BALANCING ON WATER
MANAGING WATER RESOURCES OF INDIA FOR PEOPLE AND THE ENVIRONMENT

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Water as a Symbolic Text in India

Water is a unique resource, appearing in different forms and shaping all physical and biological processes; known for its fluidity and celebrated for changing its shape and taking new forms, water also plays a special role in social and cultural representations, and hence these values and norms are reflected in the ways water is perceived, used, governed and treated. Water is commonly seen only as a part of the physical environment, and is studied by tracking the pathways of the hydrological cycle and into biology. However, much of what we make of water belongs to the domain of human culture (as asserted by de Villiers 1999; Strang 1997). The symbolism of water lies in peace, life, and regeneration, its significance expressed in spiritual, religious or social rituals, imbuing it and its users with meaning and value: 'water is always a metaphor of social, economic and political relationships – a barometer of the extent to which identity, power and resources are shared' (Strang 2004, p. 21). Nowhere else this statement is more applicable than in India, where water was and still remains the most crucial natural resource. This is evident from Kautilya's Arthashastra which puts importance on knowing rainfall behaviour and hydrology, and gives detailed instructions on construction methods and materials of dams, embankments and spillways.

As the 21st century unfolds, water in India comprises a highly contested terrain on which important global questions and debates related to the attitudes to our environment are posed daily: questions related to the ownership and control over water, access to good quality and safe water in adequate quantities, community rights and participation in its management, the commodification of this vital fluid, and the possible consequences of its privatisation. Placing this growing concern in the context of international environmental

agenda, it is not difficult to see that many of the issues are associated with climate change and are in need of finding appropriate strategies for the sustainable management of water (see Gleick 2005; Alam and Murray 2005; Hunt 2004). In India, water is at the heart of the environmental challenge that the country faces of meeting the growing needs of the rural and urban populations. Within the nation, disputes and conflicts over the control of flowing waters are evidence of the growing absolute need for water. Locally, the interconnections and interdependences of hydrology are often interwoven with caste-class identities and micro-politics. More often than not, these geographical scales of political units are intricately connected and water flows through them. The large number of books recently published reflects the amount of research currently underway by social scientists on water. Placed in this context, this paper aims to enrich the growing field of water-society relationships in India by focusing on the issues and challenges, and responses from, the communities in balancing water needs for the environment and the people in India.

The foremost driving force behind this paper is the perceived reluctance of water experts to engage with subtle and nuanced social and cultural interpretations of water that are vital in forming a holistic understanding of this natural element. Another, no less compelling factor, are the escalating conflicts between community-based practices and modernist and centralised modes of governance; and an increasing need for water, and the complications arising out of the demands and treatments of water resources. This paper brings out the contemporary issues around water and the enormous challenges that the state and communities are facing in India, from the current management practices and policies. In doing so, the paper asserts that as part of the social and cultural landscape, its uses and practices of management being rooted in history, water is both the producer and product of the material culture through which human agency is enacted. This recognition is crucial in building a conceptual base of understanding water resources in India as it provides access to the, ‘vast resource of experience in dealing with issues related to water’ as Pangare et al (2006) has recently emphasized and what Agarwal and Narain (1997) had asserted some years ago.

Water and Society in India

The relationship between water and society is a complex historical, sociological and regional problem, providing the centerpiece for social theories of civilization and state, community and collective action, and culture and common property. In describing the

landscapes of water in an irrigation system in South India, Mosse (2003: 3) noted, 'The hydrology has been manipulated politically for centuries, for example, through the layout of drainage networks, the damning and diversion of rivers, the interlinking of tanks, or the repositioning of channels.' Control over water has been a symbol of social and political power everywhere in India; locally, village elites have controlled and changed the physical flows of water through diversion structures or the positioning of sluices and heights of weirs. Nations assert their ownership of water resources and build 'empires of water' that are inextricably linked with national identities and pride. Mosse argues (2003: 4) 'Water flows have not only shaped social and political institutions, they have also legitimized them. Medieval kings and chiefs controlled and gifted water flows, creating landscapes which inscribed their rule into the hydrology and thus naturalized it. When a Maravar king dropped flowers into the flowing water of the channel that he had excavated, and their passage resolved an inter-village dispute over water rights by revealing the water's natural flow, political rule was naturalized into the drainage.'

Water in India is above all a text that has written the histories of countries, regions and nations, representing a conquest or control of nature. For millennia, civilisations were defined and nourished by the mighty rivers, in the deltas and the plains they created (Nair 2004). Water in India, however, has traditionally been a spiritual purifier, a cleanser; the flowing waters of rivers best expressing this absorption and removal of filth.[1] The water in rivers is also imagined as a powerful and independent agent, with an inherent fierceness and brutality, and destructive power, but can also be benevolent, forgiving and giving. The symbolic sacredness of water is transferred onto the places onto which it flows or rests as in a water-hole (*kunda*), creating holy places (*tirtha*s) (Kumar 1983, p. 14).

Human societies had found ways to adapt to the hydrological regimes and processes in India – the variabilities, scarcities and excesses that occur over space and between seasons[2]. Societies also evolved complex institutional systems of water management that looked after the common property resource regimes, some of which are still in operation (Singh 2006). In Bengal, an independent department with separate budget, the *pulbandi daftar* (public works department also known as *pushtabandi*), was set up by the Mughal provincial government to supervise embankments, roads, bridges and river dredging (Kamal 2006, p. 197).

As against the wetter parts of the country, in the desert or semi-desert areas of Northwest India where the groundwater is saline, soils sandy, temperatures high and

humidity is minimal, traditional adaptive processes such as rainwater harvesting and storing, and saline farming techniques allowed people to meet domestic needs and rear livestock. In drier parts of undivided Punjab, for example, people made the best use of available water for irrigation through the *khushkaba* (dry farming with direct use of rainwater) and *sailaba* (flood irrigation from runoff) systems of water management. In the high mountainous areas in the north and north-west, where the natural streams flow rapidly downhill as flash floods, and people have to travel long distances to fetch water for their daily household needs, irrigation systems such as those through *kuhl*s – small, often-lengthy, leaky channels usually constructed and maintained by the farmers collectively under a cooperative system. The tank system in South India served for hundreds of years as effective insurance against droughts, providing irrigation water and flood protection.

Some of these structures of water management and the institutions that developed around the structures, after surviving for thousands of years, are now at threat from ill-defined ownership and user rights with ever-increasing demands. Often, traditional water use systems have been disrupted by the introduction of modern techniques. Rapid increases in water use have occurred in the last four decades in agriculture, industry and the domestic sector, especially in the ever-growing urban centres (Biswas 2005). As we will see, many of the 'water problems' of India have been created by the neglect of the alternative options and by focussing on increasing the additional supply of water as against exploring solutions that have the potential of increasing the efficiency, equity and sustainability of water use. This approach has led to tensions between the nations and communities, as emotions are ingrained in the idea of water, turning it into a symbol of power such as the hydraulic societies described by Marx and Wittfogel where the harnessing of rivers implied and involved the social and political domination of some people over others (Wittfogel, 1957).

Water, State and Perceptions

The core issue of water management in India is the question of water ownership. This question is posed at different scales: between the State and communities in general, between the Central government and respective states, and between local and state governments. Technically, water is seen as a state subject, that is, to be controlled by individual states. Whilst the Central government continually tries to enlarge its roles, the states and local governments try to whittle these efforts down, giving rise to confusion.

Even though decentralisation was constitutionally mandated in the form of 73rd and 74th amendments, the panchayats and municipalities have no practical control over local water resources. Recommended by the 2nd Irrigation Commission on the establishment of the National Water Resources Council, chaired by the Prime Minister with Chief Ministers of the States as members, the first National Water Policy was adopted in 1987. This was further revised in 2002. At the launch of the 2002 NWP, the then Prime Minister Atal Bihari Vajpayee had said: 'the Policy should recognise that the community is the rightful custodians of water. Exclusive control by the government machinery … can not help us to make the paradigm shift to participation, essentially local water management of water resources." (quoted in Das, 2005, pp. 5-6). He also noted that harnessing every drop of rainwater was a national priority and that emphasis must be placed on localised and decentralised water management.

This domination of waters and rivers has been represented as 'one of the clearest illustrations of the link between the control of nature and the control of people' (McCully 1998), and has characterised water resource development planning in India (D'Souza 2003; Singh 1997). The recent riverlinking project, heavily dependent on reductionist engineering magic-making, is just one example; it is a project to rationalise water distribution to transfer into deficit river basins the waters from the surplus basins, water that is seen as being 'lost to the sea'[3]. Whereas Gyawali and Dixit (2001) have extensively critiqued the poor foundation of this so-called scientific knowledge of the waters of South Asia, particularly in view of the fact that water is difficult to be understood through any one particular disciplinary methodology, D'Souza (2002) has critiqued the ideology behind water control that is often rooted in a politics of development. This ideology begins with the concepts of 'Converting Water into Wealth' (Verghese et al, 1999), which hopes to turn the South Asian waters into 'Waters of Hope' (Verghese 1990). For example, official documents such as the National Water Policy of India (2002) approved by the National Water Council states: 'Water is a scarce national resource to be planned, developed, conserved and managed as such, and on an integrated and environmentally sound basis, keeping in view the socio-economic aspects and needs of the states'. This proclamation clearly gives the perspective that water is not a 'common property' or a tradable good, but is a national 'asset' – meant for the greater common good – to be controlled and managed by central bodies. At the same time, more and more rivers have been turned into carriers of waste, their flows drastically reduced destroying riverine ecologies and the livelihoods of communities dependent on the flows of water.

This deterioration in river ecologies and morphologies has created yet another 'tragedy of commons', examples of which abound in India (see Ravi et al 2004, for the Kerala experience in riverlinking).

Another critique of the new Water Policy, voiced particularly by research organisations such as the Centre for Science and Environment (CSE) is that it ignores the environmental concerns such as pollution load that industrial water use poses. India has a long history of river clean-up programmes. It launched its Ganga Action Plan (GAP) in 1985. This Rs 462 crore project's objective was to improve the water quality of the river to acceptable standards (defined as bathing water quality standards) by preventing pollution from reaching it: intercepting the sewage and treating it before it discharged into the river. By the time the second phase started in 1993, the Central Pollution Control Board identified 71 polluted stretches in the 14 major river basins in the country. A National River Conservation Plan (NRCP) was undertaken in 1995 to clean these stretches, and a separate Directorate for the programme was created under the Union Ministry of Environment and Forests (MoEF), which by 2006 had funded 20 states to clean up 42 polluted stretches of 34 rivers passing through 160 towns (CSE, 2007: 2). The total outlay for river cleaning programmes – GAP 1 & 2, and the NRCP – is Rs 5,166 crores. In addition, the Yamuna Action Plan (YAP) was taken up in Delhi for building sewage treatment plants in the city. The main critiques put forth succinctly by the CSE report of the river cleaning programmes are that the sewage treatment facility is inadequate (less than 20% of the total amount of sewage generated (around 33,000 mld), that the STPs cannot recover their costs, that treated effluent must be recycles and reused instead of discharging it into the river directly, and that the polluter should be made to pay.

Water resource management in India is characterised by a multiplicity of bodies causing roadblocks in sustainable management of water. The multiplicity of administrative bodies has also resulted in contradictory and conflicting claims on water. For example, the Ministry of Rural Development (MoRD) plays an important role in Watershed Development, Rajiv Gandhi Drinking Water Mission, and the development of drinking water infrastructure in rural areas. The Ministry, however, is not responsible for ensuring water availability and testing for contamination. The Ministry of Urban Development (MoUD) is responsible for drinking water in urban areas but again does not have the mandate to monitor, regulate or charge industries using water in urban areas. The Ministry of Industry is concerned with the planning and development of water resources

for industrial use, but do not have the mandate to control or regulate water use by industries. The Ministry of Power (MoP) is entrusted with the development of hydro-electricity, but has no mandate to look after either water consumption or water pollution by thermal power plants. The Ministry of Environment and Forests (MoEF) is concerned with the quality of surface and groundwater, but has no mandate to handle water scarcity or to handle water disputes or conflicts. The Central and State Pollution Control Boards (PCBs) regulate industrial water pollution and charge water cess based on the amount of waste water discharged by the industrial plants. However, they have no mandate of sourcing water. Ministry of Water Resources (MoWR) is the principal agency responsible for all water resources in India but water pollution or industrial use of water do not fall under its purview. The Central Ground Water Authority is for regulation of groundwater quality and quantity in the country, and have mandate to initiate steps to control groundwater usage. However, the organisation does not have the power to charge for industrial use of groundwater – a fact that is becoming increasingly more inconvenient for millions of poor people whose drinking water is being sourced by industries such as Coca Cola for commercial use[4]. Lastly, India has a Water Quality Assessment Authority (WQAA) which was set up by MoEF and MoWR as an apex body to compile information on water quality and to monitor the function of the agencies. However, this body has not been successful.

A Finite Resource

India is amongst the naturally 'water-rich' countries of the world, where water is the most important natural resource for the communities besides land – not only because the country contains only about 3% of the world's land but 21% of its population – but because of the extremely fraught nature of the use, control and the management of water. Historically, the utilisation and management of water resources has been pivotal to the economy and society in India and so disputes over water have been a consistent feature of the politics of the region. The popular term 'hydropolitics' has been applied at different geographical scales within India and between the nations in South Asian region to explain a range of conflicts and disputes over water resources (Avila, 2006).

One of the reasons for increased conflicts over water could be the commodification of this natural substance. In India, a trend in recent years has been to treat water resources as a commodity instead of a natural endowment. There is no doubt that water must be valued and indeed it is valued, appraised and assessed continuously[5].

Not all of these valuations, however, are done strictly in economic terms and differences might arise in terms of who is the judge. Hence, Bakker (2004) described water as an 'uncooperative commodity' that tends to refuse economic valuations. A genre of valuation has been proposed by Chapagain and Hoekstra (2004 p.) involving the measurement of the 'water footprint' as an indicator of water use in relation to the consumptions of people. This is closely related to the concept of 'virtual water', defined as the volume of water required to produce a commodity or service. Virtual water thus is an alternative external source, in addition to the internal water sources (Haddadin 2003). Water footprints of a nation can be assessed by taking the use of domestic water resources, subtracting the virtual water flow that leaves the country, and by adding the virtual water flow that enters the country (most of the international trade in virtual water consists of foodstuffs). From this perspective, India is a net exporter of water whilst Bangladesh is a small importer and Sri Lanka is a very large importer (Hoekstra and Hung 2002). On a per capita basis, total annual (including virtual) water consumption (m^3) in South Asian region are Bangladesh 896, India 980, Nepal 849, Pakistan 1218 and Sri Lanka 1292 which can be compared to values of over 2000 for North America and some European countries whilst China is about 700). However, one needs to remember that these are macro-analyses with significant uncertainties; ones that may not provide an accurate picture of the hydro-ecology or be applicable for smaller units of spatial scale. For India, with a large informal economy and informal water use practices characterized by poor data availability, it might well be impossible to paint a trustworthy picture of water trade and calculate the water footprint.

The conflicting pressures involved in water resource management are likely to become exacerbated in the future since India has the lowest availability of water per capita for any major region in the world and demand is likely to increase in the foreseeable future from a multitude of pressures (Vira *et al.* 2004, pp. 315-320). While agriculture continues to be the most significant usage of water in India, industrial growth in particular coupled with population growth are among the factors that will stimulate an increased demand in the future. On the supply side, pollution and climate change are two of the factors that are likely to decrease water availability (Vira *et al.* 2004, pp. 312-315).

However, it is important to examine the question of water scarcity more closely in India. 'Water security' is a much-used term in global policy circles. In water resource development and planning discussions, a picture of increasing scarcity and a bleak future are drawn to convey the sense of urgency to deal with the 'problem'[6]. Water security is

conceived as a simplistic linkage between increasing populations, increased environmental scarcity, decreased economic activity/migration and weakening of states resulting in conflicts and violence[7]. Turbulent images of water scarcity involve dreary scenarios of crumbling water infrastructures, depleting groundwater, climate change worsening the shortages – all eventually leading to growing conflicts: between individuals, groups, states, and nations[8]. Jairath (2003) has intensively critiqued this discourse of drought that contains hidden discourses of water resource development through large projects. Indeed, scarcities are constituted by, and in part constitute, the political economy of access to, and control over, resources; consequently, there has been a greater examination of development strategies; for example by the UNFPA (2003) that put greater emphasis on the question of access to water, the connections with health, and recognizes that the need is to look at achieving 'appropriate priorities, equity and economy': 'Generalizations about the negative effects of global population growth on the natural environment and specifically water can be misleading and the benefits of new technologies need to be factored. Even so, in many regions water scarcity and declining quality affect the poor the most.' (p. 1). All the easy and cheap options for mobilising water resources for human needs have not yet been explored (McCully 2002). In a report for International Rivers Network, McCully (2006 p. 2) points out: 'Want of clean water, decent sanitation, and adequate food and energy strips people of their dignity and their most basic rights. Inequitable access to water, especially growing crops, is a major factor in global poverty, and a death sentence for millions each year. Ending this unacceptable situation will require a radically new approach to investing in water.' Towards this goal, various efforts have been underway, rethinking the mosaic of water management (Moench et al 1999). It is now widely recognised that 'meeting the basic water, food and energy needs of the world's poorest people, and generating the economic growth needed to lift them out of poverty, can only happen if investments are redirected to affordable, decentralized and environmentally sustainable technologies' (McCully 2006, p. 2).

Discussion of the water resources of India conventionally begins with one of three approaches: a description of the size of population compared with the availability of amounts of land and water; a description of population distribution and rainfall/water availability figures; or an inventory of available water resources of any one country[9]. This tendency is evident in a range of literature, dotted with statements such as: 'massive population growth since independence has put tremendous pressure on finite natural renewable resource, water requirements' or 'the country also suffers from the uneven

distribution of water resource among its various regions' (Swain 1998 a & b). Such apprehensions found eloquent expression in the proceedings of the World Water Conferences held periodically, and it is prophesised that the water availability in India is likely to worsen significantly in the future as the rapidly growing demand for water seems likely to outstrip the potential supplies. Indeed, we have been threatened far too often with gloomy pictures of looming 'water wars' and 'water famines'. This sense of a looming crisis of water in the region brings forth an urgency of dealing with it head on. For example, in 1999 an International Hydrological Programme of UNESCO document titled 'Will water be enough, will food be enough?' notes, in its South Asia section, that the combined population of the countries in the region is large by all means, that the countries are poor and agricultural, that irrigation efficiency is poor, that water distribution in these countries is unequal, that the quality of water resources is poor, and that the countries are conflicting amongst each other on the question of water sharing. Thus, a 'problem' is envisioned – the problem of scarcity, interpreted as being not enough in aggregate terms or in per capita terms[10]. The mainstream view in the Indian 'Water Establishment'[11] has for a long time (from the British period onwards) been that the temporal and spatial variability in precipitation in the subcontinent necessitates the storing of river flows in large reservoirs for transfer from the season of abundance to the lean season, from good years to bad and from the wet areas to the dry. That view has now been reinforced by the perception that the growth of population, pace of urbanization and economic development will accentuate the pressure of increasing demand on a finite resource, and that the answer lies in large supply-side projects and long-distance water transfers.

Mehta (2003) has critiqued this mainstream view by pointing out that the access to and control over water is usually linked to prevailing social and power relations, and thus scarcity can be constructed differently by different political and social actors. The scarcity can indeed be 'real' – falling groundwater table or increased salinity indeed gives evidence to the physical lowering in water availability. However, the scarcity can also be 'constructed', especially by statist discourses which portray the lack of water as natural rather than human-induced, and chronic rather than cyclical[12]. Clearly, if densely-populated India is now facing the threats of growing water scarcity, it is due to increasing complications over its ownership, poor management, and depleting quality (Mehta 2003). Many of these doomsday water predictions have been questioned by water experts themselves. For example, Vaidyanathan notes (2001, p. 1): 'the scarcity of water is a

fuzzy concept; that its nature and extent differ greatly between countries and regions; that there is considerable, though variable, scope for augmentation, conservation and better management; and that we need to focus on policies, including especially institutional changes, needed to exploit these potentials.' Serious efforts have yet to be made in changing the patterns of demand – primarily of water-intensive farming practices and concentrated water markets in urban centres of various sizes – in this crisis scenario. The water that is required for the well-being of the populations of India is only a minute fraction of the total water demand. This demand, of course, is not only dependent on numbers, but is a function of standards of living of the populations. It is also a function of social inequity in the sharing of benefits from natural resources. Often the international agencies tend to interpret the lack of access to good quality water (and sanitation) as symptomatic of poverty, that the poor often pay more for water, and that economic development will solve the problem of scarcity. The lack of access is also seen as a distributional failure, linked to poor governance by states. This approach, that the supply of water has become a limiting factor in economic growth, is exemplified in the recent World Bank publication (Briscoe 2006).

We must remind ourselves here that it is indeed true that in absolute terms, both the population of the region and food production have increased, and so have the pressures on water supply. On this point, Mehta notes (2003) that: 'It would be an ontological fallacy to deny that there is no such thing as water scarcity or water shortage. The ever-increasing length of time spent by women on water collection and the visible decline of groundwater reserves in aquifers are clear indications of one aspect of the problem of water scarcity.' However, the point she makes is that there are many other intangible and ambiguous aspects of the water problem that lead to different types of scarcities felt by a wide range of actors. Consequently, the responses to water scarcity are vary, raising a need to understand their relational aspects. However, one response is certain: agriculture, which has been the single largest user of water, will gradually lose its share to industry and municipal uses. Increasing urbanisation, particularly the growth of mega-cities such as New Delhi, Mumbai, Kolkata and Chennai, where the rich and powerful elites with higher purchasing powers live, has necessitated a steady supply and good management of water in the region (see Biswas 2006).

One source of water that has been the greatest cause for concern is groundwater, the exploitation of which the states in India had actively promoted since the mid-1960s. Although the use of groundwater has contributed significantly towards wealth creation in

the rural sector and is essential for drinking water supplies, the entire economy has remained spontaneous, private and informal in nature (Deb Roy and Shah 2002). There is abundant evidence from all over the region that water tables are falling, tubewells are becoming deeper and well yields are decreasing. The Central Ground Water Board in India estimated that nearly one-fifth of the 5,700 blocks/*mandal*s and *taluk*s in the country have reached critical levels of over-exploitation, and their numbers are growing (Vaidyanathan 2006). In many parts of Gangetic plains, the strategy of extensive minor irrigation in winter using low-lift pumps and tubewells have continued to be the main thrust of water management, resulting in overexploitation of groundwater and causing unforeseen social and environmental consequences. Groundwater exploitation in India has thrown up important questions of governance and allocation (Mukherji and Shah n.d.; Shah 2003). Excessive groundwater exploitation has caused a progressive decline in the water tables of major cities and the decay of traditional water supply systems in rural areas. The 'colossal anarchy' over groundwater and the continues search of water policy experts for new institutions do not always bring into picture the inequities inherent in the environmental and social consequences of groundwater exploitation: the poor, and the small and marginal farmers, losing access to their existing supplies for drinking and for ensuring food security, or the creation of informal water economies and markets for water vendors.

The response from the State in face of this growing scarcity has most often been to turn towards technology that may provide clues to designing means to ameliorate this scarcity, or to equitably distribute the surplus of one region into another deficit region. Instead of devising means to reduce consumption, the construction of civil engineering structures has been paramount in the measures that India has so far dealt with the perceived 'vagaries' of water. The responses have also been ad-hoc; such as the drilling of an increasing number of wells to extract the fossil water from hard-rock aquifers in South India. The technological fixes should have made the India less dependent on water, but that has not happened. It is not that the governments are not aware of this fact; Raju et al noted (2004, p. 284) that the stress has been greater on the 'hardware' rather than the 'software' – the rules and procedures that govern the operation of water systems.

In every type of water-use, major economies are desirable and possible, although difficult. If these could be achieved, the demand picture will not remain the same. The finiteness of available water resources within fixed political boundaries that are determined historically is undoubtedly a reality; this has also incited many disputes and

hydro-squabbles. However, a major paradigm shift has not yet happened; the main conceptual and institutional changes needed are from controlling the waters to enabling waters to be a vehicle of development, and from centralised water resource planning to water resource management (Narain 1998). In the supply side answers to the demand, local rainwater harvesting (that is, `catching the raindrop as it falls') and watershed development need to be emphasised. Fortunately, many successful examples of such initiatives are available. While the large irrigation demand, and to a lesser extent the growing industrial demand for water, will be the main problems, meeting the fundamental right to safe drinking water and the Millennium Development Goal in respect of sanitation will also present formidable challenges.

Gender in water management

A regular, reliable supply of safe water remains crucial for securing the livelihoods and for ensuring food security for a large number of people, amongst whom women are the majority, providing primary subsistence needs for families (Phansalkar and Verma 2004). Yet, at times of scarcity such as droughts or excesses such as inundations, victims are invariably chosen by class and gender, the poor being affected first and most, turning them into 'environmental refugees'[13] (Khan and Seeley 2005).

A crucial area of neglect in Indian water management is the lack of attention to gender roles, needs and concerns (Lahiri-Dutt, 2006; 2007). Women play an important role in farming systems in India, and according to NSSO data, agriculture employs 70% of the working population of which about 84% are economically active women (GoI, 1991). However, according to Arya (2007: 204), women's contribution to work is not likely to be measured accurately by Census and NSS data as firstly, not all women who contribute to the GDP are likely to report themselves as workers or are likely to be reported as workers by investigators; and secondly, several women's activities that should be included in the GDP are not likely to be included through these surveys. In reality there are only a few women in India who are not farmers in some way, be it by working on the family farm, working as wage labourers or sharecroppers. Women also play a predominant role in informal management of other natural resources such as water, forests and common lands.

However, in spite of universal citizenship, women as a rule do not own the land[14], neither have they ownership rights over water, leading to their poorer status within village societies (Agarwal, 1994). The water resource management sector needs to recognise

women as productive farmers. There are examples such as that made by SEWA in Gujarat to involve women in rainwater harvesting, training of women to repair and maintain village pumps, and connect the Self-Help Groups to watershed programmes (Ahmed, 2005).

Conclusion

The journey from a sacred resource to an object of control has been a long and complex one for the waters in India. This desire for control also turned particular bodies of water into objects of disputes between the nation-states.[15] In 'sacred rivers, sacred dams', it is noted that 'In the intersections among religion, ecology, and politics, politics usually prevails. ...through the cryptic use of symbols and simplified dichotomies, developmental, environmental, and moral concerns become politicized and fundamental differences obscured. The concern ... is with where, how, and why key symbols of cultural and religious values enter into development discourse and what happens when they do' (Fisher 2000, p. 401).

This has been a hallmark of water resource development in India. For example, contrasted with traditional approaches to water in India, the 'current approach of water resource development', summed up by Sengupta (2000 p. 74) was to develop irrigation potential primarily on canals and tubewells, only large units for hydel power, and multipurpose river valley projects, a strategy that has contributed to about 10 per cent increase in production since mid-1900s: 'This is substantial if one does not have an exaggerated notion about their roles in development.'[16] Yet, large scale hydraulic infrastructures have come to be synonymous with development in India; for flood control, they have been used sparingly; for hydropower generation their contribution has not been the major source of the total electricity supply. These infrastructural developments represent a certain degree of state legitimacy for water bargains, often contained within a set of broader 'resource development' and modernisation goals that the states support by providing financial and political investments through concrete policy programs. This supply-side hydrology has been a result of little attention to 'a whole range of surface water appropriation technologies, which were serving irrigation and drinking water needs of extensive areas' (Sengupta 2000, p. 74).

Rainwater harvesting, watershed development, traditional irrigation systems, small hydel, or low and temporary embankments for dealing with floods are key methods and techniques of water resource management. These are known popularly as options and

if this repository of techniques could be added to the existing knowledge base and integrated in the existing decision-making processes, 'water resource planning can only improve after such integration because old designs are not excluded from amongst the possible applications' (Sengupta 2000, p. 76). Moench et al (2003 p. 5) disagree: 'the "need" for integration may be clear – but how it can be achieved is far less so.' According to them, major questions exist over who does the integrating, whose interests are reflected in the integration process and how this process is governed to ensure the interests of all stakeholders are reflected equitably, how disputes should be resolved, and above all, what issues need to be addressed through integrated approaches. The indications are therefore, of enormous intellectual and practical challenges – challenges that involve a shift from 'development' to the 'management' of water resources. Moench et al note (2003, p. 4): 'With the exception of groundwater, which by nature is a dispersed resource, water development is generally a large-scale construction activity requiring major resources and organisation – both of which are the prerogatives of the state. These characteristics have contributed to the development of many large centralised irrigation and water supply organisations that dominate the water sector in … South Asia'.

India is confronted again with a significant question: in economies where large portions of the population are directly dependent on agriculture for their livelihood, access to reliable sources of water is a fundamental factor influencing the level of poverty. Households depending on intensive agriculture as the single most important income source are extremely vulnerable when water quantities fall or available water supplies become unusable. Whereas groundwater access for irrigation can play a critical role in stabilizing water access for farmers (see Dayton-Johnson's 2003 review essay on the economics of such irrigation), the evidence has also pointed to its depletion resulting in 'many losing access to groundwater while a few, better situated to retain access, dominate the water economy' (Moench et al 2003p. 8). In parts of India, the intensive and wealthy groundwater based agricultural communities are now vanishing as individual farmers drill deep, unprofitable, wells into bedrock underlying depleted shallow aquifers. Often commercial interests enter the scene to capture and exhaust available waters, and aggravate the scarcity situation. Given the crucial role played by groundwater use by farmers in increasing food production in India, this raises a serious challenge of overdraft from aquifers affecting those without the ability to access this resource. Moench et al (2003, p. 3) thus describe governance as the 'core water challenge': 'the challenge South Asia faces is a complex one. It is not primarily about the ability of governments, non-

governmental organizations (NGOs) or communities to “choose” one or another uniform set of technically viable solutions to water problems. It is also not really about integration or planning mechanisms for resolving multiple demands on and disputes over a limited water resource base. Both technical solutions and the degree of integration required depend heavily on context and the specific nature of the water resource constraint being addressed.’ This statement is extremely important as it touches upon the simple yet crucial issue of voice: who makes the decisions related to water[17]? Instead of integration or technical considerations, both of which are important, Moench et al call for the need to examine the deeper ‘constitutional’ foundations on which day to day decisions and courses of action rest.

Is water the last frontier of conflict and separation, the greatest ‘commons’ of India, or is it an open access resource for the more powerful to draw upon ceaselessly to meet their own interests? Is it a resource for ‘nation-building’ in which central bodies own and take the responsibility of procuring and supplying water, often at a price, or is it a resource that can empower communities and around which ordinary citizens can strengthen their bonds with nature and enhance their commitments to others? The time has come for us to look closely at some widely circulated myths or, at least misconceptions, about water resource in India. These myths are often centred upon the view of the absolute and physical amount of water that is available for the growing populations, and based on economic premises heralded by international funding agencies. They fail to illuminate important aspects of water such as the history of water management and planning in the region that over the years has tightened the ownership and control over waters by the states in a top-down manner. There is no denying the fact that access to water is uneven among the sectors and regions of India, where the control over water, based on colonial legal principles, has provided the foundation for managing water.

Water management in India also poses the question of knowledge: incomplete knowledge; poor understanding of the local ecological context; and the wholesale incorporation of universalistic models from the West that see the rivers only as carriers of water, making invisible the enormous quantities of sediments that are brought down by them every monsoon. Managing these waters also involves the complex question of regional water sharing; whereas the water resources of the Indian subcontinent are interconnected as complex systems, political boundaries cut across them raising the question of sharing trans-boundary river waters. The sharing of these waters has thrown

up political challenges and disputes – situations that the nations seem to have at times negotiated efficiently. The Indian situation indeed offers serious challenges to ecology, health and sanitation, and many of these challenges are related to the contemporary developmental philosophies and/or originating from the onslaught of globalization. These challenges include the consequences of increasing and conflicting demands for freshwater in both rural and urban sectors, increasing competition among different uses, yet to be decided ownership and rights questions that have given rise to resistance to current systems, wastewater, impacts on poor people of commodifying and privatising water, and a complex regional politics amongst neighbours inextricably linked with sharing of the waters of rivers flowing past political boundaries. In most parts of India, the use of groundwater over the past five decades has played a central role in stabilizing agricultural production and reducing poverty, but has brought to light environmental issues such as arsenic poisoning. The foundation of economic prosperity and agricultural growth, however, is threatened by increasing competition over limited water supplies and the depletion and pollution of the existing sources.

Finally, water management comprises that critical area where gross inequalities in power between women and men in India are reflected; whereas women are the primary resource managers in homes and on farms, and also the bearers of water chores and the negative impacts of the excesses and scarcities, men tend to dominate the decision-making processes in water management. An important challenge for Indian water futures would be to create water management policies and practices that include the voices and concerns of both women and men.

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[1] Eck noted (1987, p. 110): 'The running water of rivers is often used ritually for purification … Bathing in the Ganges is said to purify not only the sins of this birth but also those of many previous births.' Feldhaus (1995, p. 5) showed that this purifying power of the rivers emanates from the fertilising properties of water that is more important than the cleansing properties. The agricultural communities dependent on rivers attributed feminine qualities to them in rural areas of South Asia. The worship of waters as feminine is a South Asian tradition (Tambs-Lyche 1999); the goddess of nature is represented as the womb that is revealed in rivers. In western cultures, not water bodies but lands 'appear as the womb of life, fertile, productive' (Giblett, 1996, p. 85), but against this notion, Baartmaans notes (2000 p. 4), 'Waters envelop both creation (*sṛsti*), maintenance and support (*sthiti*) as well as decay and destruction (*pralaya*), only to give rise to new creation.').

[2] They continue doing so, as Ahmed (1999) has shown us with many examples.

[3] Bandyopadhyay's (2004) critique of the project notes it as a simplistic supply-side solution put forward from the existing paradigm of water management. He notes (p. 5310): 'The reductionist engineering concept of water has seen it mainly in the form of visible flowing water. The totality of the ecosystem services provided by water, from the time of a drop falling on the surface of a river basin to the moment of its flowing to the sea have remained marginal and neglected for a long time….As a result, it is not possible for the existing paradigm to recognize and record these various ecological processes and their values, for instance in the conservation of biodiversity, its role as a mobile solvent, the pushing of the sediment load out to the sea, and many others. It is this conceptual limitation of the present paradigm that

makes it possible for it to describe the outflow of a river to the sea as a "waste", or finds little difficulty in locating "surplus" river basins in a limited arithmetic assessment.'

[4] The packaged water industry in India is estimated to be more than Rs 100,000 crores and growing rapidly by 30-35% per year, although with only a 6% market share of the total beverage market. With growing groundwater pollution, urban consumers are increasingly turning to the use of mineral water for drinking. Legally, groundwater belongs to the person who owns the land, but as the amount of groundwater that can be exploited is not limited by the amount of land owned, its exploitation is dependent on technology and capital. With regard to groundwater extraction by Coca Cola factory in Palakkad district of Kerala, the High Court ruled that underground water belongs to the public, with the State acting as its trustee. The Court also commented that the time has come for reinterpreting the use of resources by industries meant for public use. Another point to note that whilst most industries in India use surface water for their processing needs, soft drink factories use groundwater as a raw material as it is free from turbidity, and do not need to pay for this resource. A Joint Parliamentary Committee set up to investigate the presence of pesticide residues in soft drinks noted that the CGWA has yet to initiate measures to stop the extraction of groundwater for industrial purposes.

[5] The 1992 Dublin Principles note that freshwater is a finite and vulnerable resource, essential to sustain life, development and the environment; water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels; women play a central part in the provision, management and safeguarding of water; and above all, water has an economic value in all its competing uses, and should be recognized as an economic good.

[6] Gleick notes (200 p. 39) about these projections: 'But what will future water demands be? How can they be predicted, given all the uncertainties involved in looking into the future? At the global level, various projections and estimates of future freshwater demands have been made over the past half century, some extending out as much as 60 or 70 years. These projections have invariably turned out to be wrong.'

[7] For example, see UN World Water Development Report, *Water for People, Water for Life* published in 2003, on the eve of the Third World Water Forum in Kyoto in Japan.

[8] Gujja et al (2006, p. 572) note that 'water conflicts are symptoms of larger issues in water resources management. …implicit in these "million revolts" is a demand for change; first in the ways we think about water and second in the ways we manage it.'

[9] Rao's early authoritative book, *India's Water Wealth* exemplifies this approach.

[10] For example, according to the UNDP report published in 2001, 14% of population in India does not have access to improved water sources and 67% are without access to adequate sanitation facilities. As the population surpasses the 124 billion mark in 2015, almost half of it will be in urban areas of various sizes, making sanitation and water access one of crucial need.

[11] 'Water Establishment' stands for the Ministry of Water Resources at the centre, the corresponding department at the State level, the associated technocratic organisations such as the central water commission, the national water development agency, etc, and that part of the planning commission which deals with water and irrigation - in other words, the totality of the system (political, bureaucratic and technocratic, including the related government economists) that deals with water policy, planning, and project-building.

[12] The 'manufacture' of scarcity at the discursive level obscures several important aspects of 'real' scarcity. One, inequalities often shapes access to and control over water. Two, water scarcity is not natural, but instead largely due to anthropogenic interventions, resulting from bad water management and land use practices. The naturalisation of scarcity at the discursive level does not help mitigate the symptoms and causes of 'real' scarcity. In some cases, 'real' scarcity might be exacerbated due to the popular narratives (e g, water tables might continue to decline if the decrease in groundwater resources is attributed to climate change rather than to uncontrolled extraction). Furthermore, the 'manufacture' of scarcity might not result in the creation of solutions appropriate to local needs and conditions.

[13] Myers (2005) considers that there were 27 million environmental refugees in the world in 1995, and with global warming displacing many more, the number of such people today will be many more.

[14] Although women constitute two-thirds of the workforce in agriculture, they own less than a 10^{th} of the agricultural land and own less than 1% of property (Arya, 2007:211).

[15] Correll and Swain (1996, p. 126) have even made a threefold typology of conflicts: state versus state, state versus group, and group versus group.

[16] This is known as a 'developmentalism' which asserts that the state has a legitimate if not a necessary role in integrating the activities of various sectors of the national economy within the larger context of the state's developmental vision. The essence of this definition of the developmental state is that state authority is legitimate and that the state defines for itself and society a 'developmental' ideology that sets our concrete goals. This interest in development professed by the state may actually take place regardless of whether it has achieved positive economic results or not (Evans 1992, p. 147).

[17] See World Resources 2002-2004, *Environmental Governance.*