

Sultana, Farhana. 2004. "Engendering a catastrophe: A gendered Analysis of India's river-linking project" In *Regional Cooperation on Transboundary Rivers: Impact of the Indian River-linking Project*. Eds. M.F. Ahmed, Q.K. Ahmad, and M. Khalequzzaman, pp. 288-305. Dhaka: BAPA Press.

[www.farhanasultana.com/publications](http://www.farhanasultana.com/publications)

## Engendering a Catastrophe: A Gendered Analysis of India's River-linking Project

Farhana Sultana

Department of Geography and Interdisciplinary Center for the Study of Global Change/MacArthur Program, University of Minnesota, Minneapolis, MN, U.S.A.

### Abstract

*This paper undertakes a gendered analysis of India's river-linking project in order to shed light on the multifaceted impacts that are often overlooked in discussing the project. The paper argues that lessons from a gendered analysis of the Farakka Barrage provide key insights on what is likely to emerge with the mega river-linking project for downstream Bangladesh. The paper contends that a gendered perspective provides a more nuanced and critical understanding of the multiplicities of sufferings that will result within the context of the socio-ecological, economic and political outfalls of the mega-project. Such a gender analysis provides even greater empirical evidence of why river-linking for Bangladesh will indeed be a catastrophe.*

### Introduction

Originating in the glaciers of the Himalayas, the Ganges and Brahmaputra Rivers flow into the plains of India and travel onward to drain into the Bay of Bengal through deltaic Bangladesh. This monsoonal river system is one of the largest river systems in the world, and holds multiple symbolic, cultural, material and political meanings to the people who rely on it and its tributaries for social and economic reproduction. The ecological systems sustained by the Ganges and Brahmaputra Rivers are intricately intertwined with the livelihoods of the primarily agrarian and riverine people of the delta in India and Bangladesh. Historically, communities have come to co-exist with and rely on the flow of the rivers, forming one of the most densely populated areas with high agricultural productivity and ecological diversity. Overall, the immensity of the social, environmental and economic importance of the rivers thus cannot be overstated in the context of South Asia.

However, notions of 'development' and progress have been used to alter the rivers, transforming the hydrology, geomorphology and ecosystems of the

watersheds. Such transformations in turn have had profound impacts on the communities and societies dependent on the rivers. Post-colonial nation-building discourse in India in the last 50 years has espoused high modernism ideology, modeling much of the river development plans after the U.S.'s Tennessee Valley Authority and constructing series of dams on several rivers for irrigation, hydropower and navigation purposes, mainly on the Ganges River. India's present plan to link major rivers flowing through its territory and divert river water through massive infrastructure interventions at a cost of \$120 billion reflects continuation of such ambitious thinking and goals. While the benefits of such enormous undertakings are questionable and controversial, it would be prudent to heed the implications of diverting the Ganges River at the Farakka Barrage that have played out over the last three decades in order to assess what is likely to happen with scaled-up water diversions. This paper seeks to highlight the impacts of the Farakka Barrage on the Ganges River, particularly from a gendered perspective, to show how the lessons learnt from this case can provide some historical and geographical context that can better inform river control plans and help planners and politicians take into consideration both intended and unintended outcomes of such ambitious interventions. The lessons learnt from the impacts of the Farakka Barrage are particularly insightful in order to contextualize and extrapolate what will happen with India's mega-project of linking major international rivers for downstream Bangladesh.

This paper argues that heeding gendered dimensions of the sufferings and outcomes of water diversion via river-linking provide critical tools with which to more fully gauge the impacts of mega-projects of water diversion. However, a proper gender analysis of this mega-project is still pending. While analyses of the impacts of the river-linking project highlight various social, economic and environmental issues, it is important to disaggregate such outcomes by gender and understand that another dimension of impacts is exposed once we undertake a gendered examination of the overall impacts. In understanding the outcomes of the river-linking project, differences in coping mechanisms and responses to the situation need to be analyzed from a gendered perspective.

It is widely known that environmental degradation disproportionately affect poorer women (Agarwal, 1994; Rocheleau et al., 1996). Feminist scholars have also argued that households and communities need to be gendered and analyzed in ways that allow us to see how they are arenas of both cooperation and conflict, and not treat either to be benevolent black-boxes (Kabeer, 1994). How men and women live their lives and livelihoods and how they benefit from various decisions that are made, need to be seen in context in order to better gauge gender relations. Of course gender needs to be understood within the context of other axes of social differentiation (e.g. class, caste, age, etc.), but it must be recognized that gender differences lead to considerable inequalities and hierarchies in many places, such as rural Bangladesh.

In a comprehensive analysis of the impacts of large dams on society, Mehta and Srinivasan (1999) note that globally, the outcomes of altering rivers and construction of dams have had deleterious impacts on women compared to men. While majority of the literature on dams have focused on resettlement issues or newly-irrigated areas, there is a dearth of analysis of the downstream gendered impacts from altering river flows (Mehta and Srinivasan, 1999). As such, a gendered analysis of what is likely to happen with India's river-linking plans is a crucial arena of further study, for both political reasons as well as contributing to the empirical literature. Armed with more nuanced analysis and data, it will be possible to highlight how gendered analysis provides greater understanding of the disaster that will ensue with diverting water from common rivers. Furthermore, a gendered perspective has been sorely lacking in the broader discourses among scholars on the river-linking plan, pointing to the fact that we still have a gender-blind approach to many socio-ecological analyses in Bangladesh.

In largely patriarchal rural settings of Bangladesh, women generally tend to have less voice in decision-making capacities (both formally and informally) and less access to resources. There is a sense that women are inferior to men, and notions of shame and honor are often invoked to influence a woman's behavior and opinion. While many women challenge such practices, widespread cultural attitudes of subservience of women to men and maintaining gendered hierarchies are commonly found. It is known that economic hardships on rural families tend to disproportionately impact women and children in much of the Third World. This can be particularly exacerbated by water scarcity (Jordans and Zwartveen, 1997; Cleaver and Elson, 1995). Gendered wellbeing, participation in decision-making, economic opportunities, and labor burdens are issues that need to be analyzed more closely in order to gauge how specific areas are affected due to water withdrawal and socio-ecological changes. Overall, attention to gender issues is thus critical to equity and effectiveness of water resources management at all levels. This paper raises issues for closer scrutiny by scholars and policy-makers alike.

### **The Farakka Barrage – What We Can Learn**

In 1961, the Indian government announced that the Port of Kolkata (previously Calcutta), on the Ganges tributary of the Hooghly River, was silting up and needed to be flushed out with water diverted from the Ganges, in order to improve navigability at the Port for trade and commerce. Against protest from then East Pakistan (now Bangladesh) and warnings of grave ecological impacts downstream, the plans to build the Farakka Barrage proceeded. The Barrage, built just 11 miles from the Bangladesh border and completed in 1974, diverts water from the Ganges via a feeder canal into the Hooghly River, and was avidly

supported by merchants and local politicians of Kolkata. There was not much attention given to the externalities caused by this diversion of water, neither politically nor socio-ecologically, as they lay largely outside the borders of India. Accountability for such a grand development project in India did not appear to be much of a domestic concern nor an international political one, as both concerns involved a neighboring state that was considerably weaker than India.

This modernization and development ideology was supported in India as a part of the nationalistic rhetoric of modernity, whereby the power of science and technology invested in river management was supposed to deliver development and progress to eastern India. The ideology of high modernism has been espoused by many post-colonial states planning goals of rapid development through modernization, and is summarized by James Scott (1998; 4) in his book *Seeing like a State*, as an ideology that “is best conceived as a strong, one might say muscle-bound, version of the self-confidence about scientific and technical progress, the expansion of production, the growing satisfaction of human needs, the mastery of nature (including human nature), and, above all, the rational design of social order commensurate with the scientific understanding of natural laws.” The Farakka Barrage came to symbolize modernity and development for eastern states of India and was a part of Nehruvian dreams of large-scale water projects delivering prosperity to poorer regions of India. The marriage of high modernism to economic development thus formed the foundation of national advancement in India, whereby scientific and technical knowledge in large-scale river and water management and alteration was given the preeminent status in development planning. Replicating Western models of river development, such as the Tennessee Valley Authority's projects in the U.S., India's grandiose river plans espoused high modernism without critical contextual analysis. Adams summarizes this post-colonial statist planning as thus: “Interestingly, enthusiasm for river basin planning on the ‘TVA model’ in the Third World is not based on any long-term analysis of whether the model has actually been successful in the Tennessee Basin case” (Adams, 1992; 116). Controversial technical and scientific information was used to justify the Farakka project, and technical experts played a big role in the political justification of such ambitious plans. As Crow et al. (1995; 22) state “... the authority of scientific expertise rests on the supposed neutrality, objectivity and rationality of science... however, technical data and technical choices are frequently not neutral; they contain political aspirations clothed in technical language”. It was this use of science in a modernist ideology by the post-colonial Indian state that glorified and ratified the construction of the Farakka Barrage and its subsequent diversion of Ganges water. It appears to still be in effect in present day mega-projects of river-linking in India, which will only magnify and compound the deleterious impacts of river diversions.

As a result of the diversion of water at Farakka, the Ganges River came under bitter dispute between India and Pakistan over the sharing of its water while the Farakka Barrage was being planned (between 1950-1971), and later between India and Bangladesh, especially after its construction was completed in 1975. As the diversion of water mainly occurs during the winter months, which is the dry season with almost no rainfall and when the flow of the river is already very low, downstream areas did not get adequate water to support its economic, social or ecological reproduction. What is critical to note is that the overall amount of water in the Ganges River is inadequate to sustain the needs of both eastern India and Bangladesh, due to numerous other diversions and damming of Ganges water upstream within India (as a part of the overall modernization and river development plans). The sudden diversion of water by the Farakka Barrage upon its operation in 1975 thus led to a dramatic fall in the amount of water coming into Bangladesh, leading to a collapse of the social and economic structures that were dependent on the water in 1975 and 1976. This in turn led to large civil protests in Bangladesh, and catapulted the Farakka Barrage into national and international spotlight (Crow et al., 1995; Sarma, 1986).

The downstream impacts lying largely outside the borders of the nation-state of India facilitated its espousing high modernist ideologies and goals in pursuing its unilateral withdrawal of water of the Ganges River via the Farakka Barrage. The ability to export the negative consequences of a river alteration plan made for less domestic contestation and supported state-led high modernist development interventions and discourses in India. The exploitation of nature (via river control) of one post-colonial nation-state thus results in the exploitation of the people and nature in another nation-state. Water of the Ganges becomes a part of a larger political economy and embedded in a field of power where India holds most of the power and water becomes a leverage point. It could be further argued that a high modernist ideology has been used to justify Indian dominance over Bangladesh via control of the Ganges River, and now through its mega-project of controlling more international rivers that it shares with Bangladesh. The lack of critical discourse of the consequences of large-scale river alteration projects and a narrow focus on benefits in India reflects the failures of many other such post-colonial states (McCully, 1996; Adams, 1992, 2000). As such, the unequal balance of power in conjunction with high modernist development ideologies allow for impacts to be felt at multiple levels that often do not get adequate attention, i.e. at the transnational, national, and local levels. It is important to look at the struggles at multiple spatial scales and their interconnections in order to fully understand the impacts of mega-projects. While the impacts are spatially and temporally variegated and diverse, the majority of them are harmful and deleterious to the economy, environment, society and cultures in the downstream areas, particularly on the rural poor who

have the least amount of resources and capacity to deal with such transformations. All of this has gendered implications as well.

Much of the discourse and literature about the Farakka Barrage revolves around international politics, nationalistic rhetoric, regional negotiations, and technical resolution plans – what is lost in this milieu are the actual social, economic and ecological impacts felt on the ground in the lives and livelihoods of millions of people who are dependent on the Ganges water downstream of the Barrage. What these realities should provide is the impetus for seeking a sustainable solution to this transboundary river sharing crises. By assessing the multiple implications of these transformations, particularly at the ways that the social and the natural are dialectically related and interlinked, we can see how larger river-linking plans will have multifaceted and deleterious impacts in downstream Bangladesh.

### **Socio-Ecological and Economic Impacts of River Alterations**

Most of local level impacts of the Farakka Barrage are felt in southwest Bangladesh. To understand the extent of the impacts, one has to situate it within the larger national situation of Bangladesh. It is one of the most densely populated countries of the world, with a population of over 140 million living in 144,000 sq. km. Bangladesh has a predominantly agrarian economy and agriculture accounts for about 60% of the gross domestic product. More than 90% of the people live in rural areas, and 80% are engaged in agriculture, resulting in almost 97% of the entire country under cultivation. With the population growth surpassing the food production of the country, food-grain self-sufficiency has been a major policy objective of the Bangladesh government. Increasing food-grain production has been a target since independence in 1971, and agricultural investments are an important part of the overall development program (Rogers et al., 1989). This has resulted in a tremendous increase in the irrigation sector. The year-round availability of water is thus of crucial importance to the economy and sustenance of the country and its citizenry<sup>1</sup>.

The most significant impacts of the Farakka Barrage result from the lack of water, primarily during the non-monsoon dry season (October – May). This seasonality makes the Ganges water more precious during the time when it is not in abundance; this seasonality also exacerbates the contestations over water and makes control over water by India even more powerful. The southwest region,

---

<sup>1</sup> Moreover, in a country where hundreds of rivers and creeks criss-cross the land, river and water come to hold high cultural, literary and spiritual value. Much of the folklore and folksongs of Bangladesh invoke the affinity to rivers, rain and water in general. Having access to water bodies is thus important not only to sustain economies and households, but also for cultural reasons. A common phrase in Bangladesh is “river is life” (*nodii jiban*), and the Ganges and Brahmaputra, along with their numerous tributaries, are very important lifebloods for millions of people.

consisting of about 45 million people and comprising approximately 40% of the country's land area, depends on the Ganges water, the deficit of which has caused multiple and interlinked problems (Abbas, 1982; Begum, 1987; Crow et al., 1995). There have been several years when the flow of the Ganges was so low after Indian withdrawal, that the amount released to Bangladesh was insufficient to meet the very basic needs<sup>2</sup>. While the 1996 water-sharing treaty is supposed to guarantee a certain minimum flow in the lean season, there have been many glitches in the implementation of this treaty and with equitable water-sharing (EAB, 1997). Several piecemeal treaties in the meantime were not long-term solutions to sharing the Ganges either.

While this is not to say that all of the southwest region's environmental problems are directly a result of the Farakka Barrage, there are substantial problems linked to Farakka's water withdrawal that work in conjunction with broader natural processes to create socio-ecological degradation. The various adverse impacts of the Farakka Barrage in Bangladesh of course show temporal and spatial variations within the region, with certain locations more susceptible to certain impacts compared to others. There is also a rural-urban distinction, but since most of the region is predominantly rural, this where the impacts are more acutely felt. It is the rural poor, who have the highest vulnerabilities and lowest capacities and access to resources, that are mostly devastated by the Farakka Barrage's impacts. Moreover, the impacts and losses have been estimated using a predominantly economic approach, which does not always capture the social and cultural impacts, especially from a gendered perspective. Compounding the spatial, temporal, and socio-economic variability is the gendered differences as well. This is due to the fact that women in predominantly patriarchal and hierarchical social settings of Bangladesh bear the greater burdens of ecological, economic and social disruption and degradation. Women's lives and livelihoods are intricately linked to and nourished by water from rivers in various ways, both directly and indirectly. The following discussion shows how lack of river water affects the rural poor, particularly poor women, in order to shed light on how Farakka's impacts can be extrapolated to better gauge the impacts of river-linking and water deprivation.

In a predominantly agrarian economy, water is critical for irrigated agriculture in the Ganges-dependent area. Water is essential in the dry season for the winter crop of "boro" rice, which is the largest rice crop. The plentiful sunshine during the dry season encourages the growth of a variety of crops. Rice is a versatile plant and many of the varieties can grow in variable water depths. As excess water in the monsoon rain season destroys the high-yielding varieties

<sup>2</sup> Besides the quantity crises, the quality of water arriving from the Farakka is also polluted, due to increasing industrial, agricultural, domestic, and crematory pollution of the Ganges River within India.

(HYV), these are grown in the winter with irrigated water. It is necessary to maintain the yields of essential crops such as the winter rice, wheat, potato and jute for the Bangladesh economy (Rahman, 1984). The traditional means of irrigation have mostly been manual transport of water from rivers and streams to the fields. Since the 1950s, mechanized irrigation by water wells has increased, and groundwater extraction via deep tubewells (DTW) and shallow tubewells (STW) has come under increasing use (Rogers et al., 1989). In 1974-75, the number of DTWs was only 2,699, irrigating an area of 477 sq. km. But after the Farakka Barrage went into operation, the drastic fall in the available surface water for farming in 1976 forced the import of more DTWs. This number has been rising steadily to meet the water demands of the farmers, as the surface waters are annually reduced (Abbas, 1982).

The water table in the Ganges-dependent reportedly region fell by 5 ft in 1976 after the Barrage went into operation. The lack of replenishment of aquifers from low surface water flows has led to steady falling of the water table, leading to greater difficulty in groundwater extraction for irrigation and other needs (Islam, 1987). Falling water tables has caused less water to be available for irrigation as the water pumps can not withdraw water from such low depths. About 33% of the irrigation facilities were unable to operate in 1976, which incurred a loss of 0.95 million tons of rice crop (Abbas, 1982). In Khulna district, which is the main district in the southwest region, rice production has steadily declined over the years. The Ganges-Kobadak Irrigation Project, the largest in the country, came to a halt in 1994 as the southwest region's 193 km of main irrigation canals went dry. As a result, 350,000 acres of agricultural land were adversely affected. The hardening of the soil due to the lack of moisture and water prevented planting of the paddy. The Gorai River, an important tributary of the Ganges feeding the southwest region, dried up completely in the dry season in many years, with sandbanks up to 8-10 ft high. The low flow of the Ganges has caused dramatic siltation of the head of this river. Consequently, the soil has become dry and drought conditions are apparently experienced. The early drying of the flood plains accelerates the quantity of windblown sands to the adjacent land, causing reduction in the fertility and yield of the land. The reduced potential of agricultural production conditions usually put approximately 10 million subsistence farmers out of work in the dry season (Jones, 1994). Such rural hardships have particularly affected the poor women, who have the least amount of resources to address collapse of livelihoods and increasing poverty. Also, women's direct participation in field and post-harvest agricultural activities have declined as a result of falling agricultural productivity, causing a reduction in earnings and livelihood opportunities.

The potential to exploit groundwater in the future is not favorable in the southwest of Bangladesh (Ahmad et al., 1994). Continual pumping to meet the agricultural needs will worsen the existing sources in the aquifers, thereby

further lowering the water table, and is not deemed to be a sustainable way to meet the water demands (Moudud, 1995). Salt water intrusion in the dry season, caused by the lack of fresh water flushing out the tidal sea water intrusions, has exacerbated the groundwater crisis in the region. Lack of percolation of fresh water into the soil from rivers also causes the underground freshwater-saltwater boundary to move inland. Salinity levels in both surface and groundwater sources have thus dramatically increased in the southwest areas. The salinity level of the Gorai River has gone up considerably over the years. This drastic rise in the salinity disrupts agricultural production, ecology and human health. Crop yield is lowered when the salt content of the soil and water is increased. This is particularly so for rice, since it is vulnerable to high levels of chloride ions (Boyce, 1987). As result, not only is the water availability low in almost five months of a year but also the quality of what is available is very poor, from both surface and groundwater sources. The yield of rice paddy, coarse grain, roots and tubers, wheat, and sugar cane have declined over the years, leading to poor income for the peasants and nutrition for rural households. Such declines in household income and nutrition adversely impact women and girl children, who suffer from poor nutrition and food security in general in poorer households. A decline in productivity of fruit trees and herbs/plants also impact women's nutrition as they often rely on such sources of nutrition rather than market-based food items. A broad base of nutritional supplements thus falls for poor women.

Furthermore, saline groundwater consumed as drinking water has been linked to increases in dysentery and stomach illnesses; increased sodium ions in the body can lead to dehydration, hypertension and kidney problems. In 1976 after the Farakka went into operation, 5% of the drinking wells were rendered inoperative due to the dangerous levels of salinity in the water in the southern districts of Khulna and Jessore (Begum, 1987). The water was not potable, and has reportedly remained a constant problem since (Moudud, 1995). The low water levels in the rivers, streams, and ponds also increase the number of water borne diseases, e.g. infectious hepatitis, malaria, etc. Such health issues affect the poor more adversely, as they have fewer resources to access or purchase cleaner/safer water or to procure medical attention when needed. Health hazards and diseases affect women disproportionately as they have less access to medical care and resources to deal with illnesses compared to men. Women are also often denied proper medical attention or are reluctant to use family funds for their own treatment compared to men, and often rely on quack doctors.

In addition, the fisheries sector has suffered considerably over the decades of erratic and low flow of the Ganges River. Since fishing, both subsistence and commercial, is an occupation of millions of the rural poor, this has had a considerable socio-economic impact. The southwest region's water bodies are reported to have become saline enough to cause changes in the migratory patterns of most fish. The Hilsa fish, the most popular in consumption and

export for Bangladesh, has been affected greatly. This steady decline in fish production has been occurring due to the inability of the sweet water fish eggs to survive in saline water (Abbas, 1982). Another reason is the fish locks and fishways of the Farakka Barrage being insufficient to let fish migrate upstream. The shallow water depths is also reducing the total number of fish, and thereby endangering many species. The reduced number of fish available has forced up its price, depriving millions of rural people of their main dietary source of protein and worsening the malnutrition prevalent among the rural poor (Begum, 1987). This is particularly important for women who often rely on subsistence fishing and common property access to open-water fisheries for their major source of animal protein as well as earnings.

In addition, lack of adequate water resources can result in women having less water for their own subsistence agriculture, horticulture, and livestock rearing. This results in reduced incomes and nutrition for both the household as well as the women in particular. Furthermore, lack of surface water reduces navigability of waterways the form the major transportation system in rural Bangladesh. This results in greater difficulties and costs in mobility in general, and more so for women. Such lack of transport can compound issues of access to health care, markets, and general welfare.

The loss of cultivable land due to lack of irrigation compounded with increase in soil salinity have forced mass migration of the rural poor into urban centers and other parts of the country. The losses of livelihood from predominantly agriculture as well as other water-based occupations (e.g. fishing, boating) are said to have led to continued out-migration of almost two million people from the large Ganges-dependent areas (Swain, 1996). Such migrations lead to increases in both *de facto* and *de jure* female-headed households, resulting in an increase in the feminization of poverty. Moreover, this rural-urban migration has worsened the rapid urbanization of the larger towns and cities, contributing to slum formations and urban poverty<sup>3</sup>. Such concerns will only get worse with greater river diversions and its spiral affect of rural livelihood crises.

Ironically, the construction of the Farakka Barrage has also increased the flood peak of the rivers during the monsoon season, as engineered control structures alter a river's hydrology and flooding patterns in downstream areas (Begum, 1987). As a result, the Barrage not only reduces the water availability in the dry season, but it also increases the annual devastation caused by floods. The low flow prevents the sediment load of the river to be flushed out toward the coast, contributing to increased siltation and aggradation of riverbeds

<sup>3</sup> There have been reports of steady migration into India from the Ganges-dependant areas of Bangladesh due to lack of viable livelihoods, creating pressure in India from such environmental refugees. Ironically, the country that is creating the environmental scarcity is also facing internal conflict between its natives and Bangladeshi eco-refugees (Swain, 1996). This may be exacerbated with increased ecological crisis from further water withdrawal due to river-linking.

(Shahjahan, 1995). This reduces the carrying capacity of the river and increases the chance of floods during the monsoons. Water overflows the banks of the river faster, causing flash floods and floods of greater duration as the water drains more slowly. Similarly, riverbank erosion can increase with changing river hydrology, causing more and more precious land to be devoured by the river and increasing the marginalization and displacement of the rural poor. In these ways, the Ganges flooding patterns have been exacerbated in Bangladesh over the last three decades, leading to increasing social and economic hardship on already impoverished rural populations. During floods, women and girls suffer considerably and disproportionately compared to men. Women are more vulnerable to disasters and their coping mechanisms often constrained by social factors. For instance, sale of women's personal assets as a survival strategy of households during floods is very common (Nasreen, 2000), leading to an increased impoverishment of women.

Beyond such socio-economic impacts, the ecological ones have been considerable and perhaps worse in terms of the irreversibility of the transformations and species losses they have resulted in. Ecological disruption is observed in both marine and terrestrial ecosystems. The most drastic has been in the world's largest mangrove forest, the Sunderban Forest of the southern coast of Bangladesh. The mangrove forests are home to many different types of fish and birds and support entire ecosystems that can become disrupted as a result of an accelerated rise in the salinity level from low flow of freshwater from the tributaries of the Ganges that feed the area. The salt water intrusion that occurs can disrupt the life cycles of species, and ecological succession is unable to take place with the sudden increases and decreases in the salinity level (Khandakar, 1995). What has been seen is that with increased levels of salt water standing over a long period of time, the Sundari mangrove trees have begun to die out. With the prospect of global warming and sea level rise in future, it is important to maintain the regular flow of freshwater to sustain this brackish ecosystem.

The timber and paper industries are reported to suffer as these timber trees are disappearing (Begum, 1987). The forest vegetation, wildlife and overall biodiversity have thus become a cause of much alarm, since it can have irreversible impacts on the ecological balance of the area. The Royal Bengal Tiger and the spotted deer are endangered species that reside in the Sunderbans, and are fast becoming extinct in the region (Moudud, 1995). Forest communities that depend on the forest as a common property resource for their livelihoods have faced hardship with the dying ecology of the Sunderbans. Declining forest resources as well as declining vegetation affects poor people, particularly poor women, who rely on the resources for subsistence and economic purposes (e.g. collecting herbal medicine, selling fruits, procuring fuelwood, etc.).

In addition to the biodiversity and the socio-economic support that the Sunderbans provide, the forest also provides a crucial shielding effect to inland

areas by taking the brunt of the force of tropical cyclonic winds and surges that are common in the Bay of Bengal during pre- and post-monsoon seasons. The shielding effects of the mangrove can be drastically reduced if enough sedimentary deposits from riverflow do not counteract the loss of soil to erosion from ocean currents. The low flow of the Ganges has resulted in less sediment reaching the mangroves each year. The potential loss of the mangroves represents a serious problem in terms of the region's ability to cope with storm surges and cyclones (Begum, 1987). Again, such disasters impact women more dramatically than men as their coping mechanisms and access to resources are considerably less secure.

Since the Farakka Barrage went into action, these multifaceted and interlinked impacts have been playing out on the ground for nearly three decades. Such scenarios will only repeat at larger scales with the mega-project of river-linking. The complex, interlinked and long-standing impacts within the territory of Bangladesh result from the intricate relationship between nature and society in the country. What is important to note is that all of the impacts have important gendered aspects too, which are often not recognized in official discourse. Social and ecological deterioration has increased women's hardship and impoverishment, reduced livelihoods strategy options and increased difficulty in providing basic needs for household reproduction (for example, the daily needs of domestic water and nutrition). Gendered impacts of large-scale water development projects are only recently getting attention from scholars (Mehta and Srinivasan, 1999; Crow and Sultana, 2002), and although there have been no substantive studies directly related to the Farakka case, it is important to pay attention to the gendered impacts in fully explicating the impacts of river-linking on downstream Bangladesh.

### **Gendering the Impacts Further – A Closer Look at the Arsenic Crisis**

In this section, I want to focus in detail on a particular crisis as it is unfolding in Bangladesh and show how river-linking will exacerbate this situation. This crisis is the drinking water crisis from Arsenic contamination of groundwater sources that has resulted in the poisoning of over 35 million people and potentially exposing a total of 80 million to Arsenic poisoning from drinking contaminated water (Ahmed and Ahmed 2002). It is essential to recognize the a reduction in overall surface water availability from river-linking will worsen the overall availability of safe, Arsenic-free drinking water, and force a greater reliance on contaminated groundwater usage. For instance, with reduction in Brahmaputra River flow from river-linking, there will be a dramatic reduction in freshwater availability in the Meghna River and other dependent tributaries. In addition, the salinity line will move greatly inland into the northern and central parts of the

country, and thereby worsen surface water usage for drinking water purposes. Furthermore, as overall surface water availability is reduced, Arsenic mitigation options being promoted in the National Policy for Arsenic Mitigation, largely surface water based, will come under threat and be made even obsolete. As such, river-linking has serious implications for policies on providing safe drinking water in Bangladesh.

To gender this crisis, we need to look at how the Arsenic crisis is playing out on the ground. In rural Bangladesh, women are the main managers of water for domestic purposes (drinking, washing, cleaning, bathing, and cooking) as well as for some subsistence production in homestead gardening or raising of poultry and livestock. Women use water from different sources, including tubewells, ponds, canals, ditches, and rivers depending on availability, proximity and purpose of use (Crow and Sultana, 2002). The water supply system in rural Bangladesh is not a fixed system, but a set of water sources about which choices are made, and negotiated, often on a daily basis. Class and geographic location in rural Bangladesh differentiate access to domestic water. More prosperous households generally own deep tubewells, which can access deeper uncontaminated aquifers. So wealthier women in general have better access to cleaner water than poorer women (Shamim and Salahuddin, 1994). Access to water is differentiated by location in that those households nearer a functioning deep or safer tubewell are likely to use safe/uncontaminated groundwater more. However, deep tubewells are very expensive and beyond the reach of majority of the poor. As such, any tubewell has to be shared among different users. It is common for private owners to restrict access to their tubewell or to require some form of compensation in exchange, such as contribution of free labor, or maintaining good patron-client relationships. Tubewells available in public places such as schools, mosques, and bazaars often provide the only source of clean and safe water for rural households that do not have private tubewells (Crow and Sultana, 2002). As more and more tubewells are identified as Arsenic-contaminated throughout the country, pressure increases on the ones that are still safe (Caldwell et al., 2003). As such, acute drinking water shortages are faced by millions of people, leading in increasing consumption of contaminated water, greater morbidity and mortality rates, and exacerbating poverty (Ahmed 2002; Sultana, 2005).

Overwhelmingly, proximity dictates the source and use of the water, particularly for poorer and female-headed households. Several trips must be made each day to the nearest tubewell or surface water body to meet water needs, with women and girls devoting several hours each day to ensure household water security. The distance to be covered can range from a few yards to several hundred yards. Women and girls may walk two to five hours each day to fetch water (Shamim and Salahuddin, 1994). Contaminated tubewell water is used when time, distance or social constraints are too high. As such, in

water withdrawal areas, salinity of groundwater as well as Arsenic contamination can worsen the situation where tubewell water may be unusable for drinking purposes or simply not available, thereby increasing women and girls' labor time and effort to procure potable water. Altered hydrology can thus contribute to female hardship in performing their socio-culturally appropriate gender roles, and gendered differences in the burden in ensuring household drinking water supplies become more acute. Furthermore, with increasing exposure to Arsenic poisoning and subsequent illnesses, women and girls face greater social stigmatization and ostracization when physical symptoms of Arsenicosis become apparent (Sultana, 2005). While both men and women may be afflicted with Arsenicosis, women face greater social hardship and isolation than men.

Therefore, with increasing number of areas showing Arsenic contamination of groundwater and growing number of patients, surface water availability becomes even more critical in addressing this crisis. With the mega-project of river-linking, surface water development in Bangladesh will face further difficulties, and thus addressing the Arsenic crisis will be further complicated. Furthermore, Arsenic showing up in irrigation water and its potential impact on crop productivity, food chain, and human health, are all issues of grave concern, and necessitate less reliance on groundwater usage and more surface water availability and usage.

## Conclusion

The Principle 21 of the UN Declaration on Human Environment (Rio Earth Summit 1992) proclaims that "States have the responsibility to show that activities within their jurisdiction or control do not cause damage to the environment of other states or of areas beyond the limits of their natural jurisdiction" (quoted in Jafar, 1995). It does not appear to be so in the India-Bangladesh case, since the actions of the upper riparian are having deleterious consequences on the lower riparian country's ecology and environment. This seems to have been facilitated by a high modernist development ideology of upstream India that has been able to externalize its development projects' negative impacts outside its political borders to a weaker, downstream state. This nationalist and developmentalist discourse in India has had the longevity due to India's geopolitical hegemony in South Asia. It continues to be reflected in its present mega-project of linking the international rivers. It would appear that there is a lack of adequate reflection on the outfalls of the Farakka Barrage dispute over the last few decades, warnings of scholars and scientists of grave ecological changes, and lessons from other mega river-altering projects elsewhere.

Transnational politics and policy-making has to acknowledge that the interdependencies between the human world and the environment are

dialectically related; this sensitivity appears to be lacking in regional level political decision-making in South Asia. Local level changes are all interlinked and complex, exemplifying the multiple ways broader watershed decisions impact local lives and livelihoods. The concept of ecological rights in riverine-riparian systems has to be better addressed in international water treaties and environmental laws (Korhonen, 1996; Verghese et al., 1994). Changes in riverbasin hydrology and ecology based on anthropogenic gains and short-term political decisions in water politics have created significant ecological stress and socio-economic problems. 'Sustainable development', which has been the stated development goal of both India and Bangladesh for the last decade, therefore, would clearly call upon greater cooperation between the countries involved in managing the watershed and sharing water, a greater respect for international laws and treaties that address the issues, and increase in political commitment to developing mutual trust and good faith (Crow and Singh, 2000; Nishat, 2001).

Furthermore, a gendered analysis of the impacts and processes involved also show how the river-linking plans will exacerbate gendered suffering and hardship. Such issues need to be given due attention by scholars and politicians alike in order to draw more attention to another layer of impacts that are often overlooked<sup>4</sup>. More gender disaggregated data are needed, and gender mainstreaming in water resources management needs to account for how broader watershed and river-linking decisions have localized and gendered impacts. As such, multiscalar analysis is essential. Spatial analysis is also needed to show how spatially variegated impacts are felt through different strata of society, particularly across different groups of women. Gender, water and poverty linkages will get worse with water withdrawal: poor women's general lack of resources and power in society will further marginalize their abilities to cope with livelihood needs pertaining to water, leading to greater feminization of poverty. Overall, the gendered implications of the river-linking plans for downstream Bangladesh need to be more forcefully argued and addressed in averting a catastrophe.

## References

- Abbas, B. M. (1982), *The Ganges Water Dispute*. University Press Ltd., Bangladesh.
- Adams, W.M. (1992), *Wasting the Rain: Rivers, People and Planning in Africa*. University of Minnesota Press, Minneapolis.

<sup>4</sup> Indeed it could also be argued that the high modernism ideology that is espoused in the mega-project suffers from a masculinist approach to controlling nature and ignoring the implications.

- Adams, W.M. (2000), *Social Impacts of Large Dams: equity and distributional issues*. Report to World Commission on Dams, Thematic Review II Social Impacts of Large Dams; Equity and Distributional Issues.
- Agarwal, B. (1994), *A Field of One's Own: Gender and Land Rights in South Asia*. Cambridge University Press, Cambridge.
- Ahmad, Q.K., N. Ahmad, and K.B.S. Rasheed (1994), *Resources, environment and development in Bangladesh*. Academic Publ., Bangladesh.
- Ahmed, C. M. (2002), "Impact of Arsenic on the Rural Poor in Bangladesh", in *Bangladesh Environment 2002*, F. M. Ahmed, S. Tanveer and A.B.M. Badruzzaman (eds.), BAPA: Bangladesh. pp. 154-160.
- Ahmed, F. M. and C. M. Ahmed (2002), *Arsenic Mitigation in Bangladesh*. An Outcome of the International Workshop on Arsenic Mitigation in Bangladesh, 14-16 January 2002. Local Government Division, Ministry of LGRD and Cooperatives, Government of Bangladesh.
- Begum, K. (1987), *Tension over the Farakka Barrage*. University Press Ltd., Bangladesh.
- Boyce, J. (1987), *Agrarian Impasse in Bengal*. Oxford University Press, England.
- Caldwell, B. K., J. C. Caldwell, S. N. Mitra, and W. Smith (2003), "Tubewells and arsenic in Bangladesh: Challenging a public health success story." *International Journal of Population Geography* 9(1): 23-38.
- Cleaver, F. and D. Elson (1995), *Women and Water Resources: Continued Marginalisation and New Policies*. The Gatekeeper Series of International Institute for Environment and Development's Sustainable Agriculture Programme, no. 49, p. 3-16.
- Crow, B. and N. Singh (2000), "Impediments and innovations in international rivers: the waters of South Asia" *World Development*, 28(11): 1907-1925.
- Crow, B., A. Lindquist and D. Wilson (1995), *Sharing the Ganges: The politics and technology of river development*. Sage Publications, New Delhi.
- Crow, B. and F. Sultana (2002), "Gender, class and access to water: three cases in a poor and crowded delta" *Society and Natural Resources* 15(8): 709-724.
- EAB (1997), *Ganges Water Sharing Treaty – A Critical Evaluation*, Compiled and Edited by the Engineers Association of Bangladesh from the Ganges Water Treaty Meeting by the Shotonagoric Committee held on the 31 January 1997, Press Club, Dhaka, Bangladesh. Available at <http://www.cyberbangladesh.org/ganges.html>.
- Islam, M.R. (1987), *The Ganges Water Dispute*. University Press Ltd., Bangladesh.
- Jafar, B. M. (1995), "Implications of the diversion of the waters on an international river under international law: The Farakka Barrage, A case in point", in *Women for Water Sharing*, H. J. Moudud (ed.), Academic Publishers, Bangladesh. p.73-82.

- Jones, S. (1994), "Survey of Bangladesh", *The Financial Times*, May 9, 1994. p.29.
- Jordans, E. and M. Zwarteveen (1997), *A Well of One's Own: Gender Analysis of an Irrigation Program in Bangladesh* Grameen Krishi Foundation and International Irrigation Management Institute, Colombo.
- Kabeer, N. (1994), *Reversed Realities: Gender Hierarchies in Development Thought*, Verso, London.
- Khandakar, K (1995), "A brief study report in environmental degradation of Ganges Basin area", in *Women for Water Sharing*, H. J. Moudud (ed.), Academic Publishers, Bangladesh. p.106-121.
- Korhonen, I.M. (1996), "Riverine ecosystems in international law" *Natural Resources Journal*, 36: 481-521.
- McCully, P. (1996), *Silenced Rivers: the ecology and politics of large dams*, Zed Press, London.
- Mehta, L. and B. Srinivasan (1999), *Balancing Pains and Gains: a perspective paper on gender and large dams*. Report for the World Commission on Dams Thematic Review: Social Impacts.
- Moudud, H. J. (1995), *Women for Water Sharing*. Academic Publishers, Bangladesh.
- Nasreen, M. (2000). "Women's role during floods in Bangladesh: A gender perspective", *Philosophy and Progress*, 18: 169-189.
- Nishat, A. (2001), "Development and management of water resources in Bangladesh: Post-1996 treaty opportunities", in *Sustainable Development of the Ganges-Brahmaputra-Meghna Basins*, Biswas, A.K., and J.I. Uitto (eds.). United Nations University Press, Tokyo, Japan.
- Rahman, M. G. (1984), "Reducing the flow of the Ganges: the consequences for agriculture in Bangladesh", in E. Goldsmith and M. Hildyard (eds.), *Social and Environmental Impact of Large Dams*, 2: 267-275.
- Rocheleau, D., B. Thomas-Slayer, and E. Wangari (1996), *Feminist political ecology: Global issues and local experiences*. Routledge, New York.
- Rogers, P., P. Lydon, and D. Seckler (1989), *Eastern Waters Study*. ISPAN Technical Report, USAID.
- Sarma, S. S. (1986), *Farakka: A Gordian Knot*. Ishika, Calcutta, India.
- Scott, J. (1998), *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed*. Yale University Press, New Haven.
- Shahjahan, M. (1993), *Dividing the Ganges*, Op-Ed, The Bangladesh Observer, December 20, p.4.
- Shamim, I. and K. Salahuddin (1994), *Energy and water crisis in rural Bangladesh - Linkages with women's work and time*. Women for Women, Dhaka, Bangladesh.

- Sultana, F. (2005), "Gendered waters, poisoned wells: Political ecology of the Arsenic crisis in Bangladesh", in *Fluid Bonds: Views on Gender and Water*, K. Lahiri-Dutt (Ed.), Stree Publishers, Calcutta.
- Swain, A. (1996), *Environmental trap: the Ganges River diversion, Bangladeshi migration and conflicts in India*. Uppsala University, Department of Peace and Conflict Research Report #41. Uppsala, Sweden.
- Verghese, B.G., R.R. Iyer, Q.K. Ahmad, B.B. Pradhan, and S.K. Malla (1994), *Converting Water into Wealth, Regional Cooperation in Harnessing the Eastern Himalayan Rivers*. Konark Pub. Ltd., India.