use of water for irrigation have caused natural water bodies such as rivers, canals and wetlands to dry up, thereby reducing opportunities of subsistence food production to the landless people and small land-holder marginal farmers, who do not afford to pay for water from irrigation schemes. In a 'before' 'after' study on Sonamoral submersible embankment project implemented in Northeastern region in Bangladesh, Khan (2010) found that human development index of poor household such as fisherman, boatman's has declined in 2009 compared to 1991 (before implementing the project) due largely to negative impact of the project on the water where their livelihoods depend heavily. Meijer (2007) reported similar results in a study in Surma and Kushiara rivers floodplain in Bangladesh.

Loss of livelihood of fishermen: The extensive network of rivers, canals and floodplain wetlands in Bangladesh provides a hospitable abode for rich open-water fisheries. Canals link up floodplain wetlands and rivers provide an aquatic habitat suitable for reproduction, migration, breeding and growth of fresh-water fishes. A section of the rural population is dependent on fishing in these natural water bodies for their livelihoods. In the north-west and south-west regions of Bangladesh, small and landless farmers in agricultural communities were found significantly dependent on fisheries while in north-central, north-east and south-west regions, over 60% of all categories of farmers have had some participation in fishing (ODA, 1997). Subsistence fishing is carried out by members of households for domestic consumption as well as for commercial purposes. Open-water fisheries are a major source of protein supply for the rural poor. Open-water fisheries are self-sustaining as long as the habitat is not disrupted by change in water regime. These settings have now been adversely affected by water management projects that include flood control and irrigation activities through reduced aquatic habitat and barriers to the movement of fish between river and floodplain. Water control structures on rivers and canals also cause obstruction to the migration route of open-water fishery (Tsai and Ali, 1997; Mirza and Ericksen, 2005). Due to flood control, drainage projects and irrigation projects, many floodplain wetlands have shrunk and lost hydraulic connectivity with the river and have become seasonal water bodies. Consequently, aquatic habitat is rapidly shrinking and fishermen have lost their livelihoods (WARPO, 2001b, Ministry of Water Resources, 1999). Flood control and water conservation projects benefit the richer section of the society by creating opportunity to culture fisheries, but the less fortunate section of the society suffer from loss because of the adverse effects of these projects on open-water fishery (Sultana and Thompson, 1997). Poor fishermen are unable to make the required investment for culture fishery due to lack of capital. The shrinkage of open-water fisheries also affects the protein insecurity of the rural poor and aquatic bio-diversity (Sultana and Thompson, 1997).

Hindrance to waterway transport and loss of livelihood of boatmen: The dense network of rivers and canals in Bangladesh performs an important socio-economic function by providing an opportunity for waterway transport. Inland waterways are a cheap means of transport in Bangladesh. Non-mechanized and partly mechanized country boats provide access to outlying rural areas, which are otherwise unreachable. These boats are the only means of movement during floods in some areas. The country boat is a cheap means of transporting paddy that is harvested at remote agricultural lands. Country boats account for nearly 60% of employment in transport. This is nearly three times more than the employment in all mechanized modes taken together (Jansen et al., 1989). A section of the rural poor earn their livelihood by plying country boats. Water control structures on rivers and canals cause obstruction to boat transport. The plying of country boats is also hindered when the water in many small rivers and canals becomes shallow or dry in the arid season due to irrigation by low-lift pumps. As a result of flood control, drainage and irrigation projects, many boatmen have lost their livelihoods (Halcrow and Others, 1998).

Disruption of rural water supply: Shallow aquifers perform an important public health function in Bangladesh by supplying drinking water through hand tube-wells in rural areas. Access to safe and sufficient water, which is essential for the sustenance of human wellbeing, is recognized as a basic human need (UNGA, 2010). Meeting basic human needs is an equity requirement. The situation analysis report on water supply and sanitation (Ministry of LGRDC, 1994) observes that an increasing number of hand tube-wells for drinking and domestic purposes became inoperative for two to three months a year towards the end of the dry season because of excessive lowering of groundwater level due to expansion of shallow and deep tube-wells for irrigation. The impact of seasonally lowered water table due to groundwater irrigation on rural domestic water supplies is a concern for water management (WARPO, 2001a).

4.2 Distribution of benefits and costs of water resource development

Most of the water management projects do not pay adequate attention to the social impacts of development intervention or consult local people, particularly the poor section. Many projects for agricultural development are biased towards those with agricultural land, by-passing the landless. A majority of the water resources development projects do not target the poor directly. This raises a serious concern about the type of development interventions that do not take into account the interests of the poor, who constitute a vast majority of the country's population (NWMP, 2004). Rich farmers usually control the operation of flood control, drainage and irrigation structures that are simple and relatively small. This is an example where public goods are used as private goods by the more powerful and signifies increased inequality in the distribution of project benefits, which is already positively skewed towards large landowners. As such, certain social groups are negatively affected by the lack of adequate consideration of social impacts at the planning stage.

Table 2: Social costs and benefits of water management projects in Bangladesh

Water management activity	Gainer	Loser
Land acquisition for flood control embankment	Gainer	Small agricultural landholders who lost their land and households who lost their homestead land are the loser.
Flood control (FC) project to prevent river flooding	Protected agricultural land holders.	Because of prevention of flooding of large part of floodplain, households in the adjacent unprotected floodplain land are subject to risk transfer (higher flood level).
FC and drainage project	Large and medium agricultural land owners.	Fisherman, aquatic plant harvester and boatman are the sufferer because of reduction of ecosystem habitat, disruption of fish migration route, reduction of wetland area and obstruction to boat transport.
FC polder to prevent tidal flooding in the coastal region	Protected agricultural land owners were benefited for some years after project implementation.	The entire population in the poldered area and adjacent area are subject to severe water logging after some years from project implementation due to river bed rise.
Water retention in floodplain channel during wet season	Investors of culture fishery.	Rural poor whose livelihoods are dependent on capture fishery and aquatic plant are the loser because of adverse effect on open water fishery and reduction of aquatic plat habitat.

Water management activity	Gainer	Loser
Construction of flow control structure in river for irrigation water supply	Large and medium agricultural land owners.	Downstream population are among the sufferer because of flow reduction, and loss of livelihood of boatman, fisherman and aquatic plant harvester.
Water withdrawal from river by low lift pump for irrigation during dry season	Agricultural land owners.	Loss of livelihood of fisherman and boatman due to large reduction in water depth in the river.
Uncontrolled water withdrawal from river in the coastal region for irrigation during dry season	Upstream agricultural land owners.	Downstream agricultural land owners are the sufferer due to saline water intrusion.
Water withdrawal from groundwater by shallow and deep tubewells for irrigation during dry season	Upstream agricultural land owners.	Downstream agricultural land owners are the sufferer due to saline water intrusion.

Source: Authors prepared based on primary and secondary information

Two pertinent examples of social inequity in the water resources development are presented below:

Socio-economic hardships due to land acquisition: Flood control projects involve acquisition of substantial land for embankment construction. Land acquisition causes immense economic and social sufferings to the poor households who lose their land. Among the worst sufferers are small agricultural landholders who lose their land, and households who lose their homestead land. Because of the loss of homestead land, which in many cases was their sole property, people become homeless and are compelled to migrate to other places. The economic compensation is a lengthy process that cannot make up for economic loss because of land price inflation. More importantly, the variety of costs borne by the poor are not compensated by the economic compensation, and there is high dissatisfaction among people who are affected by land acquisition. HIFAB and MARC (1992), under the FAP-15 study, assessed the economic and social impacts of land acquisition by selecting six BWDB projects (two in the north-west region and one each in the north-central, north-east, south-west and south-east regions). Household survey in these six projects showed that 38% households lost their land and 4% lost their homestead.

Risk transfer by flood control project: Rivers with extensive floodplain are a characteristic landscape feature in Bangladesh. Floodplain landscape performs an important hydrological function by storing floodwater in flat topography, where drainage of floodwater to the sea is a slow process due to land elevation near the coastline. Thus, floodplains moderate the flood flow by acting as detention reservoir. Flood control projects prevent flooding of agricultural land and urban area located in floodplains. As flooding of the floodplain is checked, the storage space for floodwater is reduced causing increased flood level in the adjacent area. Hence, the flood risk is shifted to the adjacent area rather than reducing the overall risk. Pumped drainage of rainfall-runoff from the protected area also increases flood level in the adjacent area. The poorer section of the society is usually the victim of such risk transfer by flood control projects (Table 2). Transfer of flood risk generates social conflicts leading to forced cutting of flood control embankments by the affected people. Such forced cutting was found widespread in the north-west region (Alam and Franks, 1993).

4.3 Water resource development and environment

This section examines how water resource development projects overlook environmental considerations. Neglect of hydro-morphologic features of floodplain: The concept of flood control is aimed at protecting floodplain agricultural lands from river flood so as to reduce damage to Aman (monsoon rice) and encourage agricultural landowners to adopt more productive transplanted variety of rice in place of broadcast.

The benefits of floods are thus overlooked in water management projects. The ecology and traditional settlements around a flood plain adapt themselves naturally to inundation. They depend largely on the annual hydrological cycle. Normal annual flooding provides numerous benefits such as common access to the large natural floodplain fishery, deposition of fertile loam on agricultural fields, and flushing of stagnant water in low-lying areas (Sultana and Thompson, 1997). After a detailed study of the hydrological, morphological, ecological, social and environmental impacts of flood control, drainage and irrigation projects in Bangladesh, Chowdhury et al. (1997) concluded that the goal of water resource development could not be achieved without giving due consideration to the hydro-morphologic features of floodplain and the socio-economic conditions of rural people.

Water logging due to coastal polder: Building embankments and irrigation canals without adequate number of waterways obstructs the natural drainage. Alternate flooding and recession in tidal floodplain performs an important flushing function that is essential for the morphological stability of tidal rivers. Under the coastal embankment project, flood control polders were constructed to prevent tidal flooding of the floodplain. The polders have reduced storage area for tidal water that enters from the sea. A review of the coastal embankment project by Halcrow et al. (1993) considers that the polders have caused a rise in channel bed due to siltation. The rise in the bed of tidal river, in turn, has resulted in serious water logging of the adjacent area and has become a source of major environmental concern in the region. Continued water logging has caused serious damage to agriculture, forestry, fisheries, livestock and physical infrastructures. Many people had to abandon their ancestral homestead and traditional livelihood activities due to the water logging problem, salt water intrusion and this has generated widespread discontent among the people. The development strategy (WARPO, 2001a) of the NWMP considers it to be of foremost importance to rationalize coastal embankment schemes on the basis of environmental audit.

5. Conclusions and Recommendations

Water is a basic resource for life and production in society and is essential for sustaining a variety of environmental and ecosystem services. Water resource development has been an important thrust area since the 1950s and many projects and programmes have been undertaken for water resource development. Given the growing conflict on allocation of water for competing demands, there is a pressing need for ensuring social justice and equity in water resource development and the resultant benefits and costs. The objective of this paper was to examine how and to what extent social equity has been integrated in water resource development in Bangladesh and how the benefits and costs of water resource development projects are distributed among the different sections of the society.

Our analysis revealed that focus of water resource development in Bangladesh has been biased towards flood control, drainage and irrigation to support the agricultural sector. The role of water in other sectors, such as domestic water supply and sanitation, fisheries, navigation, industrial use, hydropower, ecology and nature and disaster management, remains mostly neglected. Moreover, water resources management favors structural solutions through a centralized approach by professional engineers. Although construction of embankment, drainage and irrigation infrastructure has facilitated agriculture production in control areas, these structural solutions and engineering approaches often neglect the social aspects and create unintended impacts to the society and the environment.

Although poverty alleviation and social equity have recently become the goal of water resources development (NWP, 2004) and some efforts have been made to involve local people in water resource management (MoWR and MoLGRD&C, 2000) the policy goal has not yet fully been translated into action, particularly at the program and project levels. Top-down centralized approach is still dominant (Chowdhury, 2007). As a result, water resource management projects have not been able to bring the expected benefit to all sections of the society because of inequity in the distribution of social costs and benefits. While the rich people get benefits from this management approach, the poor often suffer and their livelihoods are affected because of changes in the water regime brought about by projects, which are not suitable for their livelihood activities.

It is, therefore, important to institutionalize social equity and environmental justice aspects in designing and implementing water resource projects. Appropriate policy, regulations, standards and guidelines are needed to ensure social justice in the distribution of social costs and benefits of water management projects. As suggested by the World Commission on Dams (WCD, 2000) local people's initial water rights and access should be recognized in water resource development projects and attention should be paid that there rights and interest are not undermined or denied. Following Rawls's principle, discussed earlier, benefit and cost of water resource project should be distributed in such a way that the disadvantaged section of society receive higher benefits and bear less costs in comparison to their initial water access and use rights. Distributional analysis should be part of water resource development projects as traditional impact assessment often overlooks social distributional aspects. If livelihoods of poor and disadvantage group are adversely affected due to water resource project, appropriate compensation or rehabilitation should be made so that adverse impacts are properly compensated.

Successful water resource management involves balancing the needs of a wide range of water-users along with the needs of the environment. A multi-objective and holistic water resources planning approach is required to address the various needs of public health, agriculture, fisheries, ecology, river morphology, salinity intrusion prevention, and navigation, industry and hazard reduction. Water resource management should not be based on economic benefit alone. Social, environmental and ecological aspects should be considered in the process of identification, planning, implementation, operation and maintenance of water management projects. Efforts should thus be made for preservation of water quality, environmental flow and ecosystems. Water management decisions should ensure that no one is deprived of prevailing opportunities for their livelihoods and particular attention is to be given to the water-dependent subsistence activities.

Equity consideration in the decision making process is essential to ensure provision of safe domestic water, improve water-use efficiency, maintain connectivity between wetland and river, maintain support to water-dependent subsistence activities, preserve ecosystem services, maintain prevailing livelihood opportunities and reduce vulnerability to water-related natural hazards. Appropriate provisions need to be made for the poor section of the society who cannot afford to pay for service infrastructures. Appropriate restrictions need to be imposed on these activities in order to prevent adverse impacts on hydrological cycle and water regime.

To promote equity in water management activities, it should be first recognized that access to safe water is a basic human need and essential to public health and livelihood. Efforts should be made to innovate and promote non-structural solutions in flood control so that ecological and social impacts are reduced. Explore better ways to reduce ecological impacts where structural solution is inevitable.

REFERENCES

Ahmad, Q. K. (2003), Towards Poverty Alleviation: The Water Sector Perspectives, Water Resources Development, 19 (2): 263–277.

Ahmad, Q. K., Biswas, A.K., Rangachari, R. and Sainju, M. (2001), Ganges–Brahmaputra–Meghna Region: A Framework for Sustainable Development, University Press Limited, Dhaka, Bangladesh.

Alam, M. K. and Franks, T. R. (1993), The North-East Regional Study FAP2, Proc. 3rdConf on the Flood Action Plan, pp29–64, FPCO (presently WARPO), Dhaka.

Bayley, P. B. (1995). Understanding Large River-Floodplain Ecosystems, BioScience, 45 (3): 153-158

Bowen, W. (2002), An Analytical Review of Environmental Justice Research: What Do We Really Know? Environmental Management 29 (1): 3–15

Chowdhury, J. U., Rahman, M. and Salehin, M. (1997), Flood Control in a Floodplain Country Experiences of Bangladesh, prepared at IWFM, BUET, Legal No: 1276/97, ISESCO, Rabat, Morocco.

Craig, J.F., Halls, A.S., Barr, J. F. and Beand, C. (2004), The Bangladesh floodplain fisheries, Fisheries Research 66: 271–286

DHV Consulting Engineers and Others (1989), Bangladesh Inland Water Transport Masterplan, Final Report, Vol. 1, pp.70–71, BIWTA, Dhaka, Bangladesh.

Divan, S. and Rosencranz, A. (2005), Environmental Law and Policy in India (second edition, seventh imprint), New Delhi: Oxford University Press, pp. 41–86.

Few, R. (2003), Flooding, Vulnerability and Coping Strategies: Local Responses to a Global Threat, Progress in Development Studies 3: 43–58.

Franks, T. and Cleaver, F. (2007), Water governance and poverty: a framework for analysis. Progress in Development Studies 7 (4): 291–306.

GWP (2003), Poverty Reduction and IWRM, Background Paper No. 8 prepared by Technical Advisory Committee, Global Water Partnership (GWP), Stockholm, Sweden.

Halcrow and Others (1993), Final Report of Southwest Area Water Resources Management Project, FAP-4, FPCO (presently WARPO), Dhaka.

Halcrow and Partners Ltd., Mott Macdonald Ltd. and Others (1998), Social Impact Assessment, Annex A2 in Vol. 2 of the Inception Report of NWMP, WARPO, Ministry of Water Resources, Dhaka.

HIFAB International and Multidisciplinary Action Research Centre MARC (1992), Final Report of Land Acquisition and Resettlement Study, FAP-15, FPCO (presently WARPO), Dhaka.

Islam, M. 2001. Floodplain Resource Management: An Economic Analysis of Policy Issues in Bangladesh. Unpublished Dissertation. Champaign: University of Illinois

Jansen, E.G., Dolman, A.J., Jerve, A.M. and Rahman, N. (1989), The Country Boats of Bangladesh, University Press Ltd., Dhaka, Bangladesh.

Khan, M. A. (1997), Ecology of Floodplains in the Northeastern Region of Bangladesh, in Tsai, C-F. and Ali, M. Y. (Eds.), Open Water Fisheries of Bangladesh, University Press Ltd., Dhaka, Bangladesh.

Klasen, S., (2002), The Costs and Benefits of Changing In-stream Flow Requirements (IFR) below the Phase 1 Structures of the Lesotho Highlands Water Project (LHWP). 1-33.

Laban, P., (2007), 'Accountability and Rights in Right-based Approaches for Local Water Governance', International Journal of Water Resources Development, 23 (2): 355 — 367

LGED (2008), Environmental Assessment Guidelines for LGED Projects, Local Government Engineering Department (LGED), Govt. of Bangladesh.

Mainka, S., J. McNeely & B. Jackson, 2005. Depend on Nature; Ecosystem Services supporting Human Livelihoods. IUCN.

McCartney, M., (2009), Living with dams: managing the environmental impacts, Water Policy 11(1): 121–139

McLean, J. (2007), Water injustices and potential remedies in indigenous rural context: a water justice analysis. Environmentalist 27:25-38.

Meijer, K. S. (2007), Human Well-Being Values of Environmental Flows: Enhancing Social Equity in Integrated Water Resources Management, IOS Press, Amsterdam, Netherlands.

Ministry of LGRDC, UNDP and UNICEF (1994), Bangladesh Situation Analysis Water Supply and Sanitation, Local Govt. Div., Ministry of LGRDC, Govt. of Bangladesh.

MoWR and MoLGRD&C (2000) Guidelines for Participatory Water Management, Ministries of Water Resources and Local Government, Rural Development and Cooperatives, Government of Bangladesh, Dhaka

Ministry of Water Resources (1999), National Water Policy, Govt. of Bangladesh.

Ministry of Water Resources (2005), Coastal Zone Policy, WARPO, Govt. of Bangladesh.

Mirza, M. Q. and Ericksen, N. J., (2005), Impact of water control projects on fisheries resources in Bangladesh. Environmental Management 20 (4): 437-593

Mokorosi, P. S. and van der Zaag, P. (2007), Can Local People also gain from Benefit Sharing in Water Resources Development? Experiences from Dam Development in the Orange–Senqu River Basin, Physics and Chemistry of the Earth 32: 1322–1329

NWP (2004), National Water Policy, Ministry of Water Resources, Govt. of Bangladesh.

Overseas Development Administration (ODA 1997), Impacts of Flood Control and Drainage with or without Irrigation Projects on Fish Resources and Fishing Community in Bangladesh, in Tsai, C-F. and Ali, M. Y. (Eds.), Open Water Fisheries of Bangladesh, University Press Ltd., Dhaka, Bangladesh.

Phansalkar, S. J. (2007), Water, Equity and Development, International Journal of Rural Management, 3(1): 1–25

Phadke, A. and Patankar, B. 2006. Asserting the rights of the toiling peasantry for water use. In: Mollinga, P., Dixit, A. and Athukorala, K. (eds). Integrated Water Resources Management: Global Theory, Emerging Practice, and Local Needs. Water in South Asia Series, SAGE Publications, New Delhi.

Rawls, J. (1971), A Theory of Justice. Cambridge, MA: Harvard University Press.

Rijsberman, F. R., (2003), Can development of water resources reduce poverty?, Water Policy 5: 399-412.

Rogers, P. and Hall, A. (2003), Effective water governance. Global Water partnership, TEC Background Papers, no. 7.

Rogers, P., Lydon, P. and Seckler, D. (1989), Eastern Waters Study: Strategies to Manage Flood and Drought in the Ganges–Brahmaputra basin, Washington: ISPAN, USAID.

Saleth, R. and Dinar, A. (2004), Institutional Economics of Water: A Cross Country Analysis of Institutions and Governance, Cheltenham: Edward Elgar Publishing Limited.

Schlosberg, D. (2004), 'Reconceiving Environmental Justice: Global Movements and Political Theories,' Environmental Politics 13(3), 517–540.

Shawinigan Lavalin Inc. (1993), Water Transport Study, Northeast Regional Water Management Project, FAP-6, FPCO (presently WARPO), Dhaka.

Shiva, V: (2002), Water Wars: Privatization, Pollution and Profit, South End Press, Cambridge.

Sultana, P. and Thompson, P. (1997), Effects of Flood Control and Drainage on Fisheries in Bangladesh and the Design of Mitigating Measures, Regulated Rivers: Research and Management 13: 43-55

Syme, G. J., Nancarrow, B. E. and McCreddin, J. A. (1999), Defining the Components of Fairness in the Allocation of Water to Environmental and Human Uses, Journal of Environmental Management 57: 51–71.

Tockner, K. And Stanford, J.A.,(2002), Riverine flood plains: present state and future trends, Environmental Conservation 29 (30: 308-330.

Thompson, P., Sultana, P. (1996), Distributional and social impacts of flood control in Bangladesh. The Geographical Journal 162(1): 1–13.

Tisdell, J. G. (2003), Equity and Social Justice in Water Doctrines, Social Justice Research 16 (4): 401–416.

Tsai, C-F. and Ali, M. Y. (1997), Open Water Fisheries of Bangladesh, University Press Ltd., Dhaka, Bangladesh.

Venot, J. and Clement, F. (2010). Environmental Justice of Water Projects and Reforms in the Rural South, paper presented at Global Environmental Justice: Towards a New Agenda was held in Norwich, UK, from July 2-3, 2010.

Walker, G. (2010). Environmental justice, impact assessment and the politics of knowledge: The implications of assessing the social distribution of environmental outcomes. Environmental Impact Assessment Review 30: 312–318

WARPO (2001a), National Water Management Plan (NWMP) Development Strategy, Water Resources Planning Organization (WARPO), Ministry of Water Resources, Govt. of Bangladesh.

WARPO (2001b), NWMP, Vol.2: Main Report, Vol.3: Investment Portfolio and Vol.4: Regional Plans, Ministry of Water Resources, Govt. of Bangladesh.

World Development Report (2008), Agriculture for Development, The World Bank, Washington, DC.

UNGA (2010), UN General Assembly Declaration, 28 July 2010.

SAWAS
South Asian Water Studies

SAWAS
South Asian Water Studies

New Forms of Urban Governance in India- Shifts, Models, Networks and Contestations
Edited by I.S.A. Baud and J. De Wit
Sage Publications

Vasundhara Dash

Decentralisation initiatives in India are often considered to be purposefully adopted as a result of various political, social and economic factors. However, it is also considered that decentralisation is a fall out of the globalisation and liberalisation process. Much of the literature on decentralisation is based on industrial countries and assumes the existence of institutions that are usually very weak in developing countries. Urban decentralisation, which means devolving powers and responsibilities to the municipal bodies, is a result of increasing urbanisation, particularly in the larger cities.

New Forms of Urban Governance in India: Shifts, Models, Networks and Contestations, looks at the impact of decentralisation on local governance arrangements and citizen participation in urban democracy processes in India. It examines how local governments work together with other actors in governing mega cities in India, especially in view of globalisation and other internal transformation processes. It analyses whether new forms of governance open up opportunities for more participatory urban governance and improved service delivery, with positive implications for the poor in the cities. The essence of the discourse presented in the book lies in the opening phrase, "The global population is becoming more urban than rural."

The multiple opportunities and challenges that arise with urbanisation are discussed. India's emerging urban landscape is studied through various case studies that analyse the issues related to lack of infrastructure, basic amenities and the ever widening gap between the rich and the poor.

The 74th Constitutional Amendment in 1992 has brought about a paradigm shift in governance, decentralising the responsibilities to local governments and reducing the role of the national and state governments. As a response to this issue, the role of state in urban governance is increasingly being balanced by other players, such as the private sector, local and international non-governmental organisations. More importance is being given to the role of citizens and civil society organisations. Issues around bringing the government closer to citizens through decentralisation, and private-public partnerships for providing urban services, participation of the rich and the poor in local democratic process and the expertise of the state in handling the challenges of effective city governance are focussed upon.

The book is one of the products of the research project on 'New forms of governance in Indian megacities- Decentralisation, Financial, Management and Partnerships in Urban Environmental Services' that was carried out as part of the Indo-Dutch Research Programme IDPAD. The changing role of state has given rise to three different themes in urban governance which is presented in 12 chapters divided into 3 parts viz. models and instruments of decentralization, multi-stakeholder arrangements in public services, and contestations and urban governance.

The first section of the book explores the implications of urban decentralisation in India with experiences from Mumbai, Kolkata, Siliguri and Bidhan Nagar in West Bengal; and cities in Kerala particularly focussing on ward committees. In a majority of the cases the performances of Ward Committees have been far from satisfactory, as their efficacy is largely dependent on political will. The introduction of ward committees for groups of several wards is often regarded as an extension of the central municipal office rather than securing people's participation. There are the vested interests of stakeholders, and raging corruption, however, it is anticipated that the decentralisation process would gain momentum in future, as cities grow further in size leading to the requirement of more competent service delivery to citizens.

The second section of the book deals with another theme on which urban governance is primarily spearheaded by the private sector and civil society groups who provide services to citizens. This is known as multi-stakeholder arrangements (MSAs) or multi-actor arrangements (MAAs). Examples from Mumbai, Delhi, Chennai and Hyderabad are presented to assess the key factors that affect the performance of MAAs. Some authors put forth their view that within MSAs, different models are required to suit different urban scenarios while others suggest that high level of citizen participation is required to promote more equitable distribution of services and higher accountability of stakeholders.

It is mentioned that MSAs face a major roadblock in achieving the desired level of efficacy due to political interference and corruption. The discussion concludes that further reforms in multi-actor arrangements are required to attain the desired standard of quality and equitability in distribution of urban services across citizen groups. Baud and Dhanalakshmi analyse performance and accountability in multi-stakeholder arrangements for providing specific services such as sanitation or sewerage in Chennai. Lorraine Kennedy gives some insights about the emerging and aggressive role that the corporate sector has assumed and its influence on planning and development in a fast growing city like Hyderabad.

The third section of the book discusses the emergence of various forms of contestations and conflicts which these new models and approaches have given rise to and their effects on urban India. Through cases from West Bengal and Kerala it is demonstrated that contestations may take place within various government departments or can be induced by the government where there are multiple actors. This often leads to marginalising the poor by excluding them from access to basic services as well as in the decision making processes. The authors talk about judicial intervention and argue that the judiciary today is more vocal about urban governance issues. The higher judiciary which devised public interest litigation with the intent of helping the indigent and the powerless has itself let it become the vehicle for safeguarding the interests of the elite. A Textile Mills Land case in Mumbai is highlighted, where the policy has shifted towards accommodating the elite by seizing the entitlement of the poor to housing compensation. The authors strongly advocate recognition of the poor in urban planning, both in terms of social context and their contributions to urban society.

This book is a compilation of papers written by Indian and foreign scholars after research and analysis. It talks more about shifts and contestations than on the new forms of governance. The authors provide examples of the systems and processes which are biased against the poor and highly vulnerable to corruption. The book concludes that citizen participation is one of the most important instruments in ensuring equity in service delivery and accountability of the service provider. It is a useful read for researchers and students of urban planning, development, and governance.

Vasundhara is a Research Associate at SaciWATERs. Feedback to this review can be sent to vasundhara@saciwaters.org

SAWAS
South Asian Water Studies

www.sawasjournal.org
volume 2, issue 2, 2011

SAWAS
South Asian Water Studies

Waterscapes: The Cultural Politics of a Natural Resource
Ed. Amita Baviskar. Ranikhet, Uttaranchal, Permanent Black Pub, 2007, 374 p., ISBN 81-7824-176-5.

Sumathi Sivam

The problem of water governance in the global south has, for a longtime now been attested by the debates and discourses, which have been recorded in the annals of history. The governance of water has gained enormous global significance cutting across cultural, political and linguistic frontiers. This is evident from the burgeoning literature that unpacks the existence of water institutions, the role played by them in the management and distribution of water and the conflicts and tussles among them. The techniques and methods adopted by them to find solution to the existing problems that shows the kind of reform trajectory they choose to follow as well as the ideological stand that these institutions adhere to. The threats of cultural wars over water management and distribution cannot be minimized or understated. Water is so vital and integral part of human, animal and material existence that like language it has become the expression of our innermost desires and dreams.

So completely intertwined is water with life that dissolution of water (or we might say nature) from the matrix, is indeed unthinkable. Nor can any discourse on water be dissociated from the political economy of its geographical and ethnic entity. A discourse on water resources, its under-or-over exploitation is bound to touch a raw nerve of people, for the subject of water arouses heat and emotion.

The coinage "Waterscapes" in this context seems most relevant and appropriate and not exotic or eccentric as Amita Baviskar emphatically argues in her introduction to the book. Coined on the analogy of "landscapes" and perhaps "seascapes", "waterscapes" is bound to gain acceptance. The history of management of water or perhaps "waterscapes" has been increasingly recognized in the many scholarly forums which have been conducted worldwide.

The book under review entitled "Waterscapes" edited by Amita Baviskar contains twelve learned papers. The contributors of the book come from varied background such as Anthropology, Geography, Sociology, History, Environmental law and Governance. They cite original ethnographic and historical research which has a profound bearing on their analyses of wide ranging issues such as caste, participation, power relations, gender, role of state and market at different junctures while dealing with the management of water. While addressing these issues the contributors see the governance of water as a socio-economic, political, historical and cultural process which is deeply and intimately related to one other. In doing so, they have also turned the research focus to local institutions and ecology unique to each region. Thus by studying the local patterns on water discourses the scholars highlight the importance of the contextual approach to water governance.

The book is divided into three sections. The property rights of water and its commodification under colonial, post colonial and neo-liberal eras, have been one of the major issues discussed in detail in the first section of the book. The chapter by David Hardiman illustrates how the problem of water scarcity leads to construction of tube wells in north Gujarat which leads to over extraction and exploitation of groundwater by land owners (this was primarily on the basis of caste affiliations), depriving the non landowners who earlier enjoyed customary rights.

Navroz Dubash's, work comprehensively analyses the shift towards mechanized irrigation in two of the villages in north Gujarat which was biset with problems. For instance it required credit which was closely involved with the stratification of society such as caste and status. Though economic assets and caste networks were important determinants to water access, they did not guarantee regular supply of water.

Donald W. Attwood draws attention to the evolution of famine relief work and the introduction of the employment guarantee scheme in the state of Maharashtra as a means to the problem of mortality. The construction of dams and canal system did ensure increased level of production but there was inefficient use of the resource owing to the challenges of in the realm of coordination, organization and cooperation in the management of water.

The aspects of "flux", "uncertainty" and "trans boundary issues" in the management of water that ensures sustainable and equitable use of the resource is well documented in Deborah Sick's article where she analyzes the role of state, private and common property regimes in the management of water in USA and Mexico borderlands.

The essays in the next section deal with the perennial problem of water scarcity and its impact on the local communities who earlier used to have community management of water. Written in a style which is lucid, the article by Lyla Mehta and Anand Punja describe how cultural links with the surroundings, the emotional and religious factors play a crucial role in assuring the "well being" of the resettled population emerging from big dam project. While raising the question of identity of the displaced population the essay at the same time explores the politics of place and position occupied by the new migrants. Arun De Souza, in his essay discusses the struggle for the construction of tank in rural Maharashtra. He has identified the chief actors with vested interests. By analyzing their role, ulterior motives and affiliation with political parties they strategically manage to dissolve the differences among the people for the purpose of development. The question of representation in village committees which falls under the domain of public sphere is elaborated in Rita Brara's work where she deals with participation of women and representation of castes in rural Rajasthan. Likewise Judith Carney's article depicts the role played by the women during the famine in Gamibia.

The final section of the book deals with water projects and how they transform the lives of the people. David Mosse's piece on indigenous tank irrigation system in Tamil Nadu gives a political and historical understanding of the resources rights and entitlements. He narrates how the contemporary revival of traditional water harvesting techniques provides a stage for the articulation of historical claims about state and civil society.

The decentralized management of resource in the state of Madhya Pradesh is analysed by Amita Baviskar. She shows the differentiated nature of the village communities and state bureaucracies that function under the structured inequality. A comparative analysis of water embankment technologies across the world under varied political regimes is a subject of Rohan D' Souza's article on flood control and politics of natural limits. In the opinion of Hugh Raffles, the cultural politics of water has its origin in the "individual biography" and "memory".

This book opens a new vista on the complexities of "waterscapes". Written from different perspectives, there is a common theme discernible in the essays namely the eternal problems of water governance peculiar to ethnic groups, geographical entities and political grouping.

Sumathi is a Research Associate at SaciWATERs. Feedback to this review can be sent to sumathi@saciwaters.org

SAWAS
South Asian Water Studies

PERSPECTIVE

www.sawasjournal.org
volume 2, issue 2, 2011

SAWAS
South Asian Water Studies

AID, TECHNOLOGY AND PROJECT DEPENDENCE:
A Case of Institutional Weakening of Water Sector from Sri Lanka

N. C. Narayanan
Associate Professor, CTARA, IIT Bombay, India
Email: ncn@iitb.ac.in

Sunil Thrikawala
Ph D Student, PGIA, Peradeniya, Sri Lanka
Email: ncn@iitb.ac.in

Abstract

The deteriorating financial health of public sector water service providers attract large amounts of foreign funds (mostly as loans) to developing countries and could lead to dependence, deterioration of governance and weakening of institutions. The case study is primarily a whistle-blower to the proposed large-scale Water Supply and Sanitation project to be implemented in Kandy municipality in Sri Lanka funded by the Japan International Cooperation Agency (JICA).The bloated expenditure andhigh tariff rates to recover the operation and maintenance costs of treating wastewater, could be a huge burden particularly to lower and middle income households that raises questions on the larger acceptance of the proposed project. The technological appropriateness, economic viability, social acceptance, political feasibility and thus the sustainability of the project are questioned. The study also explores the related governance questions in the background of the water sector reforms currently underway in most of the countries including Sri Lanka.

Keywords: Water, sanitation, aid dependence, technology, institutional weakening, Sri Lanka.

1. INTRODUCTION

Water Supply and Sanitation (WSS) is of growing importance in the current discussions on MGDs which in turn attracts foreign aid as loans and grants to developing countries with international financial institutions perceiving huge potentials to increase their lending business. In the recent decades, WSS policies and programs of most developing countries have been influenced by donor assistance reflecting strategies of the donor countries and organizations rather than indigenous strategies of the recipients (Pradhan, 1996). An oft-repeated criticism is that such fund transfers create dependence with respect to both finances and technology and might turn up to be inappropriate to the existing institutional structure.Since the debate about the efficacy and implications of aid are not yet resolved, context specific studies are needed to ascertain the different dimensions of this complex issue. This study focuses on the wastewater disposal issues in Kandy, a place of world heritage in Sri Lanka because of its cultural, historical and aesthetic values attached to it. The city has a population of around 160 thousand with a water consumption of about 25 thousand cubic meters per day. Since there is no proper system of waste water disposal, about 80% of this gets released to Kandy Lake and toMahaweli River. Over the years, Mahaweliriver, the main source of water in the region is threatened with increasing pollutant loads due to contamination from agricultural and domestic wastes,sewage and industrial effluents. Many institutions in different sectors with own mandates are collectively responsible for this situation.

The National Water Supply and Drainage Board (hereafter NWSDB) is the principal institution providing safe drinking water and facilitating the provision of sanitation in Sri Lanka, which began as a sub department under the Public Works Department until it became a division under Ministry of Local Government in 1965.

Since 1970, this division functioned as a separate department under the Ministry of Irrigation, Power and Highway until NWSDB was established in 1975. Presently NWSDB functions under the Ministry of Water Supply and Drainage. Several urban water supply schemes operated by local authorities were taken over by the board with intention of providing better coverage and improved service. NWSDBhas proposed the Kandy City Water Supply Augmentation and Environmental Improvement Project (KCWSAEIP) with financial support from JICA, which is supposed to provide safe sanitation by treating the effluents coming to the drinking water sources and ensuring clean drinking water within the city. The twin purposes of this study is: (a) to examinethe financial problems that led NWSDB to go for the loan and (b) to assess the implications of the proposed foreign aided project in terms of dependency on technology/expertise and institutional weakening of public systems responsible for the provision of WSS services in the country.

The study banks mostly on secondary data from local agencies and governmentinstitutions. The financial position of the NWSDB was analyzed using some indicators drawn from the data available for the last two decades. The proposed project invited differential responses from various sections of the society. Key informant interviews were conducted with the professionals at NWSDB, Kandy Municipal Council (KMC), University of Peradeniya, concerned government departments, religious organizations and civil society/research organizations that opposed the project. Since some of the project documents are not available in the public realm and thus many of the information confidential, the data was collected through interviews with different officials (thus information triangulated) and with the university faculty who were involved with an Environmental Impact Assessment (EIA) exercise.

The next section discusses the experience and possible implications of foreign aid projects globally and in Sri Lanka and reviews the debate on foreign aid, aid dependency and development. The third section analyses the process that led to the financial crisis of the NWSDB that forced the organization to go for the proposed project with foreign assistance. The fourth section describes the problem of pollution and the suggested solution. The fifth section analyses the implications of the project and the larger questions of water governance.

1. FOREIGN AID, DEPENDENCY AND GOVERNANCE CHANGES

Aid dependence defines as a situation in which a government is unable to perform many of the core functions of government, such as the maintenance of existing infrastructure or the delivery of basic public services, without foreign aid funding and expertise (Brautgamand Knack, (2004). Aid also leads to problems such as volatility and uncertainty of overseas development assistance flows, fragmentation of donor efforts, project proliferation, conflicting or dominant donor agendas, competition for staff, and high administration and oversight costs (Brautigam and Knack, 2004; Knack and Rahaman, 2004; Birdsall, 2004; van de Walle, 2005). Aid practices may cause substantial burden on qualified public officials who spend all their time attending to donor concerns and managing aid activities rather than promoting the development of the country. The capable staff is pulled out to the parallel structures weakening institutions by creating resentment and lowering the morale for those left behind (Cohen, 1992). In African countries state capacity has little improved during the last four decades of aid flow and even point to specific cases of clear decline (Van de Walle, 2005). Thus it limits the government's ability in aid dependent countries to learn the skills for effective management and administration with donor conditionality undermining genuine policy learning (Brautigam and Knack, 2004). Heller and Gupta (2002) argue that the fiscal uncertainty of dependence of external assistance makes long-term planning extremely difficult.We will examine how these arguments could be relevant in the Sri Lankan case explained later. Before that let us look to the macro scenario of foreign aid in Sri Lanka.

As of 1999 the total commitments of grants and loans that were made to Sri Lanka was US$ 706 million out of which the share of loans was 90%. The three major donors; Japan, ADB, and the World Bank accounted for 77% of all aid commitments. Of the total loan commitment 8% was taken up for the development of water supply and sanitation sector in 1999 (Foreign Aid Review, Sri Lanka, 1999). The government outstanding debt is 3,432.4 billion rupees as at end of 2008 which is a 14% increase compared to 2007 figures. As a share of GDP, thegovernment debt reduced from 105.4% in 2002 to 81.1% in 2008 (Table 1). Then it increased in 2009 by 2.2%. The share of government revenue of GDP increased from 2004 to 2006 and then it started decreasing. More or less the same trend can be observed in tax share to GDP and share of government expenditure.

Table 1: Government Debt Indicators in Sri Lanka

Government finance (percent of GDP)	2002	2003	2004	2005	2006	2007	2008	2009
Government Debt	105.4	105.8	102.3	90.6	87.8	85.0	81.1	83.3
Domestic Debt	45.6	47.9	47.6	39.0	37.5	37.1	32.8	36.5
Foreign Dept	59.8	57.9	57.7	57.6	57.3	47.9	48.3	46.8
Government Revenue	16.5	15.7	14.9	15.5	16.3	15.8	14.9	14.6
Tax revenue	14.0	13.2	13.5	13.7	14.6	14.2	13.3	12.8
Government Expenditure	20.9	19.0	22.8	23.8	24.3	23.5	22.6	24.9

Source: Central Bank of Sri Lanka Annual Report 2009

1. FINANCIAL CRISIS OF NWSDB AND FOREIGN ASSISTANCE

The NWSDB and local authorities like municipal councils are the two major institutions involved in WSS services and management throughout the island with the support of the provincial councils, lending institutions, external supporting agencies, CBOs and NGOs.

Water supply and sanitation services were provided by the respective municipal councils until the NWSDB was established as a statutory board enacted by the parliament under the National Water Supply and Drainage Law No. 2 of 1974.Since then the water services were gradually taken over by the NWSDB and in 1982 consumer metering and billing were commenced. However, WSS services of some of the cities are still provided by their respective local authorities while development activities are under taken by the NWSDB. Likewise, WSS services within the city limits in Kandy are provided by the Kandy Municipal Council (KMC) while the piped water supply to the periphery of the city is provided by the NWSDB. Rural water supply and sanitation including deep well programs are also being implemented by the board (NWSDB, Annual Report 2006).

The following analysis attempts to assess the financial problems of NWSDB and consequences like increasing dependence on foreign funding.

3.1. Costs and Revenue

Table 2 depicts the annual cost of production of water that more than doubled from 2001 to 2007. The cost of production mainly consists of direct operational cost, administrative overheads and other operating expenditure contributing 56%, 16% and 19% respectively with 8% financial cost and 1% taxation (NWSDB, 2006). The operational expenditure is increasing over the years with increasing cost of each item of the operational cost. However, percentage of each cost item from the total is either decreasing or not changing over time except the personnel cost. Personnel cost as a percentage from total operational cost is increasing over time despite a drop in 2006. Being an autonomous institution the NWSDB has the power to change (increase) the water tariff from time to time. In 2009 tariff rate increased by more than 100 percent. Thus one could argue that NWSDB is transferring the burden of increased personnel expenditure to the consumers through increased tariff. This situation in fact highlights the necessity of an independent regulatory authority that could control the tariff reforms etc. of the water board.

Table 2: Operational expenditure of drinking water over the years

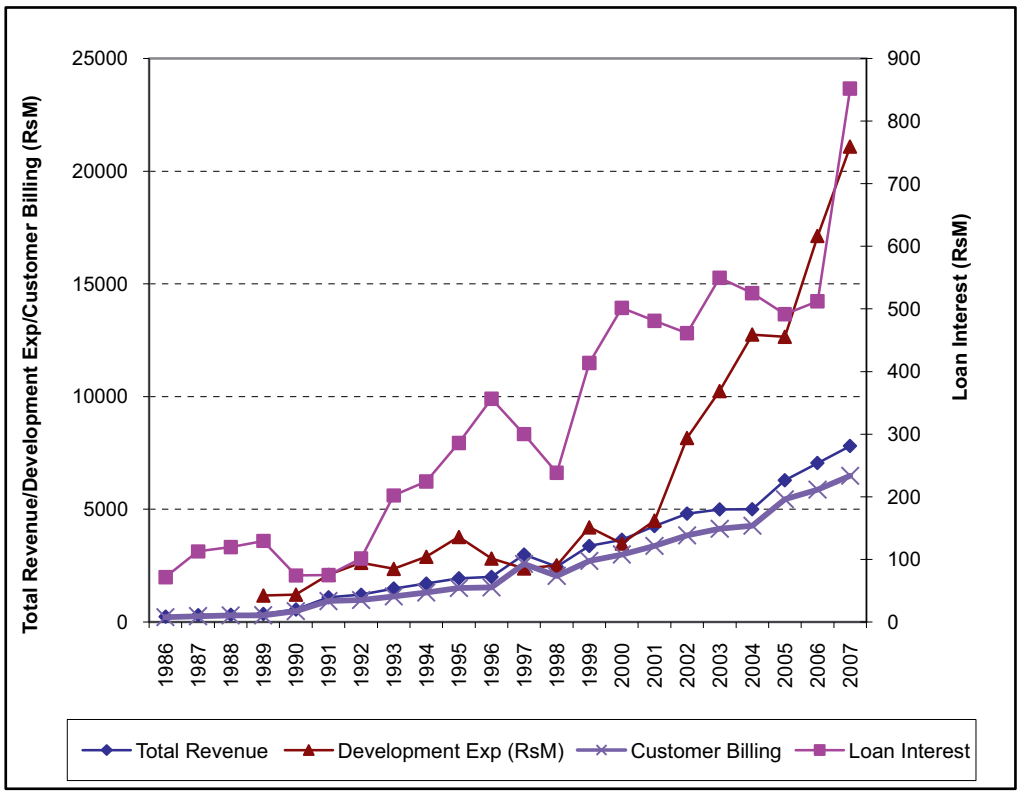
	2001	2002	2004	2005	2006	2007
Personnel	878.24 (39.09)*	1012.23 (35.39)	1919 (45.61)	2541 (48.19)	1829.35 (44.83)	2335.09 (47.63)
Pumping	904.8 (40.27)	1135.42 (39.69)	1126 (26.76)	1245 (23.61)	1360.67 (33.35)	1587.87 (32.39)
Chemical	170.33 (7.58)	182.24 (6.37)	171 (4.06)	214 (4.06)	319.57 (7.83)	349.49 (7.13)
Repair & Main	130.07 (5.79)	152.94 (5.35)	224 (5.32)	308 (5.84)	256.86 (6.29)	287.03 (5.85)
Establishment	68.28 (3.04)	272.57 (9.53)	451 (10.72)	610 (11.57)	137.64 (3.37)	152.01 (3.10)
Other	95.15 (4.23)	104.98 (3.67)	316 (7.51)	355 (6.73)	176.44 (4.32)	191.04 (3.90)
Total	2246.87	2860.38	4207	5273	4080.53	4902.53

Source: NWSDB Annual Reports, various issues.

*Values in the parenthesis are the percentage of each cost item from the total

Figure 1 shows that the development expenditure, revenue generation, customer billing and the interest payment are increasing over time. However, development expenditure has taken over the revenue as well as the customer billing except in few occasions. The interest payments are also increasing rapidly after 2001.

Figure 1: Total revenue, development expenditure and loan interest over the years



3.2. Non-revenue Water (NRW)

Over the years the production of pipe water is continuously increasing. However, the non revenue water (mostly leakage from the delivery point to the meters of the consumers[4]) continues to be around 30-40% range, though there is a slight decline (Table 3).

Table 3: Pipe water production and non-revenue water over time

Year	Piped water production(Mm3)	Non-revenue water (%)	
		Greater Colombo	Other Area
1990	219	36	40
2000	332	39	31
2001	343	39	30
2002	350	37	30
2003	357	38	31
2004	367	36	29
2005	383	35.9	33.8
2006	398	37.5	34.4
2007	424	37.8	33.1

Source: NWSDB Annual Reports, various issues (1987 to 2006)

Thus NWSDB was unable to account for 140 million cubic meters of treated water costing more than 2300 million rupees during year 2007 (Table 4). NRW in 2007 was sufficient to supply water for approximately 585,000 (140491*1000/(12*20)) new households, assuming an average consumption of 20 m3 per month, per household. The O&M cost also can be substantially reduced by cutting down the NRW. This shows the discrepancy between production and distribution and widening gap between water billing receipts and the total revenue indicating lowering of institutional capacity over the years.

Table 4: NRW and incurred cost over the years

	2003	2004	2005	2006	2007
NRW (000'm3)	124,442	123,959	96,690	136,630	140,491
Direct cost (million rupees)	1406.5	1648.4	1290.1	2040.4	2377.9
Additional cost born by consumers for every unit of consumption (Rs.)	6.04	6.76	6.76	7.82	8.37

Source: NWSDB Annual Report 2007.

[4]*Tortajada (2006) estimated that for the year 2001 the O&M cost/m3 of drinking water could have been reduced to Rs. 13.00 from Rs. 20.20 if the NRW was eliminated.*

3.3. Water Treatment Costs

Pollution by sewage, fertilizers, pesticides, and toxic metals degrade the quality of water available for human consumption with NWSDB incurring progressivelyhigher cost in treating water(see Table 4). In Sri Lanka the water is treated at the full treatment level where processes of screening, coagulation, flocculation, sedimentation, filtration anddisinfection are involved which costs Rs. 60,000 per connection with O&M cost of Rs 10-25 per cubic meter (Attanayake and Athukorale, 2007). This is a huge social cost incurred by the society due to the irresponsible use and pollution of water bodies.

Table 5: Water treatment costs

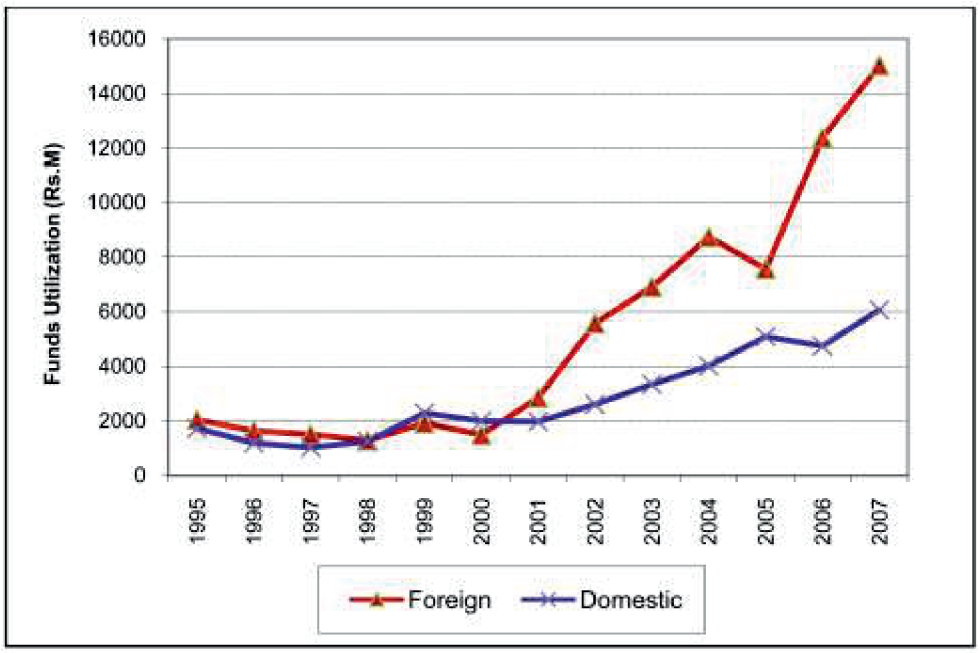
Treatment	Unit Involvement	Cost of treatment per connection (Rs)	O&M cost per cum (Rs)
Only disinfection	Screening & disinfection	1,500	0.5-1.5
Minimum treatment	Screening, filtration & disinfection	8000	1-3
Partial treatment	Screening, roughing filtration, filtration & disinfection	16,000	3-10
Full treatment	Screening, coagulation, flocculation, sedimentation, filtration & disinfection	60,000	10-25
Advanced treatment	Screening, coagulation, flocculation, sedimentation,filtration & adaptation, and disinfection	150,000	75-100

Source: Attanayake and Athukorala (2007)

3.4. Foreign Aid to the NWSDB

In 2007 NWSDB obtained 14,166 million rupees as foreign funds and the government of Sri Lanka provided 4,587 million rupees as counterpart funds (NWSDB, Annual Report 2007). NWSDB is handling 15 foreign funded projects with funding mostly from ADB, JICA and GTZ. Figure 2 shows a sharp increase in foreign funds coming as grants and loans during the period of 2000 to 2007. In 2005 the Board has obtained 36,338 and 12,841 million rupees as foreign grants and loans respectively (Annual Report 2006). Even though the revenue income is increasing along with the increasing service connections by 2004, the board had a deficit of over 800 million rupees that came down to Rs. 22 million due to the improved revenue and reduced interest paid in 2005. The level of high interest on loans along with high level of foreign grants and loans indicate dependency of the water board on foreign funds. Further except few occasions development expenditure exceeded total revenue indicating the dependency on external funds. In 2007 the foreign fund allocations was much more than double of the local fund allocation. The provision of water services is increasingly dependent upon foreign support evident through ever increasing development expenditure and the widening gap of foreign funds to local funds.

Figure 2: Utilization of the funds by NWSDB over the years



Source: NWSDB Annual Reports, various issues (1987 to 2007)

The following are the major observations on the dire financial crisis of NWSDB:

- *The development expenditure has exceeded revenue as well as the customer billing except in few occasions. The interest payments are also increasing rapidly after 2001 indicating the deteriorating financial health of NWSDB.*
- *The discrepancy between production and distribution (30-40% of non-revenue water)and widening gap between customer billing and revenue shows the lowering of institutional capacity over the years.*
- *Pollution of water leads to huge costs for treatment of water.*
- *Increasing development expenditure with huge proportion of loans and grants indicates enhancing dependency of NWSDB on foreign funds.*

1. WASTE WATER IN KANDY: PROBLEM AND PROPOSED SOLUTION (KCWSAEIP)

Mahaweli is the most important river for Sri Lankans as it provides water for multiple purposes such as domestic and industrial use, hydropower and irrigation. Over the years, Mahaweli river, is threatened with increasing pollutant loads due to contamination from agricultural, industrial and domestic wastes and sewerage. Urbanization and increased population in the Kandy city coupled with inefficient sewage systems contribute heavily to the pollution of Mahaweli river. The sewage in the downtown area flows directly into the drainage system causing heavy pollution to Mahaweli river. Further, sewage—mainly gray water from hotels, offices and residences around Kandy Lake flow into the Kandy lake causing heavy contamination (like algae bloom). Kandy has a long history of indigenous design and management of drinking water. The current problem in Kandy cityand the expected benefits and estimated costs of the Kandy City Water Supply Augmentation and Environmental Improvement Project (KCWSAEIP) are discussed in this section. The technology/expertise involved, impacts on the institution and the sustainability of the proposed project are then discussed under the implications.

The NWSDB is planning to operate a Sewage Treatment Plant (STP) in two phases with equal capacities of 8500cum/day. The project is planning to collect the waste water of the Kandy city area through a system of pipe lines, to pump to a treatment plant, to treat and to dispose the treated effluent to the Mahaweli River.

The expected benefits are

- Reduction in public nuisance, because of increased safe water sources and reduction of open-air sewers in urban area
- Improvement in public health resulting from the reduction of water-born vector diseases
- Improved surface and ground water quality
- Elimination or minimization of the pollution in Kandy lake
- Improvement of the aesthetic value of Kandy lake and the surroundings
- Reduction of the odor problems in the city
- Improving the raw water quality at the Gohagoda intake in Mahaweli river.

The project is estimated at almost 14 billion rupees, in which 82.9% is coming as a soft loan through treasury by JICA (see Table 5) and the estimated O&M cost is going be Rs. 11 million per month to dispose 17,000m3of wastewater per day for55,000 people in the Kandy city. This works out to be Rs. 210 per month per household for waste water treatment alone.

Table 6: Estimated costs of STP

Cost Item	Foreign Million Yen	Local Million Rs	Amount (Million Rs)
Construction contracts	4,352.2	3,450.9	7,407.4
Provisional sums			
Road reinstatement	0	334.0	334.0
Power supply	0	10.0	10.0
Equipment procurement	133.1	0	121.0
Sub total	133.1	344.0	465.0
Contingencies	224.3	2,515.1	2,729.0
Engineering services			
Detailed design	318.7	145.6	435.4
Construction management/supervision	255.9	152.5	385.1
Price contingency on Engineering services	129.6	0	117.8
Sub total	704.2	298.1	938.3
JICA loan portion	5,413.8	6,609.1	11,539.7 (82.90%)
Project administration	0	111.1	111.1
Land acquisition	0	0	0.0
Custom duties	0	539.4	539.4
Value added tax	0	1729.4	1,729.9
GOSL portion	0	2379.9	2,379.9 (17.10%)
Total	5,413.8	8989.0	13,910.6*

[5] This is the current intake of water from the Mahaweliriver for city water supply. This intake is 500m downstream of the proposed STP outlet to the river.
[6] URL www.jica.go.jp/srilanka/english/office/topics/press17_01.html accessed on September 22, 2010.

Source:SAPROF Report (2005).

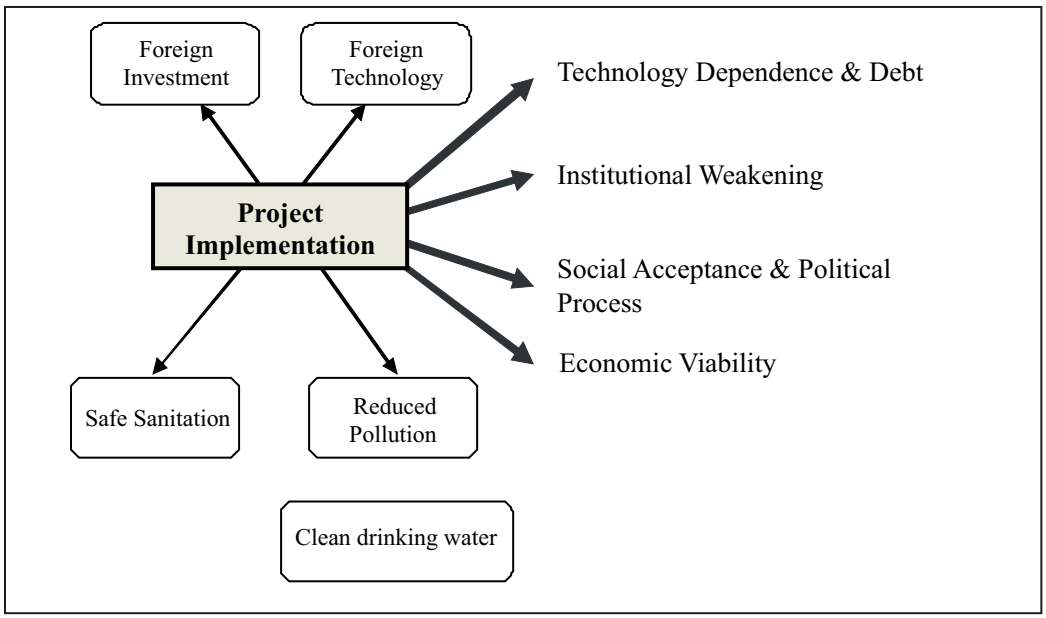
Note: * The latest figure is Rs. 18.11 billion (Yen 14.09 billion)

From the foreign portion of the loan, which includes construction contracts, provisional sums, contingencies and engineering services, almost 50% is going back to the lenders. The sustainability and even the initiation of the system after completion depend on the Sri Lankan government exclusively spending huge sums on house connections and ensuring power supplies. The responsibility of inclusion of low-income settlements and public sanitation also rests exclusively with the government with no donor spending on that. The road reinstatement after the disarray of putting the pipes also is government responsibility. The price tag for the engineering services and expertise that come from Japan and the huge benefits of selling the (black box of) technology for the plant and pumping station seen in the table clarifies the unequal benefits and costs accrued by the 'donor' and 'receiver'. The provisional sums of equipment procurement and engineering services consist of detailed designing, construction management supervision and price contingency on engineering services. Thus from the Rs.11.5 billion rupees that comes as the loan,a major share will be accrued by the donors with questions of sustainability at various levels (will be discussed in following sections). With hind sight of the delays in such projects, the escalation of costs could be a huge burden to the exchequer. An important observation here is the cost escalation of the total project cost from Rs 3billion in 1998to the current estimated project cost of Rs.18.11 billion (Yen 14.09 billion) as per the agreement signed between JICA and Government of Sri Lanka on March 21, 2010. With the ongoing delays, we can easily anticipate further escalation of costs.

5. IMPLICATIONS OF THE PROJECT

The implication of the project can be conceptualized as given in Figure 3. The project is expected to source funds from a foreign donor and needs exotic technology to be imported creating dependency. Bringing in new technology along with policy changes has to be suitable to the existing institutional setup, especially qualified staff to handle the new technology. Either the existing institution has to increase the technical capacity or affiliate with other institutions. This will have an impact on project cost and hence the sustainability. New skills and the funds will have an impact on the organizational culture. Developing new culture may be detrimental to the existing setup. When the new project is implemented it has to recover at least the O&M expenditure. The project expects to recover O&M expenditure through increased water tariffs. If unaffordable will lead to exclusion. It is also important to look whether there is a political will to implement the project and a scenario without the project being implemented. The discussion so far justifies the exploration for alternative lower cost technologies through mobilizing indigenous resources.

Figure 3: KCWSAEIP Project and its Implications



[7] (http://www.kandynews.net/august_2007/news.shtml)
[8] http://www.jica.go.jp/english/operations/evaluation/oda_loan/economic_cooperation/pdf/sri100326_02.pdf accessed on September 20,2010.

5.1 Technology Appropriateness

Centralised System Needed? The technology for waste water treatment has come as a package with the loan from the donors. The nature of technology, appropriateness of it for local circumstances, cost of alternative technologies etc. still remains to be tested. The proposed treatment technology—Oxidation Ditch—is highly sophisticated and complicated. An EIA done by a private firm has given green signal to the technology claiming that under prevailing conditions(continuous increase in population, limited land availability, soil type and high water table in the area) a centralized wastewater treatment method is needed to avoid contamination of Mahaweli water by sewage (NRMS, 2005). However, the report does not analyze any alternate technologies. Further a restructuring of the Kandy City is already approved with several big polluters like the prison, bus station etc. to be relocated outside the city.In that case the space problem highlighted as justification to the centralized system become insignificant.

Organic Pollution load and uncertainty? According to the comments submitted by the Environmental Foundation Ltd to the CEA, the effluents from the proposed plant is going to increase the organic pollution load by up to 700% though it is supposed to reduce the pollution level. However, according to CEA standards if BOD level can be maintained below 20mg/l, increase of organic pollutant loading does not harm the water quality since the self oxidation ability of the moving water. The Environmental Foundation Ltd (EFL) also argues that during periods of plant failure (which is quite unavoidable according to the past experience of small scale STPs in local context) it would increase the organic pollution load up to 4.2 tons of BOD per day(NRMS, 2005).The heterogeneous composition and unpredictable inflows of waste water is difficult to handle and hence the only reasonably successful plants in Sri Lanka are the common STPs of industries in which volume and composition of the load from each industry is predictable and constant.

Dependency, Lifespan, Operations and Maintenance? After such large investments if this is unavoidable, the donors may be giving huge bills for maintenance in the future (elaborated later). The expected lifespan of the project is 30-40 years (NRMS, 2005). However, this is possible only if appropriate operation and maintenance activities at sewage collection and treatment plant are maintained. The sustainability of the system rests on a set of sequential activities that demand experts, technicians and skilled labor. The shortfall in any activity could cause the collapse of the whole system evidenced from similar (but smaller scale) plants. The major problem in the existing smaller systems in Kandy (Narayanan and Thrikawala, 2007) is mostly the poor maintenance. The operation of the STP entirely depend on the electric power for running pumps at various locations on inflow systems and pumps of the STP and effluent system . Power failure at any location could cause shut down of the entire system. The risk of blocking the sewerage inflow transmission or power failure at the STP could cause spills and overflow of tanks leading to sanitation and health hazards and odor problems. Since the power failures are very common, the subsequent chaotic situations can be frequent with the implementation of the project. This implies that the proposed technology might increase the risks and health hazards that it is supposed to curb. Further, the pipe system has to be laid on a very systematic manner to collect and pump the sewerage. However, Kandy is not a planed city as such and all the roads, buildingsand other structures are established in an ad hoc manner. Thus, setting up a systematic pipe system for sewerage is very challenging.

5.2. Economic Viability

Enhanced debt: The project is estimated at almost 18.11billion rupees of which 82% is funded by JICA with the estimated O&M cost going to be at Rs. 11 million per month to dispose 17,000m3 per day to serve 55,000 people in the Kandy district. The money is coming as a soft loan from JICA to the treasury and grant from treasury to NWSDB. It is 0.56% of the GDP (GDP=Rs. 2500 billion1) and the current debt of each individual will go up by 0.12% to serve a very small fraction (0.3%) of the total population of Sri Lanka. This is in fact dependency on money from foreign donors.

[9](http://www.sundayobserver.lk/2010/01/24/new41.asp. accessed on January 24, 2010.

[10]Personal Communication with Mr. M. Sivakumar, Former Deputy Director of Northern and Eastern Province of Central Environment Authority on September 27, 2007.

[11]The sewerage treatment plants at PeradeniyaHospital, Hantana housing scheme, Raddoluwa housing scheme all failed.

Huge O&M Costs and Increased Tariffs: NWSDB is planning to hand over the plant to the Kandy Municipal Council (KMC) once the constructions are done. KMC will be the local authority responsible for cost recovery and maintenance. The EIA report (NRMS, 2005) as well as Table 5 indicates most of the construction and materials have to be imported with foreign expertise. The sustenance of the system needs continuous import of materials during repairs and replacements. Thus NWSDB and the KMC will be continuously dependent on the donor technology.

Even though KMC is planning to recover the full O&M cost for proper maintenance of the project. This is in addition to the asset management costs that work out to be 10% of the capital costs for repairs and replacement. The water board has understood that adding this to the water bill is going to be a huge financial burden for the users and a major reason to depend on the external sources leading to a perpetual dependence on technology and funding.

Operation and maintenance consist of personnel, electricity, chemicals, repairs and maintenance, and establishment costs as given in Table 6. The total O&M cost is 101.3 million rupees per annum. Per capita sewerage flow has been estimated at 86 L/day which is equivalent to 0.086m3/day (NRMS, 2005). If we assume a five member family there will be 0.43 m3/day of sewerage discharge per household per day. The total O&M cost to dispose 17,000 m3/day works out to be Rs. 16.33/m3. Then each household will have to pay Rs. 210/month for the service. However water board is proposing a differential tariff system based on household income and type of uses. Tariff rates are discriminated on the type of users and further for domestic users according to their income categories. On average thus a household within the medium income group will have to pay Rs. 200/month.In addition, a connection charge which depends particularly on the distance from household to the main sewage pipeis another financial burden for the consumers with very few people willing to get the connection even if a fully reliable service is guaranteed. Morethan 40% of the total cost is taken up by chemicals repair and maintenance by which at least 90% go back to the donors annually with water board and the KMC dependent on replacement of parts and chemicals for ever. The EIA report indicates that most of the equipmentshave to be imported (NRMS, 2005)

Table 7: Direct O&M costs of KCWSAEIP

Item	O&M Costs (Million Rupees/annum)
Personnel	8.8
Electricity	38.8
Chemicals	16.7
Repairs and Maintenance	34.6
Establishment	2.4
Total	2.4

Source:Feasibility Report of KCWSAEIP

5.3 Institutional Weakening and Dependence

The construction of the plant, operation and maintenance, and repairs needs experts and skilled workers for which there is a plan for allocating 27 personnel for O&M for various tasks such as inspection, sewer pumping, sewer treatment, water analysis etc.NWSDB and KMC will have to depend on external expertise during constructions, operation and maintenance and in emergency breakdowns as well (NRMS, 2005). The project has no budget allocation for capacity development of NWSDB personnel and hence the technology and processes remainsa black box for the institution, leading hiring to over-priced foreign and local consultancy expertise that results in over-spending. The lack of institutionalization of expertise by NWSDB will lead to deskilling and enhancement of costs. The opaqueness of the project office regarding sharing of many vital information does not allow us to assess this aspect in all its detail.

[12]Personal communication with Mr. J.C. Jayalath, Acting project Director.
[13]Mr. Jayalath, Project Director, personal communication

5.4. Social Acceptance and Political Process

The EIA study (NRMS, 2005) has conducted two surveys to determine the opinion of the people around the proposed STP site and the general public of Kandy city. The survey around the plant site was conducted with 165 respondents. 68% of the respondents were supporting the project since they believe that project will ensure cleanliness of the Kandy city, reduce environmental pollution, meet the needs of the increasing population, keep water quality in the Mahaweli River and scope of recycling waste for agricultural production. 40%opposed the project with reasons of uncertainty in maintenanceresulting in bad odour, adverse impact on the botanical garden due to gas emissions, proximity to the Buddhist temple, treating/reusing water with human excreta and thenegative impacts on the experimental fields of the Department of Agriculture.

There were protestsagainst the project with participation of over 5000 people. The protestscentered around the selection of STP site was organized by the Gatambe Buddhist Temple with participation of monks, religious leaders, officials of Department of Agriculture and general public. The protest questioned the survey findings with its "manufactured consent". It was argued that there is no social acceptance for this project even with the current lack of transparency that hides the implications of the project. If a genuine public debate is triggered with sharing transparent information about the technological, economic and institutional implications, it is doubtful whether it will pass the test of democratic consensus to take the project forward.

1. CONCLUSIONS

In the larger background of Sri Lanka's NWSDB's financial crisis, this study attempted to investigate the donor influence and institutional changes in the proposed foreign aided project in Kandy. The techno-economic analysis brought out the implications for dependency and debt. The insights from the literature about the need for strong policies and institutions to have aid-effectiveness were proved valid

in the case study. The unequal terms of aid, with weak bargaining power would breed technological, knowledge and economic dependency on donors. The price tag for the engineering services and expertise that come from Japan and the huge benefits of selling the (black box of) technology for the plant clarifies the unequal benefits and costs accrued by the 'donor' and 'receiver'. The proposed technology might not be the most appropriate one with very high capital cost, O&M cost and asset management cost where latter two are recurring and essential for the sustainability of the plant.

The financial crisis of NWSDB in Sri Lanka is reflective of the similar problems of public utilities in WSS sector in developing countries. The internationally available technology solutions are capital/technology intensive. The public utilities are faced with problems of resource mobilisation, work culture and populist policies against tariff hikes. The privitisation of public utilities has faced resistance and it is almost clear that developing countries could not support the rate of returns required by international equity capital (Hall and Lobina, 2007). All these point to the need of contextual solutions that are technologically appropriate, institutionally viable and economically feasible.

Decentralized technological alternatives like (a combination of) individual septic tanks and constructed wetlands could be integrated at the mini/micro watershed level to be managed by community-based institutions seem to be promising (Narayanan and Thrikawala, 2007). Paradoxically, the alternatives projected also are foreign-funded. However, they have built-in resilience mechanisms of simple locally appropriate technology banking on local labor and pooling of local resources (both financial and human). It has institutional mechanisms of a demand-driven approach that builds on consensus and ownership with participation of local NGOs and CBOs. All these might throw up other questions, which we have raised elsewhere (Irshad and Narayanan, 2007).

14The figure does not add up to 100% because some people had mixed opinions (NRMS, 2005: 103-104).

15 A larger survey was done covering the benefiting areas in Kandy city with a sample of 100 households. There were 78%, 3% and 19% supporting, opposing and with mixed opinions. Apart from the reasons given above, improved health conditions of the public, creation of job opportunities and efficient usage of small plots of land were reasons given by those supporting the project (NRMS, 2005:103-106).

But, in comparison, the alternatives offer scope for less dependent (technologically and financially) solutions for WSS problems in Sri Lanka and elsewhere. Future studies have to streamline the technological alternatives to suit diverse biophysical and socio-economic contexts with appropriate institutional arrangements. Further a thorough economic analysis should be done to investigate the possibility of establishing decentralized individual systems of sewerage management.

The increasing quantity and quality of waste water pouring into the water bodies with the increasing costs of purification raises the issue of addressing the problem at source than treating the symptom with technological solutions like STPs. The alternatives suggested seem to address the core issue of treating the pollution at its source, whereas techno-energy intensive models as assessed in this study raises sustainability issues at different levels.

A striking governance observation of this study is the lack of transparency about the project details like the high costs and implications like huge tariff hikes to the citizen. Ensuring accountability of officials to opt for appropriate technological choices depend on the transparency of information availability to trigger societal debates for more democratic decision-making. The near-absence of any civic involvement to facilitate such processes will ensure the repetition of similar projects in South Asia.

REFERENCES

ADB (2007). Sri Lanka assistance program evaluation:Water supply and sanitation sector assistance evaluation. Evaluation Working Paper, Operation Evaluation Department, Asian Development Bank.

ADB (2006). Country Water Action: Sri Lanka, 3rd Water Supply and Sanitation Project—Participatory, Consultative and Empowering
http://www.adb.org/water/printer-friendly.asp?url=/water/actions/SRI/third-water-supply.asp

Annual Report (2006).National Water Supply and Drainage Board, Sri Lanka.

Attanayake, M.A.M.S.L. andK. Athukorala, (2007). An experience of an epidemic-highlighting the need for collective decision-making through IWRM based strategy. Paper presented at the Second South Asian Research Workshop on Water Supply Sanitation and Wastewater Management. 24-26th September, Kandy Sri Lanka.

Bandara, K.R.N (2005). A national water policy for Sri Lanka. Paper presented at the Water Professional Day Symposium, 2005.

Bell, D.E. (1965). The Quality of aid. Foreign Affaires, Vol. 43; 601-607.

Brautigam, N and S. Knack (2004). Foreign aid, institutions and governance in Sub-Saharan Africa. Economic Development and Cultural Change. Vol. 52(2), 255-285.

Birdsall, N. (2004). Seven Deadly Sins: Reflection on Donor Failings. CGD Working Paper no. 50. WashingtonDC: The Center for Gobal Development

Central Bank of Sri Lanka. Annual Report 2006.

Ciria, M.P., M.L. Solano and P. Sariano (2005). Role of MacrophyteTyphalatifolia in a constructed wetlnd for wastewater treatment and assessment of its potential as a biomass fuel. Biosystem Engineering. Vol. 92:535-544.

Cohen, J. M. (1992). Foreign advisors and capacity building: The case of Kenya. Public Administration and Development. Vol. 12(5):493-510

Dayawansa, N.D.K. (2007). Need for coherent approach for sanitation, wastewater management and water supply: A case from Sri Lanka. Paper presented at the Second South Asian Research Workshop on Water Supply Sanitation and Wastewater Management. 24-26th September, Kandy Sri Lanka.

Devarajan, S., D.R. Dollar, and T. Holmgren eds., Aid and Reform in Africa: Lessons from ten case studies, World Bank 2001, WashingtonDC.

Dubreuil, C. (2006). Synthesis on the right to water; Fourth World Water Council, Mexico. World Water Council.

Durrbarry, R., N. Gemmel, and D. Greenway (1998). New evidence on the impact of foreign aid on economic growth. Research Paper No. 98/8. Center for Research in Economic Development and International Trade, Nottingham.

Farley, M. and S. Kilbey (1999). Environmentally-friendly hygienic dry sanitation technology. Paper presented at the 25th WEDC conference on integrated development for water supply and sanitation, Addis Ababa, Ethiopia.

Friedmen, M. (1957). Foreign economic aid: Means and objectives. Yale Review, Vol. 47(4); 500-516.

Foreign Aid Review, Sri Lanka. (1999). External Resources Department, Ministry of Finance and Planning, Sri Lanka.

Gupta, S., B. Clements, A. Pivovarsky, and E. Tiongson (2004). Foreign aid and revenue response: Does the composition of foreign aid matter?. In Helping Countries Develop. The Role of Fiscal Policy, eds. S. Gupta, B. Clements and G. Inchauste. WashingtonDC:IMF

Hall David and Lobina Emmanuel (2007). Water as a Public Service. www.psiru.orgAccessed on September 22, 2010.

Heller, P. and S.Gupta (2002). Challenges in expanding developmental assistance. IMF Policy Discussion Paper. PDP/02/5.

Herron, A.H. Low-cost Sanitation: An overview of available methods
. http://www.wilsoncenter.org/topics/pubs/WaterStoriesSanitation.pdf. Accessed on August 10, 2008.

Knack, S. and A. Rahaman (2004). Aid dependence and the quality of governance: A cross-country empirical analysis. Background Paper, World Development Report.

McGillvray and Morrissey (2000). A review of evidence on fiscal effects of aid. CREDIT Research Paper No. 01/13.

Morton, K. (1975). Aid and dependence: British aid to Malawi. London: Croom Helm in Association with the Overseas Development Institute.

Moss T., G. Pettersson and N. van de Walle (2005). The aid institution paradox: Long-term cost of high aid dependency.

Web: http://www.cgdev.org/content/publications/detail/5646.Accessed on July 30, 2007.

Mowjood, M.I.M, K.B.S.N. Jinadasa, N. Tanaka and D.R.I.B. Werellagama (2007). Applicability of constructed wetlands for wastewater treatments in tropical countries: A case study from Sri Lanka. Paper presented at the Second South Asian Research Workshop on Water Supply Sanitation and Wastewater Management. 24-26th September, Kandy Sri Lanka.

Narayanan. N.C and Irshad Mohammed, 2007, Foreign Assistance and Institutional Weakening: Experience of provision of drinking Water in Kerala, India. Paper presented at the Workshop on 'Civil Society in Water Governance' at Mulshi, Pune, India from October 10-12, 2007.

Narayanan. N.C and Sunil Thrikawala, (2007), Beyond the Big and Familiar: Technological and Institutional Alternativesin Water and Sanitation Sector in Sri Lanka. Paper presented at the Workshop on 'Civil Society in Water Governance' at Mulshi, Pune, India from October 10-12, 2007.

NRMS (Natural Resources Management Services (Pvt) Ltd.), 2005, EIA Report of KandyCity Waste Water Disposal Project-The Environmental Impact Assessment Submitted to the Central Environmental Authority., Sri Lanka.

Remmer, K. (2004). Does foreign aid promote the expansion of government? American Journal of Political Science. Vol. 48(1);77-99.

Payer, C. (1974). The debt trap: The International Monitory Fund and the Third World. New York: Monthly Review Press, pp 212-213.

Pradhan, S., 1996, "Evaluating Public Spending: A Framework for Public Expenditure Reviews," World Bank Discussion Paper No. 323, World Bank, Washington D.C.

Sachs, Jeffry D. (2005). The End of Poverty; Economic Possibilities for Our Time. Penguin Books Ltd. 80, Strand London WC2R) ORI, England.

Sudasinghe, M.I., L.W. Galagedara, and E.R.N. Gunawardena. Performance Evaluation of Selected Sewerage Treatment Plants in Sri Lanka. Paper accepted for publication in the Journal of Tropical Agricultural Research.

UNDP 2005. MillenniumDevelopmentGoalsCounty Report: Sri Lanka.

van de Walle, N. (2005). Overcoming Stagnation in Aid-Dependent Countries. Washington DC: Center for Global Development.

Windberg, C. and P. Barraggne-Bigot (2006). Ecological sanitation compost toilets in Sri Lanka: An Appropriate solution? Paper presented at 32nd WEDC international Conference on Sustainable development of water resources, water supply and environmental sanitation, Colombo, Sri Lanka.

AbbreviationDescription

ADB	Asian Development Bank
CBOs	Community Based Organizations
CEA	Central Environmental Authority
CWLs	Constructed Wetlands
DOA	Department of Agriculture
EFL	Environmental Foundation Ltd.
GNDs	GramaNiladari Divisions
GTZ	German Agency for Technical Cooperation
JICA	Japan International Cooperation Agency
KMC	Kandy Municipal Council
MDG	Millennium Development Goal
NWSDB	National Water Supply and Drainage Board
O & M	Operation and Management
OECD	Organization for Economic Co-operation and Development
PAP	Participatory Action PlanK
CWSAEIP	City Water Supply Augmentation and Environmental Improvement Project
STP	Sewage Treatment Plant
UDAUrban	Development Authority
USAID	United States Agency for International Development
WSS	Water Supply and Sanitation