BOOK OF ABSTRACTS

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CONTESTED WATER POLICY IN SOUTH ASIA

Indian irrigation in transition: Growing disconnect between public policy and private enterprise

Tushaar Shah

In the India that Alfred Deakin, three times Australian Prime Minister, and a great irrigation enthusiast toured in 1891, what impressed him most was the aggressive partnership between the state and science in undertaking gigantic irrigation works. The Ganges canal, the Grand Anicut on Cauvery and the growing network of canals in the then nearly unpeopled Indus basin were symbols of Anglo-Saxon energy he wanted unleashed in Victoria. Victoria dithered; but British India witnessed feverish canal construction, until 70% of irrigation was delivered by government canals in the 1930's. The enthusiasm for building public irrigation system for gravity irrigation has continued after Independence; and even today, canal and reservoir building is all that irrigation planners think of when it comes to agricultural water management.

Especially since 1970, however, Indian irrigation has turned full circle, with the share of government canals falling to 30% in India's irrigated areas by c. 2000. India - indeed the whole of South Asia—has experienced a runaway groundwater boom as a response, essentially, to rapid ghettoisation of Indian agriculture. At some 400 million, Indo-Gangetic basin is home to more poor people dependent on farming than all of Africa. Compared to anywhere else in the world, regions in India have brought higher proportion of geographic area under cultivation, higher proportion of cultivated area under irrigation, and higher proportion of irrigated area dependent on groundwater. Groundwater wells have been the mainstay of India's agrarian poor; however, the sustainability of such high reliance on groundwater is a cause of much concern. Increasingly worrisome are falling water tables and salinity in the west, and in the east, growing problems of geogenic contaminants, and annual cycles of monsoon floods and summer low-flows.

Despite its meteoric rise in the country's agriculture, groundwater continues to be treated by India's irrigation planners as 'minor irrigation', receiving minor attention and similarly minor share in the allocation of plan funds. As groundwater irrigation has spread upstream and downstream of river basins, within and outside command areas, in rich alluvial aquifers and poor hard-rock aquifers, the share of public systems in India's irrigated areas fell, first in relative terms, but in recent years, in absolute terms. Since 1990, India has invested over US $ 3 billion in building new and rehabilitating old public irrigation projects; yet, area irrigated by these have shrunk by 3 million ha. Much discussion in irrigation literature has suggested institutional reform-such as Participatory Irrigation Management (PIM) and Irrigation Management Transfer (IMT) -- as the way out for defunct public irrigation; but the Indian trends suggest that canal irrigation as a technology is up against some hard questions. Clearly, India needs to reinvent public irrigation.

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Developing water policy in a multi-party system

Rajindra de S Ariyabandu

Over a decade of efforts to develop a holistic Water Resource Management (WRM) policy have failed. Sri Lanka is a classic case of attempting to develop policy, nationally demanded but designed by external actors without adequate attention to context and consultation. Thus, the policy process generated intense controversy and became both the tool and victim of national policies.

Due to inherent tradition of paddy cultivation, water has a powerful social, cultural and a political role. Although water scarcity is not an immediate problem, increase urbanizations and industrialization, demands a rational system of water allocation. Water resources management in Sri Lanka faces a number of challenges including multiplicity of institutions dealing with water, inadequate laws and lack of a comprehensive data base. Consensus emerged in early 1990s to formulate a comprehensive water resources policy. Subsequently, number of donor agencies including the Asian Development Bank played a key role in investing to establish a comprehensive policy. Despite over a decade of investments and efforts, these initiatives were never implemented largely due to poor understanding of the country context with its multi-party system of government, strong cultural values, vocal civil society and a politicized media willing to exploit controversies.

The Comprehensive Water Resources Management Project (1992) which assessed the institutional capacity of WRM recommended a single overarching policy, law and an apex body to manage water resources. In the years to follow these efforts were supported by donor agencies, culminating in the Water Resources Management project (2001), which attempted capacity development of the new institutional arrangement for Comprehensive Water Resources Management (CWRM). Although the guiding principles of CWRM was institutionalizing Integrated Water Resource Management (IWRM) through an overarching policy, the new policy attempted to introduce several unfamiliar approaches like, entitlements (ownership rights) to water, transferability and water pricing. Following controversial land reforms and cases of water privatization elsewhere in the world, these measures were strongly opposed by civil society as commodification of water. Institutional arrangement proposed under the new policy also caused controversy and confusion among traditional institutions. Besides, the policy was used as a political tool both by politicians and media. Further, the policy development process was always piecemeal subject to political interruptions. Finally, the process was never underpinned by strong stakeholder consultation or effective communication to solicit support. In the face of mounting difficulties and lack of political commitment, policy development process effectively collapsed with the withdrawal of financial support for CWRM in 2006.

Pluralizing the policy terrain for sustainable water development

– Dipak Gyawali

Abstract: Prior to engaging in a discussion on "water policy" and the kind of studies needed to inform and enlighten it, it is necessary to re-examine the understandings around it. This presentation relies on works such as those by Steven Lukes and others on Power, as well as those of the collegium upholding the Theory of Socio-Cultural Viability, to argue that the policy terrain is plural and contested, and certainly not confined to that of the state hydrocracies. However, that plurality is often hidden, underground as it were, when the water policy terrain has been hegemonized by one social solidarity, or when other voices have been suppressed. Using this theoretical background, the presentation will examine Nepal's Irrigation Policy 2060 (June 2003) as well as the implemented policy to pluralize the hydropower terrain in Nepal with a view to teasing out the potentials and pitfalls in policy reform, much of it experienced by the presenter as water minister. It will then close with a discussion on what "water policy research" should be, and how it would have to differ from other "normal" research if it is to feed into the policy process.

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The conception, design and implementation of Irrigation Management Transfer (IMT) in Pakistan's Punjab: A public policy reflection

Mehmood Ul Hassan

The water resource projects carried out in Pakistan over the past sixty years have contributed much to its agricultural development. The construction of several small and large dams have also made it possible for the nation to have access to hydro-electricity, that had derived its pertinent textile and other industry, and boosted employment and foreign exchange earnings. At the same time, however, water resource development has also displaced hundreds of thousands of families, mobilized salts, caused water logging in some areas, and depleted precious groundwater aquifers in others. Besides, various segments of population have not benefited equitably from water resource development. Therefore, the water scene of Pakistan has been, and remains, a contested arena for several actors, including the agents representing various hierarchical levels of federal and provincial governments, farmers and rural communities, NGOs and researchers, as well as international development agencies.

Pakistan has been undertaking reform of its large-scale irrigation and drainage sector since 1997 on the advice and push of international donors. The paper briefly examines the reform design and implementation experience in Pakistan's biggest province. The paper analyzes the reform experience through the public policy concepts of "lessons drawing", "voluntary" and "coercive" "policy transfer", and "policy irritant", and agues that irrigation management transfer proved to be a policy irritant.

The latest water policy of Pakistan was drafted in 2004, but still awaits its implementation in full. The policy draws heavily on the principles of Integrated Water Resources Management (IWRM), the contemporary and perhaps the most influential water resource management paradigm. The International Financial Institutions (IFIs) aggressively advocate the IWRM paradigm in water development cooperation. Pakistan's new water policy refers to it as the main source of inspiration. Some elements of the new water policy, such as statements on full cost pricing of water, increasing the storage potential, and devolving the management of irrigation systems to farmer's organizations and private sector have potential to trigger further controversies amongst various segments of society, and can be seen as the "sticking points" of the policy.

The paper restricts itself in large parts to the IMT experience in the most populous Punjab province, which forms the major part of Pakistan's irrigated area, and remains the biggest user of water diverted for agricultural use. It introduces the conception and design of IMT in Pakistan and presents a few key features of IMT and its implementation. The paper asserts that the development donors should pay more attention to learning lessons themselves from the public policy research and practice to improve their lesson drawing exercises and policy transfer processes.

A synthesis of water policies in Bangladesh

Begum Shamsun Nahar

The ministry of water resources declared the National Water Policy (NWP) for Bangladesh in 1998. The declaration states: 'as water is essential for human survival, socioeconomic development of the country and preservation of its natural environment, it is the policy of the government of Bangladesh that all necessary means and measures will be taken to manage water resources in the country in a comprehensive, integrated and equitable manner'. The policies enunciated herein are designed to ensure continued progress towards fulfilling the national goals of economic development, poverty alleviation, food security, public health and safety, decent standard of living for the people and protection of natural environment.

The NWP has 16 components, which describes policy measures to be undertaken to achieve the above objectives. These policy measures include: (1) river basin management, (2) planning and management of water resources, (3) water rights allocation, (4) public and private involvement, (5) public water investment, (6) water supply and sanitation, (7) water and agriculture, (8) water and industry (9) water, fisheries and wildlife, (10) water and navigation, (11) water hydropower and recreation, (12) water for environment, (13) water for preservation of haors, boars, and beels, (14) economic and financial management, (15) research and information management and (16) stakeholder participation.

The NFP emphasizes among others, three interrelated issues such as planning and management of water resources, economic and financial management, research and information management water rights allocation, stakeholder participation. Water and agriculture, water, fish and wild life, and water for preservation of haors, baors and beels. The notable policy directions in the NWP were to encourage planning, management and stakeholder participation, water rights allocation, private sector/ development of groundwater for irrigation and also to emphasize surface water augmentation.

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Session 2:

CONTESTED WATER REFORMS: GLOBAL EXPERIENCES

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Chilean water markets: history, politics and empirical outcomes

Jessica Budds

This paper presents an account of the water markets model in Chile, covering its history, politics and contestations and its empirical outcomes for lower-income water users through two case studies in Northern Chile. The paper challenges the claims that water rights markets have led to social benefits for lower-income water users, and show that, instead, private property rights and trading has produced negative impacts. The two cases presented are characterised by demand for water from economic interests that posed a threat to the availability and/or security of water among lower-income water users. In both places, lower-income groups experienced violations of their water rights by other parties (abuses by large farmers, water prospecting on ancestral land) and neither was able to properly resort to the courts or government in the absence of regulation.

The analyses of cases challenge some of the broader economic arguments made about water markets, including the simplistic assessment that water transfers demonstrate efficiency if they reallocate water from low to high value uses. These standard cost-benefit assessments fail to incorporate the impacts of losses of traditional lifestyles and community cohesion, or environmental degradation.

One of the principal social benefits associated with private water rights is increased water security. This also can be contested on two grounds. Firstly, legal water rights can only be defended in the civil (private) courts. In practice, groups with a low socio-economic status neither have the social skills nor the resources to use the legal system. Secondly, private property rights are a double-edged sword. Paradoxically, the tradability of legal water rights brings them into the market, and thus subject to acquisition by others through simple and legitimate market transactions. Social impacts of the Water Code have often been dismissed by the assertions that water use has not changed since the implementation of the 1981 Water Code, or that the law 'applies to all Chileans alike'. Both cases show that water use has indeed changed since 1981. The cases highlight inequality of access to the legal system.

The Water Code's neoliberal features enabled economic sectors to exert greater control over water resources, to the detriment of lower-income users, traditional rights and water sources. However, these social outcomes should not be understood as impacts of the water markets model per se. Rather, they are embedded within wider social relations that produce social inequality, including access to water. In this regard, it is very important not to detach the Water Code from the historical-political context within which it was produced. The Water Code formed a key part of the political project assembled by the 'technocrats' under the military government, that was less about an effective way to manage water, and more about fostering benefits to Chile's key economic industries. The outcomes of the Water Code cannot, therefore, be understood in isolation from this context.

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South African water reform and its contested implementation

Eiman Karar

Since the promulgation of its National Water Act in 1998, South Africa has been characterized by a 'buzzing' water sector where government, academia, private sector and non governmental agencies strived to produce a state-of-the-art legislation. In the past, South Africa harnessed the law, and the water, in the interests of a dominant class and group which had privileged access to land and economic power. It is for this reason that the new democratic government has been confronted with a situation in which not only have the majority of South Africa's people been excluded from the land but they have been denied either direct access to water for productive use or access to the benefits from the use of the nation's water. Hence the new reforms come with a wide expectation from the marginalised South Africans and the dream of imminent improvements in their lives, and a full sharing in the resources of their country. The latter adds the urgency component for service delivery which is central to all the manifesto of the ANC. The vision for water is "some for all for ever" through institutional reforms to yield better management of water resources where processes are made more effective for achieving South Africa's development vision of "better life for all". The National Water Act of 1998 is the instrument to make this happen.

The presentation will focus on the water reforms retrospecting the last 10 years of implementation. This will be done by establishing indicative parameters to review implementation to date and the emerging anomalies between the idealist IWRM versus the realistic IWRM for South Africa. In so doing, the founding Dublin principles reflected in the principle of subsidiarity, gender equity, water as an economic good and the water management along hydrological boundaries can be used. The presentation is essential for developing countries undergoing similar reforms pregnant with high expectations.

Major strides in national planning, allocation reforms, institutional arrangements, pricing, monitoring, compliance and enforcement as well as research and development were made in South Africa in the last 10 years. However, certain weaknesses have been observed which have lead to very slow implementation pace verging on the lack of delivery. The reasons could be; the long incubation periods for perfecting complicated systems whether they are for planning, environmental reserve determinations, water allocation reform, institutional arrangements, etc; the intention of undertaking all the tasks in the Act at the same time without properly prioritizing the necessary tasks where the limited resources can be grouped for the desired impact; the mismatch between the decentralizing principles/policies and the substantial human resources shortages in the sector at all technical as well as managerial levels could be some of the reasons that will be shared during the presentation.

Innovation in European water policy and the need for exchange on water policy reform at a global scale

Claudia Pahl-Wostl

Over the past decade, a major change in the rhetoric surrounding water resources management has been evident. The debate is now dominated by an increased awareness of integrated management approaches taking into account environmental, economic and social considerations and by the search for strategies which go beyond technical end-of-pipe solutions. In particular, the importance of improving water governance is now widely recognized.

Challenges for water governance are manifold. Normative principles of "good" water governance should be respected. Governance regimes should be adaptive and flexible to be able to deal with complexity and uncertainty expected to even increase with the impacts of global change. Stakeholder participation has gained increasing importance. Latest developments in European Water Policy have taken such considerations into account. The European Water Framework Directive adopts a more integrated approach and emphasizes the involvement of all interested parties in the development and implementation of river basin management plans.

European and national policies currently developed for the adaptation to Climate Change argue for even more profound changes. One might even talk of a paradigm shift in water management. This is very pronounced in the Netherlands where the government asks for a radical rethinking of flood management – more space for rivers and living with water rather than controlling water. However, despite this change in public and political discourse change in management practices is very slow. Such inertia can be explained by the radical changes in the management regime that are needed to realize the postulated paradigm shift.

The paper will report on these developments and argue for the need for an exchange on a global scale. Climate change has exposed vulnerability of current water management regimes and is another driver for water policy reform. Hence we can expect to witness a whole range of policy experiment in the years to come to improve water governance. What is needed is a globally coordinated learning process to be able to share lessons learned and to jointly build a global knowledge base. This would support the development of the "diagnostic" approach which develops tools to analyse problems embedded in context and supports the development of context specific integrated solution instead of advocating simplistic technical and institutional panaceas.

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Session 4:

ECONOMICS OF WATER

Approaches to water policy analysis in peninsular India

N. Nagaraj and Arne Hallam

In India, both surface and groundwater are dependent on the monsoon rains. More than 85 percent of total groundwater extraction is for irrigation. The quantity and distribution of rainfall is a major determinant of the farm economy irrespective of whether the farm is rainfed or irrigated. Surface water irrigation is dominated by reservoirs and canal systems where almost the entire investment is borne by the public. Farmers, in this case, bear little if any infrastructure cost. Farmers using surface water typically remit no more than a fixed water charge, which seldom covers operational costs let alone the amortized cost of reservoirs, canals and so forth. In several states, farmers do not even a remit the water rate / water charges for surface water in which case surface water becomes a 'free' public good. In the case of groundwater, the farmer contributes for wells, pumps, electrical fixtures, conveyance pipes, and so forth. The farmer may be required to pay for the electricity, though in many states this cost is subsidized or completely waived. Heavily subsidized electricity has promoted intensive groundwater extractions in hard rock areas.

Given the positive interaction between ground and surface water and overall agricultural productivity, groundwater resources cannot be viewed in isolation and should be treated in an integrated holistic manner following the tenets of Integrated Water Resources Management (IWRM). Sustainable use of groundwater will sustain irrigated agriculture, which can sustain food security

The Dublin principles and the Integrated Water Resources Management model indicate that water should be treated as an economic good. Failure to treat water as economic good has resulted in manifold problems in the water sector. Market based and institutional approaches for pricing surface water are a political economy question that should be addressed on a watershed and water basin level.

Independent of aggregate policy, there are many things the individual producer can do to more efficiently use water resources. Examples include appropriate cropping patterns and land use and improved irrigation technologies. Aggregate policy, however, must take account of the micro-level incentives provided to farmers in crafting appropriate policies. Hence, the approach to policy analysis should focus on the institutional framework, economic instruments and regulations for sustainable and equitable management of groundwater both on short run and long run basis, paying particular attention to effects of firm level decisions on the success of aggregate policy and the effect of aggregate policy on firm level decisions.

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Malaise of urban (industrial and domestic) water supply through public-private partnerships: Lessons from a south Indian case study

Prakash Nelliyat

Private sector boom and public sector malaise in water resources development In rapidly growing cities, provision of adequate water is a big task. Since water is a 'fluctuating resource' ensuring its availability in time and in space is a challenge and required large investment. Generally private firms are not interested in constructing water supply systems because of the long gestation periods and the comparatively low returns on investments. The Public-Private Partnership (PPP) water supply project of Tiruppur, a major textile city in South India, is an interesting example.

The textile industry in Tiruppur not only has a dominant position in the economy, but is also a large water user (90 million litres per day - mld). In earlier years industries extracted their required water from their own wells. But from the early 1990's due to textile pollution industries transport water from the periphery by tankers paying about US $ 22 million/year. Subsequently, industries enter into a PPP with the Government to implement the water supply scheme. The Tiruppu's Area Development Project (TADP) was implemented through NTADCL, a group of public and private entities. NTADCL act as a Special Purpose Vehicle operating on a Build-Own-Operate-Transfer base with a 30-year time stipulation and is the first PPP in the water sector in South Asia. The project (total cost of US $ 230 million) inaugurated on February 2006 and bringing 185 mld of water from the Cauvery river to Tiruppur for industries and households. The TADP was developed by the Government of Tamilnadu, IL&FSL, and Industry Association with the assistance of USAID. The price of water determined to industry and domestic supply was US $ 1/m3 and US $ 0.12/m3 respectively. It was assumed that after the project commenced the tankers would disappear and industry would prefer TADP water. However, some of the industries do not prefer the TADP water because of its high price compared to the tankers. After the scheme the tankers started to significantly reduce their prices. Now the stiff competition from private tankers has become a great challenge to the TADP, which was forced to cut the water tariff to US $ 0.5/m3, 50% less than the original rate. In this situation, the financial sustainability of the project is jeopardy.

Another serious problem that the TADP faces is the new regulatory requirement on "Zero-discharge" (effluent recycling) imposed by the Pollution Control Board. If recycling is enforced, the industrial water requirements/demand will be substantially reduced. It is unfortunate that TADP did not include the industrial wastewater management in project design. The Tiruppur experiences demonstrates that planning the project in terms of the full water cycle project is essential for achieving sustainable water resources management for both economic and environmental perspectives.

A paradigm shift in approach to water policy is the need of the hour with special reference to drinking water

J. Cyril Kanmony

Gone are those days when fresh water was considered as free good and water from all surface sources including ponds and tanks and even water courses running among paddy fields was drunk without any hesitation. Now, we are in a state, where water is becoming economic good and drinking water from any surface source without proper treatment causes serious health hazards. This water scarcity in both its quantitative and qualitative manifestations is a major challenge for the socio-economic development of many countries. But, even today we are following the same old supply-oriented approaches and policies that were followed in the era of plenty. Hence, the requirement of the hour is a paradigm shift in our approaches and policies.

The present water scarcity is the result of inefficient use and poor management rather than of the limited supply of fresh water. However, there are fewer opportunities for supply side solution as there are physical, financial and ecological constraints.

The main sources of water pollution are urban sewage, farm chemicals, industrial effluents and domestic wastes. The water supplied by local authorities specifically in rural areas it is not properly treated. The quantity of water supplied is also not equal due the engineering and political approaches. Water is not available where or when needed. Rich families are supplied with more water and they spend it lavishly, while the poor people, who are not supplied with enough quantity, depend on unsafe surface sources. Sound finance is the basic necessity for conservation, good maintenance and management. But, due to the subsidized pricing policy, most of the panchayats are in financial crisis. Low water charges and poor cost recovery jeopardizes the efficient maintenance of water infrastructure and the scope for future investment in water development projects. There are also water conflicts between regions and countries in making use of water sources.

The paper argues for a paradigm shift in approaches to water policy and the new approach must ensure efficient use and better management with equitable distribution. There is very much scope for diverting a significant portion of water used in agriculture for domestic purposes. Water conflicts and water-related issues can be solved by establishing water courts. Conflicts between states can be addressed by framing a National Water Policy. To avoid over exploitation of groundwater, the paper suggests the permission of quantified water-use rights. Public-private partnership in water investment may be allowed. Water Users' Association shall be started to share the limited water available among them. Policies to recycle the urban sewage and treat industrial effluents must be framed. Thus, the paper goes on explaining the real situation existing and the ideal situation to be attained.

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Municipal water pricing in transition: A case study of Calcutta, India

Chirodip Majumdar

Full cost recovery from users is the ideal long-term objective for pricing municipal water supply. But pricing with the objective of full cost recovery is expected to be legally and politically unacceptable and thus not feasible or even desirable in the phase of transition. A transitional phase implies a phase when a historically subsidized system is moving into a system where cost recovery is seriously targeted. A possible way out, in the transitional phase, is to somehow obtain public consent on payment of water dues to the municipal corporation. This could be done by obtaining a willingness-to-pay (WTP) estimate, through a contingent valuation (CV) study, based upon a survey of a suitable sample. A water pricing principle, which considers consumers' WTP, can be a useful tool and a proper base for full cost recovery in the future.

Water utilities in Calcutta, India are historically subsidized. This has kept residents still quite unfamiliar with the concept of volumetric pricing of water. But pricing strategies have recently been receiving attention and the charges regime appears to be in transition. However, pricing with the objective of full cost recovery may not be feasible or even desirable in the transitional phase. The purpose of the paper is to formulate a water pricing principle that incorporates consumers' willingness to pay. A dichotomous choice contingent valuation question was asked to the respondents and it was found from the responses that people are willing to pay a charge of Rs. 4 per kiloliter for water of desirable quality. The logit regression analysis revealed that people incurring higher averting expenditure and cost on waterborne illness have a greater chance to pay. Respondents having kids, higher level of education and higher income are more eager to pay for water of desirable quality. Spending for water of desirable quality is incentive compatible for consumers as they presently incur an average out-of-pocket expenditure of Rs. 43.86 per month per household on water. Such principle, which considers consumers' opinion, is expected to neutralize the political and public resentment in the phase of transition and can be a base for full cost recovery in the future. Respondents expressed opinion that the underprivileged should receive some support from the government and contribute a part of the payment. It was also found that residents of Calcutta have little objection upon a private water operator if improved service is ensured.

The paper argues that the transitional phase pricing scheme should be simple, transparent, easily understandable and implementable. The advantage of such pricing structure is that it favors conservation and expected to check wastage of water. As there is no fixed part in the pricing structure, this will give enough scope of cross-subsidization for low-income users. This structure has an in-built mechanism of consent generation of users and hence expected not to face political or public resentment at the time of implementation. It is also a good base of full cost recovery in future.

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The end of water sector privatizations in an age of cooperation?

Kumudini Abeysuriya and Cynthia Mitchell

The idea of privatization, where a private agent with a profit motive is involved in the provision of essential water services, is met with opposition from many quarters. In this paper we submit that this opposition is rooted in the dominance of the neoclassical economic perspective of private firms as entirely self-interested entities, exclusively intent of increasing profit and shareholder value. We argue that many of the problems with privatizations can be attributed to neoclassical economics being overextended. Alternative economic perspectives of private firms as "political economic organisations", relational with their stakeholders rather than isolated, open up new possibilities for cooperation as well as higher expectations and behavioural norms of a firm. We take 'privatization', a term not consistently defined, to mean private control of the entire urban water infrastructure system within a defined geographic area through long term concessionaire agreement. We briefly review privatizations that took place in developing countries during the 1990s, often driven by multilateral lending agencies with commitments to neoclassical economics.

The theory that privatization and market liberalization can deliver better services more efficiently than public monopolies has not been confirmed by experience of the urban water sector. For multinational companies who entered the field, the reality of operating in developing countries has produced neither the anticipated profits nor a satisfied customer base. Failures with privatizations have been exacerbated when regulation has been too weak, processes have excluded the views of the public and competition has been restricted through alleged corrupt practices. As governments in developing countries struggle to provide adequate and sustainable water services to their cities, the private sector can still play a critical role given the right context. We argue that a genuine prospect for profitability for the private agency is a critical requirement for success, in addition to strong regulatory frameworks and authentic engagement with the public. Problems have arisen when special arrangements are made with governments to ensure profit to a private agent involved in an inherently unprofitable activity. Some functions that make up the urban water supply and sanitation system may be profitable, and be an opportunity for private sector participation in the form of Public Private Partnerships (PPP) while a public utility, playing a coordinating role, retains responsibility for overall services. PPPs are necessarily cooperative with the public utility, and, facilitated by NGOs, create possibilities for cooperation with the public.

We submit that economic perspectives which prioritize economic, environmental and social sustainability equally, can bring a new age of cooperation in the water sector.

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Session 5:

YOUNG PROFESSIONALS

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Water use conflict between agriculture and fisheries in a selected water resources development project in Bangladesh

Sonia Binte Murshed & M. Shah Alam Khan

In many areas of Bangladesh, beels or shallow wetlands are dewatered or drained to allow dry season agriculture. Structural interventions including embankments and sluice gates are often introduced for this purpose, with the main objective to increase crop production with higher economic return to the farmers who are relatively strong in the community power structure. However, this arrangement adversely affects fisheries, ecosystem and their livelihood support in the short and long terms. So the water use conflicts between dry season agriculture and fisheries are almost inevitable. The conflicts are more complex where the open access fisheries resources are limited due to intervention of the aquatic ecosystem. Even within a participatory process of decision-making for such interventions, the needs and priorities of the fishing communities are often marginalized, mostly because of their weak position in the community.

Based on a socio-technical approach, this paper provides an understanding of the conflicts between agriculture and fisheries due to structural interventions in a selected water resources development project. Social survey and stakeholder analysis through focus group discussions (FGDs) and interviews with different groups including farmers, fishermen and women revealed the differences in their realities and identified the conflicts by assessing the impact of project interventions on irrigated agriculture, fisheries, ecosystem and livelihood support. An apparent discontent prevails among the less powerful fishing community as their needs, priorities and alternate livelihood options have not been properly addressed in the project formulation process. Technical analysis revealed conflicting water requirements in the dry season for irrigated agriculture, fisheries and aquatic ecosystem.

This study also attempted to identify a feasible platform for conflict resolution. Two stakeholder workshops were arranged to understand the potential areas and opportunities for conflict reduction. Although such workshops or meetings may be very useful to find agreeable mitigation measures where the social power structure is skewed, participation of the local government in this process and policy interventions are essential to reduce the conflicts. The National Water Policy of Bangladesh states that necessary actions should be taken to manage the water resources of the country in a comprehensive, integrated and equitable manner. However, practical implementation of this policy is an urgent need to manage the water use conflicts.

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Social capital and sustenance of participatory institutions: A case study of watershed management programmes in Ratlam District of Madhya Pradesh

Poulomi Banerjee and Sucharita Sen

The Watershed Management Programmes (WMP) in India have traversed a long journey from its earlier uncoordinated, sectoral approach to its current integrated bottom-up approach with a vision of providing employment, reducing poverty and securing livelihood for the millions of disadvantaged sections, specially women and dalits. Under the latter model, process indicators, specifically people's participation has been seen as the one of most important aspect of WMP success in long run.

The relevant question to ask here is what are the conditions particularly given the varied fabric of rural societies of developing countries in general and India in particular, that would lead to sustained and successful participatory institutions? One of the issues that have got some focus in the existing literature in this regard is the link between social capital and participation. Social capital may be defined as a) the quantity and/or quality of resources that an actor (be it an individual group or community) can access in a social network and b) an actor's location in the social network. In this context, it becomes critical to firstly delve deeper into understanding social capital in an empirical sense, and secondly, to examine whether higher levels of social capital leads to better participatory mechanisms. Empirical evidences are also limited in understanding the relationship between social capital on one hand and sustenance of the programme particularly in terms of survival of the participatory institutions after withdrawal of the implementing organization, on the other.

This paper attempts to look into the above mentioned problem at length, taking watershed programmes as case study. The paper tries to understand the concept of social capital and attempt a measurement of the same. In doing so, the paper examines issues as social perception, trust, values, and norms existing in rural societies that lead to integration and cohesion within the society. Further, it also examines the factors as homogeneity of rural society and selected demographic characteristics that explain dynamics of social capital. Lastly, it analyzes the relationship between social capital and formation and sustenance of participatory institutions. In other words, an attempt is made to see how far the above mentioned values, trust, norms etc, secludes or includes the marginalized in the loop of mainstream watershed programmes.

The study area selected for the above work is Ratlam district of Madhya Pradesh. The paper is based on primary field survey at the household, village and institution levels. The sample size of the household survey is around 370.

Study of environmental flows in Bhadra River, Karnataka, India

B.K. Harish Kumara, S. Srikantaswamy

Environmental water requirements, also referred as 'Environmental Flows', are a compromise between water resources development and the maintenance of a river in ecologically acceptable or agreed condition. Dams are often the most significant and direct modifiers of Natural River flows. They are therefore an important starting point to implement environmental flows. Downstream releases from dams are determined by pass water through, over or around the dam. The operating policies and rules determine the amount and timing of releases for environmental flows.

Managing environmental water flow is a complex task, because the change of quantity of water occurs as the flow moves downstream. For instance, between a major storage and the places downstream where water is diverted, the quantity of water in a river may be greatly changed from the natural condition and also seasonal pattern of flow may be drastically altered. Further downstream, where a large proportion of the river's water has been removed for human uses is likely to be reduced by the overall flow levels. This paper attempts to present the existing conditions of the water flow from the Bhadra River, and water requirements for the better management of a downstream ecosystem, based on both the field investigations and desk study.

A dam across the river Bhadra has reduced the natural flow in the main river. It has altered the socio economic condition of the downstream dependent population of the River. The upper catchment of the river covered with good vegetation, the downstream of the river for 40 km has shrunken in its river bed. The livelihood support has gradually comedown during last decade leading in shifting of the occupation and migration of the community has commonly registered during the study.

The paper shows that endemism is very high in the river basin, both in the terrestrial ecosystem and aquatic ecosystem. Agricultural water demand and industrial water demand has increased the stress on the water resources of the river basin. Several incidents have occurred in the basin due to less flow. Local community has failed to link the effects due to the less flow of runoff. The immediate impact of flow regime change was observed in the vicinity of river where farmers have observed that their consumption of inorganic fertilizers has increased as now their fields are getting enriched by the silt. The ground water table has dropped down along the river course and quality of river water has decreased from what it used to be as a result of reduction in the diversity factor. It is impossible to imagine a river in to the virgin condition, but it is necessary to maintain river in pristine condition by allocating minimum water release regularly to the downstream of the river.

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Consumption, solid waste generation and water pollution in River Mahaweli, Sri Lanka

M T M Mahees, C. Sivayoganathan, B. F. A. Basnayaka

The direct solid waste disposal into water bodies and the untreated dumping sites are supposed to be some of the major causes of water pollution. It always through the technical aspects, the responsible institutes attempt to seek solution for solid waste crisis and promote solid waste management programs and projects. Nevertheless, it is important to understand the nature and patterns of solid waste. The comprehensive understanding of solid waste generation will bring about many underlining stories of waste disposal and its link with water pollution. The solid waste driven water pollution is a serious crisis in most of the developing countries. The consumption patterns of people often determine the nature and amount of solid waste generation based on their class and social backgrounds. Here, the symbolic consumerism which has become life style of urban middle and upper class people, promotes a "consumer society" with the influence of mass culture. As a result of higher social value given for mass consumption in this global economic order, people frequently consume unwanted goods to achieve symbolic and social satisfaction rather than limiting their consumption to actual necessities. The consumption culture, that generates more and more solid waste especially in urban social environment, impacts on the quality of water and aggravates crisis of water pollution. Therefore, water pollution created by solid waste disposal is not a just problem limited natural scientists to solve but it is a social problem caused by many socio- economic and cultural practices of people.

This paper basically attempts to examine the causal relationship between the consumption pattern and solid waste generation and its link with water pollution in river Mahaweli by reviewing the literature. The main objective of this paper is to understand the significance of consumption pattern in generating solid waste quantitatively and qualitatively. Although there are many studies done on the relationship between solid waste and water pollution at global level, the link between consumption pattern and solid waste generation has not been taken for any of proper social science review or studies in Sri Lanka.

Although the natural sciences have been dealing very much with the crisis of solid waste and water pollution, the relevant sociological perspectives are helpful to understand the actual subjective factors and forces of solid waste disposal and its connection with water pollution. For example, the luxury consumption patterns of economically rich people as well as the poverty conditions of low income groups are causing the crisis of solid waste and water pollution. Therefore, it is necessary to mention that sociological or environmental sociological approach can realize subjective causes and effects of the solid waste disposal and water pollution better than any other academic disciplines.

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Risk-based floodplain management of the eastern part of Dhaka city

Animesh Kumar Gain, M. Mozzammel Hoque

In the past, most authorities as well as people assumed that floods could be prevented by building the embankments high and strong enough. Until recently, water policy was based on flood inundation maps which were used as a base to define safety levels. But, water management is no longer limited to flood prevention at all costs everywhere. Nowadays water management starts from the point that floods were, are and will be an inevitable reality. A total protection against flooding is not justifiable socially nor economically and technically not possible. So water management policy should be based on the minimization of flood damage.

Dhaka, the capital city of Bangladesh is surrounded by a network of rivers which makes the city vulnerable to flooding. After the 1988 flood, the western part of Dhaka City is protected from river flooding by embankments and raised roads. In spite of taking protective measure for Dhaka West, cadastral floods in 1998 and 2004 affected both the protected western part and unprotected eastern part of the city. The situation is deteriorating mainly because all these protective measures were taken without considering the behavior of uncertainty and risk.

In the present study, first flood inundation maps of Balu-Tongi Khal River system within the eastern part of Dhaka City is prepared for different return period by using Geographic Information System (GIS), HEC-GeoRAS and hydrodynamic model HEC-RAS. Then raster-based vulnerability maps and finally expected damage maps are produced which represent the expected damage of the study area for different event. It involves several steps: (1) flood inundation mapping using geo-informatics tools, (2) estimation of expected damage and risk mapping of designed flood event using GIS, and (3) finally the development of risk-based approach to floodplain management. The study proposes a methodology how these expected damage maps can be useful to evaluate policy alternatives and to minimize property damage due to floods in the study area.

In comparison to the classical inundation maps, these flood risk maps generate more information about the flooding event because they bring into account the effects (e.g., the monetary damages in the target area) of flooding. The planners and the decision makers may find the result of this study useful for framing an appropriate flood risk management plan in the eastern side of Dhaka City.

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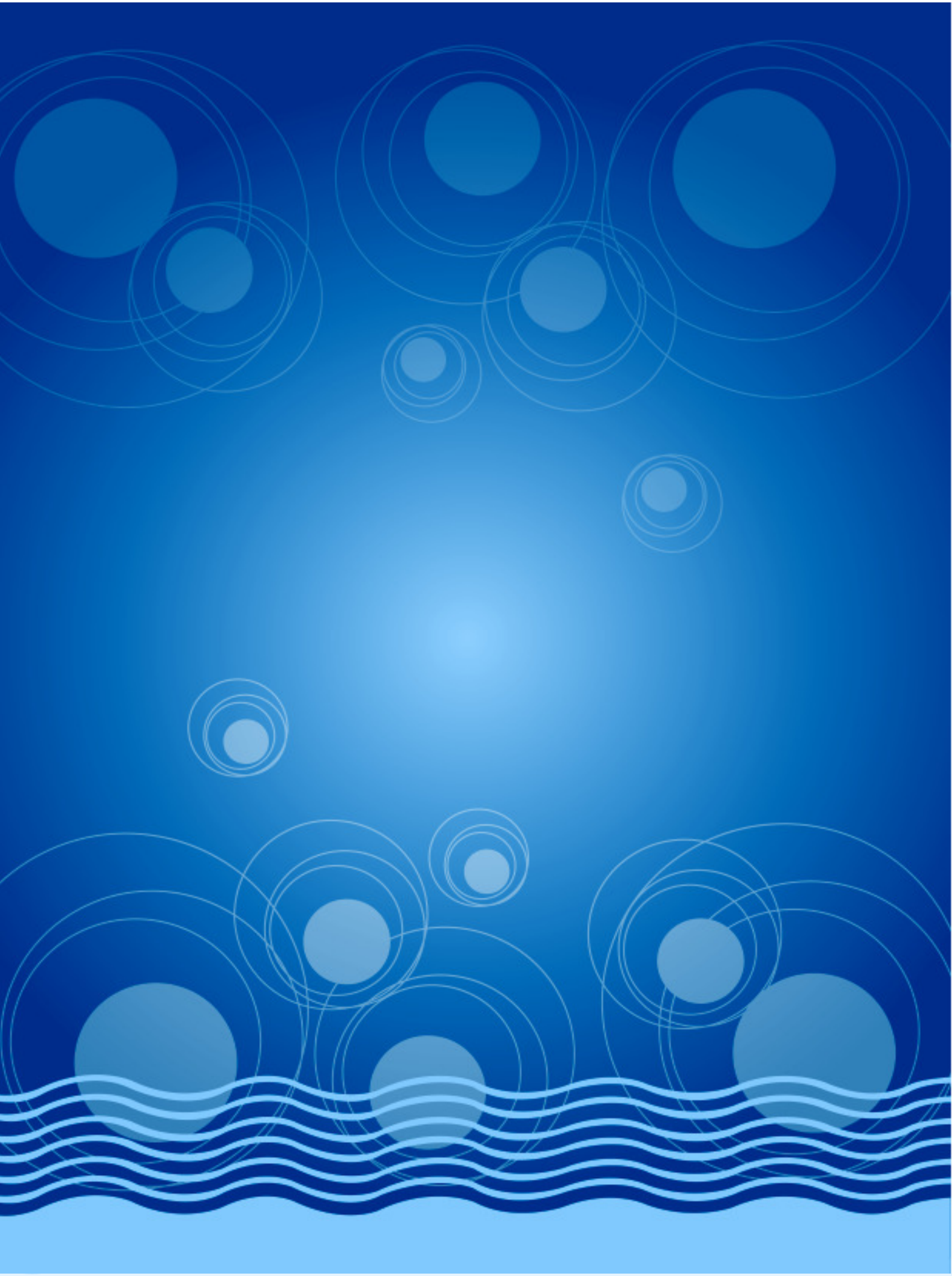
Water management of integrated rice-fish farming in inundated floodplains of Balajtala-Kalmadanga sub-project

Md. Sydur Rahman and Mashfiqus Salehin

The burning issues that currently surround the countries in South Asia are food security and ecosystem security. While food security is of paramount importance, protein requirement is also an important issue, since many of the rural children and older people suffer from severe protein malnutrition. In Bangladesh, fish is the only source of free animal protein for the poorer section of the community. One of the potential scopes for improving fish production in Bangladesh is to integrate aquaculture with rice farming, and tremendous scopes are there to exercise such practice in inundated rice fields (about 2.83 million hectares out of 10.14 million hectares of paddy field) during the monsoon season through local community based water management.

Apart from the production of fish and the resulting enhanced nutrition level and income, other benefits of such practice include improved yield of rice, increased nutrient concentration in rice and straw, an incentive to implement integrated pest management, and lower rice production cost.

The potential of integrated rice-fish farming was explored in inundated areas of a small water management project, namely, Balajtala-Kalmadanga Subproject in Gopalganj district of the Southwest region of Bangladesh. The study followed an interdisciplinary approach through technical assessments as well as application of participatory tools to address different dimensions of the issue, including physical, socio-economic, institutional and environmental aspects. Using a set of criteria and indicators, the system was evaluated from a sustainability point of view; for example, whether the existing physical systems are suitable for integrated farming practice, whether the new system is able or have the potential to have a positive impact on the socio-economic condition, whether the system will be environmentally sound, and what kind of management infrastructure and water management system are required for the integrated farming system to be sustainable over long periods. The results of this evaluation will be presented in this paper.



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A comprehensive assessment of India's largest irrigation sector: Past, present and future

A. Narayanamoorthy

The irrigation sector of Maharashtra (a western State of India) is one of the largest in the country in terms of number of large dams, investment and the live storage capacity. Yet, the irrigation sector of Maharashtra is not free from problems. On the one hand, the water availability for the future use of irrigation has been reducing at a fast rate, but on the other hand, the demand for water for irrigation purposes has been alarmingly increasing due to agricultural expansion and intensification. The Maharashtra Water and Irrigation Commission estimates that water available from both surface and groundwater can irrigate at the most about 60 percent of the cultivated land. The actual utilization of irrigation potential created through major and medium irrigation sector was only 1.73 million hectares (60.05 percent) as against the created potential of 2.88 million hectares up to the end of ninth plan period. This is very low when compared to the average utilization percentage of the country.

On the financial front also the irrigation sector has not done well, despite revision of water rates at a regular interval. In spite of having the second largest live storage capacity, the percentage of irrigated area to gross cropped area is one of the lowest among the major states, mainly due to the improper distribution of water among different crops. Micro-irrigation technologies such as drip irrigation have been introduced in the state aiming to improve the water use efficiency through subsidy programmes. Presently the state ranks first in the area under drip irrigation, not many studies have attempted to find out its potential and prospects, including its economic viability. Though most of the states' irrigation sector has been confronting with similar problems, not many studies have attempted to examine as to why these problems are occurring.

In this study we try to examine the overall performance of one of the India's largest irrigation sector covering period from 1960-61 to 2004-05 so as to understand the present state of the sector. Specifically we plan to examine the questions such as: Why is the utilization of irrigation potential created very low in the state? What needs to be done to increase the availability of irrigation water? Are there any problems in mobilizing capital required for completing the irrigation projects? What needs to be done to meet the increasing demand for water for irrigation purpose? What is the role of institutions in improving the water use efficiency? How far drip irrigation technology will be useful in solving the problem of water scarcity? Has the periodic revision of water rates made any improvement in the financial recovery? The study has utilized secondary level information for all its analysis.

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Are sector reforms working? Assessing implementation of irrigation management act of Madhya Pradesh

Nitin Bassi

The irrigation sector plays a vital role in food production and rural economy. Realizing the importance, various reforms have been carried out world over to make the irrigation systems modernized and more efficient. In India, irrigation policy reforms have been carried out over the past decade .This is primarily because: a) water is becoming increasingly scarce in many regions, and requires judicious management and b) country's surface irrigation systems are deteriorating. As per estimates, of all the uses of water in India, irrigation is a major consumer. To improve the overall situation in irrigation management, it is important to involve end user groups or farmers in the operation and maintenance of the conveyance system, which can improve irrigation efficiency, generate a sense of ownership among farmers towards canal system and improve the irrigation charge recovery rate. This laid the foundation for irrigation management transfer (IMT) in India. IMT started mainly as a Participatory Irrigation Management (PIM) movement.

This paper looks into the implementation of Irrigation Management Transfer (IMT) Act in the Indian state of Madhya Pradesh where partial responsibility of irrigation management was transferred to the end users. Madhya Pradesh has a total irrigation potential of 6.72 million hectares. Of this, a potential of 2.15 million hectare has already been created. However, the potential utilized is only 46%. . The main reasons for such heavy underutilization were system deficiencies, deferred maintenance of the system, insufficient revenue to meet O&M cost and non-involvement of farmers in irrigation management. Looking at the MP PIM act formulation and implementation, we see that more of a "top down approach" was followed, especially during the initial years. This approach created number of resistance forces both within and outside the policy process system and resulted in little success in terms of benefits to community. Although the model adopted for policy formulation, the incrementalist model, was not rational but surely one, which was politically feasible under the system.

Emphasis is given on the administrative, governance, institutional and financial reforms carried out as per the act and the impact these reforms had on the irrigation management. Assessment of implementation of IMT in the state indicates that the success of such programs is highly dependent on effectiveness of the execution and the financial resources available with the government which are often limited. Such programs will reap desired benefits, if the end users are involved in more effective manner with greater autonomy and delegation of authority. Also in view of financial scarcity with governments to carry out such large programs, the idea of involving private sector investors in irrigation management may be a good option. Such alternative institutional models can be considered to further improve the overall efficiency and management of the irrigation systems.

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Management of water for irrigation in Kerala, India: Need for a change in policy

M. Lathika and C.E. Ajith Kumar

Kerala is known for its rich natural endowments. With a geographical share of only 1.1 percent of India, it enjoys 4.8 percent of the water resources of the country. Being located in the strategic humid tropical wet region (between 80 18' and 120 48' degree North latitude), the state falls in a region where the potential for biomass production is very high. However it occupies 3.1 percent of the population of the country with a density of 819 persons per sq. km., against the national tally of 324 persons. Despite its abundant bounty of natural wealth, the state finds itself increasingly under pressure for the two vital resources of land and water and efficiency in their use is, therefore, deemed to be the key to survival for this state as well, as it is so for many other regions on the globe.

Land utilization in Kerala has undergone drastic changes, as much of the land hitherto engaged for water-intensive food grain cultivation is either converted to suit the human needs or is increasingly employed for the less-water-demanding crops. A vast pool of the state's scarce financial resources was being used for improving irrigation for agriculture. Irrigation systems demanded very less of the public money till 1980. The total state expenditure on irrigation systems and related expenses has already crossed 3,881 crores rupees. Thus, the shift in the demand regime of water in Kerala agriculture emphasizes the need for a review of total efficiency and utilization of installed irrigation capacity in Kerala, against the total cost outlay.

This paper is set largely in this milieu and seeks to examine critically if the strategy of pumping more funds to the irrigation sector, especially to the major irrigation schemes in Kerala, would stand to wisdom any more. The specific objectives of the study are: a) to make an appraisal of water resources of the state of Kerala, India. b) to assess the total water requirement of major crops in Kerala over a long period (of 20-25 years) and to track the changes in water demand for agriculture, in view of the shifts in cropping pattern. c) to review the expenditure pattern on public funded irrigation systems in Kerala.

The study reveals that the public investment in irrigation was a highly welcome proposal in the context of a growing threat of food insecurity in India and with the largely erratic rainfall pattern. Kerala also embarked on a series of high-budget irrigation projects right from the first five-year plan period. However, the land brought newly under irrigation cost the state heavily. Yet, the facts that the domestic production levels of food grains declined owing to the fast shrinkage in area and that the irrigation infrastructure remained grossly under utilised even by other crops, warranted a fresh look at the whole agenda of development of major irrigation facilities in the state.

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Are the irrigation reforms stretched beyond farmers' capacities? – Analysis of PIM Processes in 4 Indian states in the context of Minor Irrigation Tanks

R.V. Rama Mohan

Participatory Irrigation Management (PIM) has been conceived as the thrust area in effective irrigation management through participation of farmers in operation and maintenance of irrigation systems in India. PIM has been instrumental in enhancing role of the farmers in irrigation management and to address the growing gap between the potential created and realized in irrigation sector. Many states in India took steps to form Command Area Development Authorities (CADAs) and gave attention to promote PIM. Initially, states like Maharashtra, Orissa and Andhra Pradesh amended their Irrigation Acts providing for farmers' participation in irrigation management.

In 1997, Andhra Pradesh enacted exclusive legislation for farmers' participation in irrigation sector and has taken up implementation in a big way. Later, States like Tamil Nadu and Orissa followed the suit in due course of time. Maharashtra formulated their PIM Act in 2005. The legislations of Karnataka and Maharashtra have the unique feature of volumetric entitlements to the farmers' organizations by the government; full-cost recovery from users and transfer of system maintenance responsibility to farmers' organization. Several pilot initiatives were taken up in these states involving Water Users' Associations (WUAs) over last 10 years. These ground experiences often led to formulation and refinement of State Policies on PIM. These states have been advancing the reforms over last decade, progressively enhancing the role of communities in irrigation management.

In few pilot projects, such as EC aided project in Orissa full cost recovery was attempted and Pani Panchayats (equivalent of WUAs) were empowered to collect and retain 100% of water rates with them. In KfW supported tank rehabilitation project in Maharashtra, complete management transfer of the irrigation system was assigned to WUAs not just the O & M of distribution network. These recent advances in irrigation reforms raise certain questions, such as, whether WUAs are ready and capable of taking over complete system maintenance. At the same time, whether complete withdrawal of Government from irrigation system management is desirable and can be equaled with intentionally abstaining from its social sector responsibilities. This paper compares PIM policies of 4 states and critically examines the trends in reforms and their sustainability. Few case studies from field will be used to put the analysis in practical context.

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Institutional Design Perspective, Capacity Constraints and Participatory Irrigation Management in South Asia

Jayanath Ananda

Water institutions in South Asia play a crucial role in managing scarce water resources and are central to the economic development and poverty alleviation. Designing appropriate institutional mechanisms to allocate scarce water and river flows has been an enormous challenge due to the complex legal, constitutional and social issues involved. Notwithstanding the progress in water reforms, particularly Participatory Irrigation Management (PIM), many South Asian countries have been grappling with poor performance in the water sector and deterioration of canal and tank irrigation systems, high extraction levels of groundwater and related economic and environmental problems.

This paper assesses the institutional arrangements of PIM in South Asia using a set of generic institutional design principles and examines the reasons for the poor performance of irrigation management transfer. The findings indicate that traditional 'farmer-managed' irrigation systems have a significantly different set of institutional features compared to large-scale irrigation institutions established under PIM. These farmer-managed systems are generally highly adaptive to environmental changes, high in compliance capacity and interconnect well with informal institutions such as social norms and customs. On the implementation side, one of the core barriers to the PIM in South Asia has been the capacity constraints including technical and information capacities of the existing water user associations.

The up-scaling of PIM initiatives has also been problematic due to ill-conceived institutional design and poor institutional linkages. The irrigation management turnover has been seen as shifting the burden of rehabilitating and managing the rundown irrigation infrastructure to the lowest level rather than a genuine transfer of management and/or property rights. Reconfiguring the institutional design for PIM requires a greater understanding of socio-political relationships, appropriate spatial and administrative scales and process-based long term learning.

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Irrigation Development: A Process of Land Degradation and Marginalization? A Study of Ganga Basin in Allahabad

Firdaus Fatima Rizvi

Sustainability of agriculture is determined by the sustainable use of natural resources i.e. land, water and agricultural biodiversity. In the last couple of decades, a number of agriculture related environmental concerns and hence of sustainability of agriculture, have been raised in the context of growth induced mainly by intensification of agriculture. The main problems raised are soil quality degradation, increase in salinity and soil erosion, depletion of groundwater level and water logging.

In agriculture, land, water and human capital are core assets that work as an effective instrument for development. Yet the assets of the rural poor are often squeezed by population growth, environmental degradation, and social biases in policies. Population pressures together with declining farm size and water inefficiency are major challenges in agricultural development. There is increasing poverty and declining land quality called as the vicious circle of poverty and land degradation.

Though a large majority of Indians continue to live in the countryside and work on land, the share of agriculture to the national income has come down to less than a quarter over the period. There is in fact a higher incidence of poverty and inequality among the local inhabitants of the basin, living in its lower catchments areas that have sub-marginal landholdings and are historically marginalized. Instances of growing water-logging, which is a negative externality of developmental process (canal irrigation) have affected the marginalized sections to high extent who mainly depend on land for livelihood and self-sustenance.

This paper deals with the case study of Ganga basin in Allahabad that is one of the most fertile plains of the Ganges. But, since the coming up of Sharda Sahayak Canal in the area, water-logging has emerged for the past sixteen years. The surplus water from canal, rainwater, absence of effective drainage system and low capacity of river Varuna all adds up to contribute high level of water-logging in the crop fields. Land area of about 600 hectares in Phulpur Block is waterlogged. The high water table has engulfed vast areas thereby affecting the agricultural production to a larger extent.

This paper throws light on efficiency of irrigation; water availability in agriculture, extent, height and duration of water-logging in crop fields, extent of crop loss etc. It also includes land use pattern of agricultural households and loss of expected production. The study will also analyze the change in agriculture development within a difference of five-six years. The paper lastly deals with policy implications and suggestions.

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Integration of Policies in Framing Water Management Problems: A Case Study from Indian Himalayas

V.S. Saravanan

The formulation and implementation of policy packages (consisting of enabling environment, coordinated institutional roles, a participatory watershed approach, and treating water as an economic good) with linear implementation strategies are the hallmark of 'good policies' in integrated water resource management. While there is growing realization that IWRM policy packages are exploited by various actors, there is inadequate understanding of the integration of these in shaping and reshaping water management.

While most studies focus on integration of strategies, structures and processes within governmental institutions, the attempt to examine the integration across socio-ecological systems in influencing policy processes is much less common. This paper contributes to this understanding by analyzing this policy process with the logic of strengthening the developmental role of the state.

Drawing from a case study in a watershed in the Indian Himalayas, it identifies multiple actors (along with contextual factors) drawing diverse rules in framing water management problems. Using a combination of research methods and with application of Bayesian network, the socio-political process of policy integration is explored. In this integration, actors adopt a 'fire-fighting' approach presuming that water is finite and can be harvested as much as they can, to meet the growing water demand. Inadequate understanding of the socio-ecological characteristics has been the driving force behind this 'fire-fighting' approach, which requires to be overcome for an informed water management.

This paper reveals that water is not managed by one form of governance (state-centric, market or community-based), nor is any one form of governance superior to the other. Rather, each form of governance superimposes on the other in the management of water. In this multifaceted governance arrangement, contemporary assumptions of 'good policies' for community-based management of water resources is misplaced. The paper calls for a comprehensive approach to understand policy processes and transcend the distinction between nature and society for a sustainable future.

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Integrated Water Resources Management: From Policy to Practice through a Comprehensive National Water Management Plan—A Bangladesh Case Study

Sultan Ahmed

Integrated Water Resources Management: From Policy to Practice through a Comprehensive National Water Management Plan—A Bangladesh Case Study Bangladesh has adopted more than two dozens of sector policies since early nineties. The National Water Policy (NWPo), adopted in 1999 for comprehensive management of the water resources of the country, aims to provide direction to all agencies working in the water sector, and institutions that relate to the water sector in one form or another, for achievement of certain specified objectives. One of them is integrated water resources management (IWRM). Though, the policy did not coin the term IWRM explicitly, but it holistically advocates for social equity, conservation of natural environmental and efficiency of water management—the basic components of IWRM. National experts were involved from the very conceptual stage of drafting the policy and the plan and have been in the practice in their own fields of activities. National Water Management Plan (NWMP) and the Guidelines for Participatory Water Management are also adopted by the government and are in practice. Policy, plan, guidelines and regulatory regimes of water sector are conducive to the development and management of water resources following the concept of integrated water resources management.

There is a clear line between water resources development and management, and drinking water supply and sanitation in Bangladesh. The serious issues and problems of devastating floods, cyclones, saline water intrusion, river erosions, and siltation, drainage congestion, etc call for special attention and therefore a separate Ministry, Ministry of Water Resources, has been dealing with the development and management of water resources of the country. On the other hand drinking water supply and sanitation has been dealt with another ministry because of its crucial nature of need and urgency. The NWPo and the NWMP have given due importance to both water management, and water supply and sanitation. The policy through its various provisions, emphasis the issues of participatory water management and highlight the importance of stakeholder participation. It recognized that the nation\'s water resources management should include the protection, restoration, and preservation of the environment and its biodiversity including wetlands, mangrove and other national forests, endangered species, and the water quality. The policy also states that the 'water will be considered an economic resource and priced to convey its scarcity value to all users and provide motivation for its conservation'.

This paper will examine how a comprehensive national water policy has been translated into concrete actions. It will also examine whether the policy statements of the government are only rhetoric or they have been translated into robust and replicable development practice.

Institutional aspects of implementation of land and water policies in the Upper Mahaweli Catchment, Sri Lanka

Amarasekara, M.G.T.S., Dayawansa, N.D.K. and De Silva, W.P.R.P

Upper Mahaweli Catchment (UMC) comprises 70% of the hill region of the country. It consists of 3118 sq. km and feeds four major reservoirs viz. Victoria, Randenigala, Rantambe and diversion pond at Polgolla. The exiting land use pattern in the Upper Mahaweli Catchment is the result of a complex series of changes occurred over the last two centuries. Traditional subsistence farming system was replaced by plantation agriculture with the influence of colonial government.

During last three to four decades UMC has experienced considerable change in the structure and the composition of the land cover as a result of accelerated development program. All these activities have influenced to increase denudation of forest cover and accelerate soil erosion which have adverse impact on the quantity and quality of natural water sources. Today soil erosion is considered one of the five major environmental issues in Sri Lanka.

During the British colonial rule land policies were not in favour of the local population and one of the landmarks of their land policy was Crown Land Ordinance of 1840. This in effect declared all land not under permanent cultivation or in which title deeds could not be shown to be the property of the crown. Then the Waste Lands Ordinance which was also biased against the peasantry was enacted in 1897 to prevent encroachment of crown waste lands by present. As a result more than 70% of the lands of UMC is under state control even under the present situation.

Soil conservation act was enacted in 1951 to ensure sustainability and productive capacity of soil by preventing soil erosion. At present there are about 13 major legislations to ensure protection and sustainable utilization of land resources. Many of the government institutions active in the UMC are involved in different extent in land management issues. As an example in 1986 there were 38 government institutions and 12 ministries involved more or less in soil conservation activities in UMC. However in the Sri Lankan context, government institutions are more compartmentalized rather than sharing responsibilities with the sector organizations. Therefore it is time to study whether the state land policies and institutional capacity is capable enough to address accelerated soil erosion and its adverse impact on the environment of UMC

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Integrated Water Resource Management: Identification and Scope for Implementation, in Tungabhadra River Basin, South India

M. S. Umesh Babu and E. T. Puttaiah

The Tungabhadra is one the major tributary of Krishna basin in southern India. This originates in Western ghats (Gangamula) in Karnataka and flows towards Andhra Pradesh and later joins krishna river in same state. Integrated water resource Management (IWRM) is a tool to understand the constraints and challenges or services from the water and land. This paper mainly focuses on the supply, demand and issues of water and land management in river basin. This study is comparative study with 3 other river basins; (Tejo Tagus from Portugal and Spain, Glomma from Norway and Sesan from Cambodia Vietnam).

This study raises issues of water management in the command area. Allocation of water for different stakeholder such as irrigation (agriculture), drinking water, Industries and Environment flows. This study found an major issues such as insufficient supply of water for authorized irrigation area (tail end problem); violation of cropping pattern (more than 60 per cent); un-authorized irrigation area (more than 25 per cent),; over cultivation at the head reach; expansion of urban settlements or growth increases the demand on surface water almost 3.9 TMC ft annually with over extraction of ground water (194 TMC ft including agriculture). Increased industrial (27 large and 2543 small scale) activities in the basin draw 6.1 TMC ft surface water annually for their production; and about 30 per cent of the rainfall should be released into the river to increase the ground water recharge and reduce the water pollution by the effluents discharged by the industries and waste water released from the near by towns or urban settlements. In this paper also addresses issues like Pollution, eco-restoration initiatives, fisheries etc.

The study reveals that there is lack of co-ordination between different departments in managing water resources in Tungabhadra Basin. An overall plan is required to envisage how the transformation can be achieved with a basin wise management approach. Although it is mentioned in the water policy to reflect the principles of sustainable management through integrated water resources management, it is not implemented. Among the existing ones, regulatory mechanisms for implementing and enforcing them are limited or non-existent. To put the policy into practice is likely to require the reform of water law and water institutions. This can be a long process and needs to involve extensive consultations with affected agencies and the public. Bringing some of the principles of IWRM into a water sector policy and achieving political support may be challenging, as hard decisions have to be made which requires major legal and institutional reforms.

Water Parliament: Integrated Water Resource Management (IWRM): in the Hands of People

Mr. Nawaraj Basnet, Dr. Vijaya Shrestha, Dr. Karuna Onta

Nepal is blessed with abundance of surface water resources. Approximately, 6,000 rivers and rivulets flow through Nepal. Despite its massive water resource potential, only 72 percent of the population has access to piped water facilities. Likewise, 42 percent of the cultivated area 92,642,000 ha) has irrigation of some sort. Only 17 percent of the cultivated area has irrigation facility available throughout the year. The country has 43,000 MW economically viable hydro-power potential. Major problems faced in Nepal are lack of effective dialogue and interaction between the national water institutions, civic group entities, political parties and community institutions involved in water resources development at various levels. Secondly and mostimportantly, the stakeholders are not involved during the decision-making processes at various levels, although historically community initiatives and institutions played a major role in water resource development.

The Government of Nepal has developed National Water Plan and National Water Resources Strategy to ensure better management of water resources by adopting the principles of IWRM. Guided by the Country National Water Plan and Water Resource Strategy, Jalsrot Vikas Sanstha (JVS) a host organization of Nepal Water Partnership, in 2007 initiated a process to introduce IWRM at the community level in Sindhupalchowk district at Melamchi river basin through Local Water Parliaments (LWP). People learnt about the water use rights and multiple uses of water at the individual level and at the community level they come together and develop their water resource plan.

The reach and scope of LWP has increased beyond their community helping them leverage resources from other organization. They have recognized their important role in taking control and management of their water resources. In order to make IWRM truly meaningful and effective LWP should be linked with Area Water Partnership.

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Session 8:

CONTENDING WATER USES AND USERS AND INTER-SECTORAL EQUITY IN INDIA: AGENDA FOR A NEW POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

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Multiple Water Conflicts and their Magnitude in Management of Irrigation Tanks in India

(Necessity to rebuild Social Capital for Water Resources with Empowerment Approach)

A.Gurunathan and N.Venkatesan

Irrigation tanks, categorised as minor irrigation source, remain as simple and efficient water resources in India over centuries and more particularly in Deccan Peninsular South India. Tank irrigation is one of the important and oldest source of irrigation in India. There are 500 000 tanks in India. Southern part of India is noted for the intensity of tanks. There are about 127 000 tanks in Southern region consisting of Andhra Pradesh, Karnataka and Tamil Nadu.

As one of the traditional irrigation commons, tanks serve the multiple uses like irrigation, fisheries, domestic use, social forestry etc. Tanks have multiple users namely peasants, shepherds, washer (wo)men, common people, fisher rearers, brick makers and each of them have their vested interest in tanks and their resources. Therefore, the tanks warrant water conflicts in sharing and using the water within tank and among the tanks in cascades. In addition to the hydrological conflicts, conflicts too emerge due to encroachments, customary rights, dumping of soil wastes and pollution etc. More than five departments of state administration involved in tank ownership and different aspects like revenue, agriculture leave the conflicts in tank management a robust one. This paper high lights the magnitude of varieties of tank conflicts from our field insights and also come up with suggestions to overcome the conflict in order to preserve irrigation tanks in 21st century.

This present paper discuses four cases from South India that enumerate the conflicting issues around tanks and pond systems. Since the demand for tank works are enormous running into several thousand crores for the entire country, a consistent programme across the state shall be taken up on an urgent basis. In order to make the tanks and performance in the modern context without conflicting situation, rebuilding Social Capital for traditional Water irrigation tanks and ponds with empowerment approach is a viable as well as sustainable proposition.

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Inter-Sector Allocation of Hirakud Dam Water: An economic Analysis

Sanjukta Das

During the last few decades water conflicts are increasing all over the world. They mainly centre around the inter-sectoral allocation of water and differential access to water within the sector. Water is used both for the household consumption i.e., drinking, cooking, cleaning, bathing etc., purpose as well as for production i.e., for irrigation in agriculture and water as an input in the industry, purposes.

In the past multi-purpose river valley projects were undertaken to control flood and use the water for irrigation, electricity generation and other purposes. Distribution of water of the big dams for different purposes has become very complex at present. Since Government constructs these big dams (because of huge cost and long gestation period), it also assumes the responsibility of water management in many cases. Over time priorities attached to different purposes very often changes and accordingly the allocation of water. These changes create a lot of discontent among the affected parties and they demand a review of the policy. This paper discusses the inter-sectoral conflict for the use of Hirakud Dam water.

In the 1950s Hirakud Multi-purpose River Valley Project was built on the river Mahanadi at Sambalpur in Orissa, India. It is the longest River dam project in the world with the length of 25 km. For this 1.83 lakh acres of land of undivided Sambalpur District was submerged in the dam water of which 1.23 lakh acres were fertile agricultural land. Dam was constructed mainly to control the flood, to irrigate the large area of Western Orissa and to generate electricity. Pisciculture and the provision of drinking water to the Sambalpur municipal areas and its agglomerates were the other objectives.

Over time Government's industrialization priority has resulted in more water allocation to industries. This has created a lot of discontent among the farmers and it is reflected in their organized protests in recent times.

This paper discusses the different uses of the reservoir water and efficiency and equity issues relating to its uses. It also suggests for the equitable and efficient inter sectoral allocation of dam water and reduction of conflict.

Economic Development and intersectoral water conflicts: A Study of the transitional economy of Orissa, India

Padmaja Mishra & Aurobindo Behera

Water is a natural resource, an integrated part of the ecosystem and a pivot for socio-economic development. It is 'natural' in origin as its existence is not man made and as a 'resource' its use, utility and exchange values are determined in socio-economic context. Economics calls for efficient utilization of scarce resources. Though, there is no unique definition for scarcity, ordinarily supply not being enough to meet demand implies scarcity and 'ensuring adequate supply" has been the focus of resource 'management' which are context specific. Scarcity is not absolute nor natural as its existence is always socially mediated (Mehta;2003) and it can be 'real' or 'constructed'. Conflicts may follow because of multiple uses and users. Disagreements and disputes over access to, control and use of water accumulate and take different forms as varied and sometimes incompatible, interests and needs arise out of the dynamics of development.

In this context, this paper examines the issue of inter-sectoral water conflicts in case of Orissa, an eastern state of India in transition and characterized by coexistence of high poverty ratio and rich resource base. The proposed paper consists of five major sections.

The first section deals with the concepts and the issue of water scarcity and inters sectoral conflicts in context economic development in general. The second section will discuss the characteristics of the Orissa economy with special emphasis on economic growth and the sectoral dynamics. The third section will discuss the position of water resource and its use pattern with special emphasis on state water policy. Section four will discuss the emerging scenario of conflicts over water in view of the recent spurt of industrialization in the state. This section will focus the problem and the conflict resolution possibilities. The concluding section will focus on integrated water management as a possible solution with emphasis on both demand and supply management. May be "time has come when water policies and major water related issues should be assessed, analyzed, reviewed and resolved within an overall societal and development context (Biswas;2001". Economic development be sustained maintaining inter-sectoral harmony and ecological balance.

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Modeling the conflict and (possible) cooperation over Cauveri water dispute: Insights from Drama Theory

Suman Ranjan Sensarma

The article intends to bring a new perspective on conflict and cooperation analysis addressing the Cauvery water disputes. The genesis of the Cauvery conflict can be traced to the nineteenth century between the two down stream and upstream states i.e., Tamil Nadu (then Madras presidency) and Karnataka (then Mysore). The conflict is rooted on sharing of the waters of Cauvery between these two states. The conflict becomes more prone after the elapse of the 50 years old agreement. Karnataka denied accepting the two controversial agreements in 1892 and 1984. They claim a renegotiation based on equal sharing of waters. After several rounds of meetings both parties are not able to come to a stable resolution till date.

This complex situation is analyzed by use of drama theory (derived from game theory) which incorporates non rational aspects of decision making process such as crisis, emotion, and self realization.

Drama theory describes how game can be changed in the context of players' threats and promises. It allows redefining the game until the players' find a common ground on which they all are agree. In the process of redefining the game, players change their stands, beliefs and preferences. In drama theory, players face a dilemma when their threats and promises are incredible. Dilemmas can be delineated if the players! change their position. When none of the dilemmas exist, then the players reach an agreement to carryout their promises. From this point there are no potential improvements for them. This is called the 'strong equilibrium' in drama theory (i.e., can be trusted not to break the agreement). Further drama theory helps to (de)construct the model observing what is happening outside.

This study emphasize that (possible) cooperation can be reached cooperatively by a group, rather than by way of confrontation in the conflict. This study brings an effective methodological leverage showing how hidden collaboration can brought about with continuous communication process through third party involvement. This is a win-win solution in drama theoretic sense. This analysis shows that giving an emphasis on long term gain, both the states can cooperate to strengthen their survivability and vitality.

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Water conflicts, Contending Water Uses and Agenda for a New Policy, Legal and Institutional Framework

K. J. Joy and Suhas Paranjape

Though there are different types of water conflicts unfolding all over South Asia, the focus of this paper is the conflicts over contending water uses and users and the issue of water allocation. The paper tries to understand the increasing conflicts over water allocation and sharing amongst different uses and users within an overall normative framework committed to equity and sustainability, evolve certain principles of allocation and suggest what could be the legal and institutional mechanisms to resolve these conflicts.

The paper has been organised under five parts or sections. In Part 1 – bio-physical and social peculiarities of water – we try to contextualise contending water uses and conflicts in the bio-physical and social characteristics of water. Then in Part 2 we move on to discuss the range of contentions over water, especially the conflicts over equity, access, and allocations, with the help of a couple of case studies. In part 3 we argue for an integrated approach and take up issues like equity, integration of local and exogenous water, surface and groundwater, and variable and assured water, and water rights, allocations, and transfers and related issues for a detailed discussion. Part 4 is about multi stakeholder platforms as a possible option for conflict resolution and governance and discuss some of the necessary conditions for multi-stakeholder processes to become meaningful instruments of governance especially the need for an inclusive normative framework, access to reliable data, information and decision support systems, and the role of the state. In Part 5 – legal and regulatory frameworks – we discuss some of the critical issues like the different types of laws (union, state, natural and customary laws) with regard to water, rights, regulation and globalisation, and the interconnectedness of law and policy in the water sector.

Analysing some of the policy initiatives in Maharashtra the paper concludes that the present legal framework, including the newer ones that seek to institutionalise participative management and regulation, are entirely inadequate to address the issue of water conflicts. Alternatively it is important that civil society initiatives for legislative reform should be based on a radically and fundamentally different normative framework that takes into account the specific nature of water as a natural, common pool resource and as property.

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Session 9:

ENGENDERING WATER GOVERNANCE IN SOUTH ASIA: RE-THINKING POLICY AND PRACTICE

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Challenging the flow: Gendered Participation, Equity and Sustainability in Decentralised Water Governance in Gujarat

Sara Ahmed

The concept of governance provides a useful tool for rethinking gendered patterns of access to water and water management within broader social relations and organisational structures. However, not only is theoretical analysis and debate on 'good water governance' limited, it is also largely gender-blind. Notions of what constitutes good governance are typically rooted in normative principles of accountability and transparency or participation and partnerships which, it is assumed, will eventually lead to 'good outcomes' for water, people and the environment.

Since the early 1990s decentralization policies in South Asia have sought to frame a new role for the state: from a supply driven provider of water services to one which is facilitating demand and enabling community management. At the core of this process of institutional restructuring is the realization that water is no longer a free good and that decentralized management is the only way to ensure sustainable, equitable and efficient water delivery. Based on principles of cost recovery from users, new community-based institutions, either structured around decentralized governance, (e.g. pani samitis or water committees often work within the framework of village panchayats in India) or emerging as separate institutions (e.g. water user associations in participatory irrigation programmes in Pakistan) – are meant to address management inefficiencies through participatory planning and inclusive decision-making.

Women's participation is seen as integral to these new institutions not only because of the gender division of roles and responsibilities in relation to water collection or agriculture and livelihoods broadly, but also because there is an implicit assumption that women's involvement is empowering for them and will lead to more sustainable and gender equitable outcomes. However, participation is not a panacea in itself for achieving project or program objectives, nor do participatory processes necessarily challenge internalized oppression or lead to self-efficacy. Empowering rural women through water management initiatives requires more than providing access to decision-making or technical training. This means questioning notions of a 'hegemonic masculinity', understanding how gendered identities are continuously reconstituted by institutional change, and how women themselves perceive their transformatory potential. Empowerment cannot be achieved by separating and isolating women from the complex social relations underlying their myriad and diverse relationships with water, the environment and the larger socio-economic, political and cultural context within which a gendered analysis of decentralized water governance is embedded. Decentralization is a process, which needs to be negotiated, and the hard reality is that for poor and marginalized women negotiation is being contested in an economic environment where policies of privatization, pricing and centralized, technocentric delivery systems dominate the political discourse on water management.

Seeing women and questioning gender in water management

Margreet Zwarteveen

In this paper I try explaining why it is so difficult to see women, or ask questions about gender, in conventional water thinking, focusing on irrigation. I have identified three sets of reasons. A first reason relates to some more general features of irrigation thinking, such as its lack of a critical interpretative tradition and its' cherishing of this lack as a virtue of modern science. These features have roots in positivist epistemological beliefs. A second set of reasons have to do with the way in which irrigation systems are normally defined, how its conceptual boundaries are drawn, and in the choice of metaphors that are used for representing irrigation realities. These metaphors tend to structure the world in oppositional dichotomies that are rather strongly associated with gender.

Distinctions such as those between production and consumption, or between private and public, are for instance widely used in irrigation conceptualizations. Normal definitions of irrigation systems also tend to ontologically separate the technical from the social, or 'the system' and its context. A third set of reasons is that power and politics are bracketed from the normal analyses of irrigation. The use of deductive methods and ideal-typical models of explanation is widespread, and there is a strong association of much irrigation knowledge with those who 'rule' or manage irrigation systems.

The methodological individualism that characterizes much water thinking also belongs to this third set of reasons, just as its narrow and rather instrumentalist concept of human agency. These sets of reasons are inter-related. Using insights drawing on field experience in South Asia and other developing regions, this paper argues that the social construction of gender and power, or rather the lack of it, in irrigation knowledge systems, is reflected in irrigation policy and practice, even that which claims to be participatory and thus, by extension, more socially or 'people' inclined.

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Entering men's domain and challenging stereotypes: A case study on gender and irrigation in Sindh-Pakistan

Shaheen Khan and Nazeer Ahmed Memon

The role of women in agriculture has long been accepted and documented, but it has never been extended to irrigation and irrigated water management. This study offers a case study of women's participation in Participatory Irrigation Management System (PIMS) in Sindh, primarily based on information provided by institutions involved in implementation and interviews of women farmers and professionals working for PIMS.

Research and practical experience demonstrate that effective, efficient and equitable management of water resources can only be achieved when men and women are equally involved in consultation processes and in the management and implementation of water related services. In case of participatory water management in Sindh, women have never been consulted in conception, planning, design or implementation of the program. It was assumed that water management for irrigation is virtually men's domain. But experiences from Sindh stipulate that these assumptions are not valid; women do use water and irrigation for both productive as well as domestic purposes. Our study reveals that due to lack of visible participation of women in water management boards, women enjoy less privilege or access to opportunities irrigation reforms. Even in some cases potential women water users have been excluded from participation. The requirements that beneficiaries be heads of households (generally male) and permanent agriculture workers (again mostly male) excluded most women from land ownership. However, 73 percent of women in rural areas are economically active, and in agriculture households 25% of full time workers (defined as one who does only agricultural work) and 75% of part-time workers are women.

It is important to understand that Pakistani society is not uniform and different sectors of society use infrastructure in different ways. Planners and designers must ensure that poor and socially excluded are not further disadvantaged by their lack of gender sensitiveness. Our paper argues and provides evidence from the field that lack of women's participation in consultation processes has badly affected the efficiency and effectiveness of irrigation infrastructure. It highlights major problems associated with women's active participation in community / water users associations at grass root level. In doing so, the paper aims to analyze the argument that women have much more to contribute for effective water management in Sindh. It intends to answer the questions – [1] to what extend has decentralization of water resources created space for women and marginalized? [2] what are the opportunity costs of participation for women in reform program? [3] what are the gendered aspects of community infrastructures developed at grass root level?

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Rethinking Gender Inclusion and Equity in irrigation policy: Insights from Nepal

Pranita Bhushan Udas

Nepal has a long history of hydrologic civilization. Historical evidences suggest that the agrarian communities of Nepal were involved in irrigation development and management much before the sixth century BC. Most of these systems were initiated and managed by farmers. The irrigation development in the country from decentralized management has changed to centralized water management with state intervention in 1920s. With the promulgation of decentralization policy in 1980s, participatory approach to irrigation sector development was adopted. But it was not till the 1990s that the agenda of gender water equity was included in water policies and plans, mostly due to the influence of funding agencies.

Gender equity is an important component of the social equity agenda of development programs and plans. Gender equity, as defined by the United Nations, means "fairness of treatment for women and men, according to their respective needs. This may include equal treatment or treatment that is different but considered equivalent in terms of rights, benefits, obligations and opportunities.

A review of irrigation water policy documents and evidence from the field reveals that the translation of this definition is limited in practice. The content of water policy and its implementation has been limited to visibility of women in water committees. The policy documents (water resources act, irrigation policy and regulation) failed to provide guidelines on 'fair treatment' as mentioned in the UN definition. This paper is an attempt to explore and explain reasons for these limitations in the context of Nepal. The main argument of the paper is that there are gaps in context specific knowledge creation on providing working definitions of gender equity in specific (irrigation) sectors. The justification for inclusion of gender issue in irrigation sector is limited to gender and development arguments. Typically, it is limited to arguments based on equal population of male and female in a society and therefore equal representation. Beyond this argument, it cannot address issues such as labor contribution proportionate to land-holding size during construction of irrigation canal, or limiting membership criteria to land ownership, etc. This paper argues that addressing such issues which help women and men water users (from different socio-economic backgrounds) to fairly access water resources is also a gender water equity concern. The arguments are based on field work conducted in Nepal between 2004 and 2006 as part of the author's PhD research.

Gender and Water Resource Management: An Indian Dimension

S. K. Lal and Shalini Tiwari

Safe, adequate and sustainable water supplies for all are one of the main social goals enunciated at global level in the past few years. One-quarter of the developing world's population still lacks clean water while millions die annually from water related diseases. As the world population continues to grow, the need and demand for water escalates. Water has become a strategic resource: its control is a source of power, a key to economic development, and a trigger to socio-political stress. The multiple uses of any water source in any given area can be incompatible, both in terms of the amount of water people require and the effect on the resources they have.

Water Resources Management (WRM) is a systematic process for the sustainable development, allocation, and monitoring of water resources. Current approaches to water management are highly segregated, focusing on technical improvements and sectoral solutions without sufficient attention to their basic social and sustainability goals. Within this social reorientation, most recent policy documents have recognized that the Gender approach is essential to the development of effective, efficient and sustainable systems and strategies. Women are household and community managers of water. They conserve supplies, invest time and labor in improving supplies, and monitor quality and quantity. Clearly, the time has now come for this long-standing interest and concern to be optimized. But, women cannot be expected to play effective roles as managers and decision-makers if their position is undermined by the wider society. Hence, their status in society, their self-confidence as managers, the development of their technical skills and their autonomy have to be supported. For this to happen, a gender approach in water resources management is essential. This will lead to greater: Effectiveness, Efficiency, Development, Sustainable use in freshwater ecosystems and Equity. The benefits that will accrue to society, to the environment, and to the water sector can be classified and elaborated under various heads, for example: Economic, Nutrition and Health, Social, Environmental, Financial and Cultural benefits.

A new development paradigm is needed that enables all individuals to enlarge their human capabilities to the full and to put those capabilities to their best use in all fields –economic, social, cultural and political.

This paper outlines why Gender approach is necessary in water resource management and how it works. The entire approach is based on the Indian Economy which despite being inherently traditional is, nonetheless, moving towards modernization e.g. technical and manpower advancement. The paper is based on secondary data analysis. We, hope that the paper will stimulate thinking among all actors in this crucial field, and will contribute to the development of greater equity and sustainability in this sector, so that safe and adequate water supply is no longer an issue for humanity in the decades to come.

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Session 10:

INTERFACE BETWEEN WATER, POVERTY AND GENDER EMPOWERMENT: REVISITING THEORIES, POLICIES AND PRACTICES

Gender Dimensions of Water Governance and Management

Amita Shah and Seema Kulkarni

The interface between water, poverty, and gender rests primarily on the premise that water being one of the most critical hence contested natural resources for enhancing human well-being and poverty reduction, may create space for women's participation as well as empowerment. The trajectory however, may neither be uni-directional nor smooth and certain nor in fact likely to be influenced by a complex interplay of factors-natural, socio-economic-political, and cultural. Whereas, there is substantial amount of empirical evidence highlighting the poverty reduction impact of improved access to water for both domestic as well as productive use, the association is found to be fairly diverse across regions, households, and gender. Conversely, lack of adequate quality and quantity of water may obstruct life chances, and at times, push many of them into poverty. As per UNDP the growing consensus world over, underlines the fact that whereas availability of water is a concern for some countries, scarcity of water is rooted in power, poverty and inequality. Also there is little understanding on the mechanisms and processes that mediate the link between changes in the access to water and poverty reduction at macro as well as micro levels.

The paper aims at addressing these concerns by revisiting the received theories and their contextualisation in the light of the recent trends in policy formulation and the actual experience from various participatory initiatives in water sector in the region; evolving an analytical framework and identifying key research questions; and exploring appropriate methodologies for empirical investigation

The analysis is divided in seven sections including this introduction. The next two sections present a brief overview of the recent discourses on water-poverty and water-gender interface in the context of developing economies. This is followed by discussion of a tentative framework for conducting empirical investigation for understanding the interface between water-poverty-gender in a context specific scenario. Sections 5 and 6 identify major questions and methodologies for empirically examining the research questions. The last section 7 presents some concluding remarks.

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Women's Empowerment through Participatory Water Management: Lessons Learnt from Small Scale Water Resources Management in Bangladesh.

Sayeda Asifa Ashrafi, Rezaur Rahman and Fousia Mannan

Government of Bangladesh has taken concrete steps to ensure women's participation in development process. National Water Policy was declared and women's participation was highlighted in this. Water resources projects' implementing organization and institutions has taken it as their mandate to ensure women's participation in water management (WM) for gender equality. Small Scale Water Resources Development Sector Projects (SSWRDSP) under its first phase has made an attempt to involve women in water management through formation of water management co-operative association (WMCA).

This study was aimed at exploring the women's status in the project area of SSWRDSP first phases with special emphasis on women's empowerment through their participation in WMCA. In this study, women's empowerment due to the project has been measured by some indices. In order to measure empowerment few issues like mobility, decision making power, autonomy, economic empowerment, exposure to information, institutional involvement, etc, have been used. Using these issues, empowerment index of an issue (EI) and composite empowerment index (CEI) for a woman has been calculated.

Three major areas have been focused in the study: women's empowerment due to participation in WM, scoping some newer areas of involvement for women in WM and factors that are hindering women's participation and efficient working in WM. It was observed that women who are participating in WM are more empowered in comparison to the control site. Average index for empowerment issues was observed to be higher where women are more involved in WM activities. They have more access and control over decision-making both in household and WMCA than the women in the control site. Average index for economic empowerment issue was also highest in the project area. Approximately 50% of the present women involvement in WM is not so satisfactory in terms of return. Women in the project area thought that they could contribute more in WM. Women were facing different barriers for participating in WM. It was observed that though they are involved in WMCA they could not work efficiently in WMCA due to some gender-based gaps in the society. They also pointed out some social, financial, cultural and religious factors that hindered their participation in WM. The study will help in understanding women's status in WM. The study has pointed out some recommendations for further research.

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Gender and Participation in Water Irrigation Management: Case Study of AKRSP (India)'s intervention in Tribal Gujarat

Jyotirmayee Acharya

Gender and Participation in Low-cost Irrigation Schemes A Case of AKRSP(India)'s Interventions in Tribal Gujarat The present paper concerns marginal tribal landholders, especially women's integration in ground water management in Gujarat, India. Although, irrigation policies in Gujarat have attempted to address some of the ground water management problems in the semi-arid region, policy-making has hardly designed and implemented the gender equity considerations, factors of production and the recognition that non-exploitative gender production relations foster agrarian productivity. The main question addressed in this study does the irrigation system bring any change in the trend of women's participation in agricultural practices at all? Does the current mode of women's participation in the irrigation management (increasingly engage in implementation and supervision, collective action and decision-making) have brought change in their lives?

This study analyzes the effectiveness of the model environment created by AKRSP(India) in the Irrigation Management process for enhancing collective action and dialogue between users, agencies and governments. The significance of experience of female group members managing group-well, often narrated orally, to shed light on their perspectives on new challenges to what overtake as "farm women". Cultural politics of the integration of new forms of women's organization into the low-cost water conservation and management skills comes out to be the major reason as they shape the "waterscape" and agricultural productivities. Study has shown that GW association has a better impact on the agricultural productivity and gender equity but still is a peripheral body in the gramsabha/grampanchayat.

Furthermore, the author has emphasized that sustaining the enabling environment, GW has the potential to promote women farmers' association that could function as responsible and self-reliant ! in the best interest of the tribal women's rising prosperity and gender equity within the community and beyond. Agricultural policy-makers and intervention agencies, including irrigation agencies and practitioners that seek to promote agricultural growth would foster women's access to and control over such factors both in the household and institutions.

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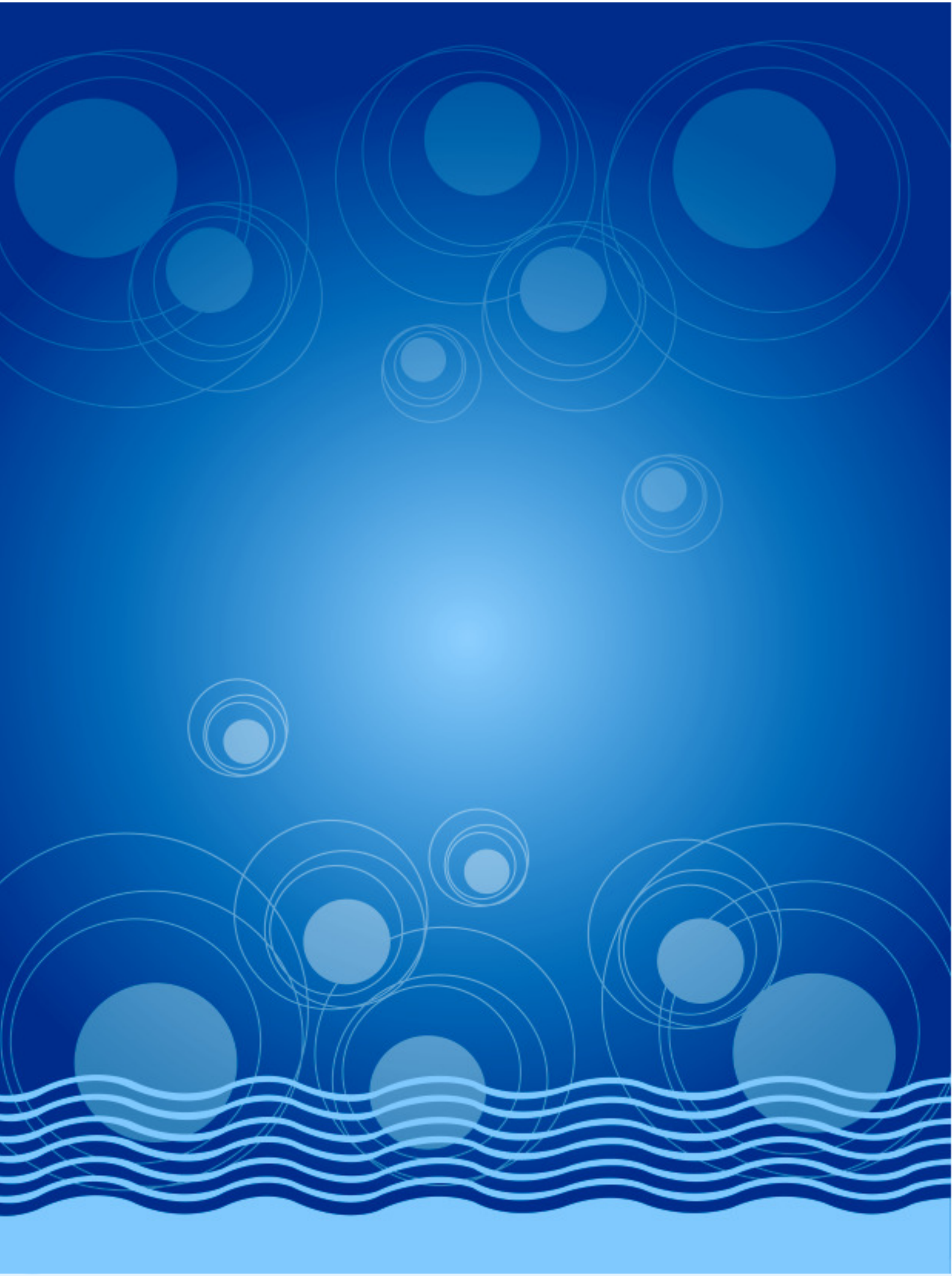
Gender Sensitivity Analysis in Small Scale Irrigation Project

Nazmun Naher and Hamidul Huq

Till now Bangladesh implemented about 800 number of irrigation based water project by Bangladesh Water Development Board (BWDB), Local Government Engineering Department (LGED), and Bangladesh Agriculture Development Corporation (BADC). On the other hand the LGED alone has implemented 280 subprojects in its 1st phase (19995-2002) and 300 subprojects are in completion stage in its 2nd phase (2002-2009). The construction of these projects must have been in line of guidelines of water governance that recommended by Bangladesh's NWMP (National Water Management Plan) and NWPo (National Water Policy). But, in practice, policy guidelines are not followed, particularly in relation to gender. It can be argued that the gender perspectives are almost absent in practice that is in the water project processes.

This paper will attempt to discuss why, how the gender is absent in the process of irrigation project and its consequences. What is the present scenario in Bangladesh, in reference to, broadly, my research area – the Southwest Region of Bangladesh that contains about 80 Flood Control Drainage & Irrigation (FCDI) project. I will bring the arguments that because of lack of taking the gender perspectives into account in the processes of water project the gender issues are remain unaddressed; interest of women are not protected, power and potentials are not tapped, negative environmental impact is explicit and institutionalization of local potentials remain absent in water resources management process. Therefore it is crucially important to focus on gender sensitive project approach in sustainable water resources management which requires more empirical research, training and education of the project holders as well as planners, decision makers. The aims of this paper are to describe the present practices of small scale water irrigation project, with reference to LGED implemented projects in Arial District, which is a part of Southwest region in Bangladesh.

My paper will discuss about how the gender sensitivity among the planners, designers and decision-makers is important, because lack of gender sensitivity among these actors, in particular, causes absence of gender perspectives in water resources management project. This paper will reflect on the arguments that it requires interdisciplinary approach with special focus on gender analysis in the project processes towards ensuring practices of gender perspectives in irrigation project, which may generate maximum outputs and sustainable water management.



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Hydro-Hazardscapes of South Asia: Redefining Adaptation and Resilience to Global Climate Change

Daanish Mustafa

Epistemological commitment to reactive mitigation and adaptation to modelling scenarios of high end climate science is likely to have limited efficacy in the South Asian cultural, institutional and developmental context. The almost universal hegemony of narrowly defined developmental and technocratic discourses at the policy level coupled with pervasive poverty, cultural diversity and multiple drivers of vulnerability at the local level in South Asia are major challenges to the transference of a Western agenda of climate adaptation. The need is for the modernist monologue on vulnerability and adaptation to be changed into a dialogue where high science and policy can learn from and contribute to vulnerable populations' everyday strategies of adapting and coping with hazards as well as struggles for diversified and stable livelihoods.

We identify four main challenges to more efficacious climate adaptation regimes in South Asia: (1) repositioning a concern with socially driven vulnerability at the centre of policy discourse on development, disaster risk reduction and climate adaptation, (2) demonstrating the linkage between environmental quality and poverty reduction, (3) dialogue between modern scientific community and local level actors, both women and men, and (4) reinsertion of indigenous cultural knowledge on the environment and world views in national and regional policy.

Under globalization South Asia is already undergoing substantial socio-economic change – change which, in many cases is contributing to increasing hazard risk and widening the 'development deficit'. The traditional distinction between rural and urban livelihoods or social and environmental management systems is getting less and less useful. The evidence from case studies points to diversified livelihoods, migration and selective modern communication and resource extractive technologies as key adaptation strategies already being used by vulnerable groups in South Asia. However, the importance of the ongoing transformation is not well understood in the context of climate change and disaster risk reduction. People's ongoing coping strategies against enhanced social and environmental uncertainties hold key lessons for formulating effective strategies against global climate change.

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Risk-based evaluation of proposed Brahmaputra water development in meeting future water demand

M. Shahjahan Mondal, Jahir Uddin Chowdhury and Md. Ruknul Ferdous

The government of Bangladesh declared a National Water Policy in 1999. In the policy, 'comprehensive development and management of the main rivers' through a system of barrages and other structural and non-structural measures have been envisioned for multipurpose uses. The National Water Management Plan (NWMP) serves as the basis for planning and management of water resources in Bangladesh for a period of 25 years (2000-01 to 2024-25).

There is a proposal in the National Water Management Plan (NWMP) of Bangladesh for development of Brahmaputra water. The Brahmaputra River is one of the largest rivers in the world with a total length of about 2740 km and a catchment area of about 0.55×106 km2. One of the program included in the NWMP would lead to a decision to build a barrage inside Bangladesh to harness the Brahmaputra water. The barrage would enable off-stream utilization of a relatively large quantum of water and carrying over surplus water from low demand periods to high demand periods using its storage capacity. However, due to flat topography of the Brahmaputra catchment within Bangladesh limiting the storage capacity of the proposed barrage, ever-growing water demand from increasing population, urbanization, industrialization and irrigation coverage, strong seasonal variability in both water demands and river inflows, global warming induced climate change impacts on water demand and resource, etc., it is necessary to evaluate the likely performance of the proposed barrage in meeting future water demand of the Brahmaputra Floodplain Area within Bangladesh under anticipated hydro-climatic conditions.

A risk-based evaluation of the proposed development is performed for meeting future water demands in the Brahmaputra Floodplain Area within Bangladesh (BFA). This evaluation is carried out using three risk-based performance indicators: reliability, resiliency and vulnerability. The vulnerability indicator has been redefined incorporating the aspect of a supply failure. The analysis includes the impacts of climate change on both water demands and resources, and the generation of synthetic flows of the Brahmaputra River using time series models. The simulated values of the indicators reveal that the expected demand of the BFA up to the year 2050 can be supplied with the proposed Brahmaputra barrage inside Bangladesh under the 'no change' in climatic condition, provided that the groundwater remains usable. However, if groundwater becomes unusable due to widespread arsenic contamination and/or a climate change occurs, it would not be possible to meet the future water demand of the region with high reliability, moderate resiliency and low vulnerability.

An assessment of the riparian zone of the Paradeke Oya

Kamal Melvani and Shantha Jayaweera

Restoration of Riparian Zones in Watershed Management In 2007, the Gampola area of Sri Lanka was affected by the spread of the Hepatitis A virus. While more than 75 persons died from the illness, fingers pointed to the contamination of the streams that flowed in to the Paradeke Oya. The National Water Supply and Drainage Board tap the waters of the Paradeke Oya to distribute to downstream communities. They contracted the Neo Synthesis Research Centre (NSRC) to develop a sustainable plan for the ecological restoration of the Paradeke Oya Watershed.

As riparian zones are potentially valuable indicators of catchment condition, NSRC undertook the assessment of the riparian condition of the Paradeke Oya as a preliminary step. Riparian zones along river networks possess important ecological properties, far in excess of their spatial extent. They are now regarded as one of the biosphere•s most complex ecological systems since they maintain the vitality of landscapes. Riparian zones control the flows and characteristics of nutrients and other materials across the landscape, they harbour rich assemblages of flora and fauna, and they have proven applications for watershed and wildlife management. They also manifest early indications of global environmental change, particularly because of their sensitivity to variation in the hydrological cycle. The modified version of the Tropical Rapid Appraisal of Riparian Condition (TRARC) was used to assess the Paradeke Oya. TRARC is a multi metric, visual assessment of the riparian zone that uses simple indicators like plant cover, erosion, pressures and flow regime. The results were startling. Analysis of the data revealed that less than 30% of the riparian zone is under vegetation cover composed of 2-3 canopies only. This compares poorly to the reference riparian forests of the area that have up to 9 canopies. Further, over 80% of the vegetation is composed of exotic species with the most dominant being Camellia sinensis or Tea. In terms of erosion, over 50% of the riparian zone suffers from exposed soil. However, the most serious concern is the scale of contamination from faecal matter, solid waste and agrochemicals. The maximum contamination is from nitrogen based fertilizers.

The value of riparian ecosystems in a watershed is important from the perspective of their mediating effect on nutrient export. In intensive agricultural systems the use of pesticides and artificial fertilizers greatly heightens the need to define and protect watercourses. The presence of natural forest within these streamside zones could reduce the overland flow of contaminants into watercourses by enhancing evaporation, infiltration and the utilization of nutrients. The restoration of riparian vegetation alongside small feeder streams will be critical to the restoration and sustainable management of watersheds.

Watershed Management Policies and Programmes in Bhutan- empowering the powerless

Thinley Gyamtsho

Bhutan is endowed with rich water resources. Traditionally, water is used mainly for irrigation, livestock rearing, domestic purposes, and turning the prayer wheels. Of lately, hydropower generation and industrial uses are increasing rapidly. At national level per capita water availability is 70,000 m3 per person per year is one of the highest in the South Asia. But the people's capacity to command over this resource is very low because big river systems are hardly being put into productive use except for generating electricity in few river systems. A typical figure for rural people's ability to command over water resources is on 2% of 70,000m3 (Lingmutey Chu Watershed). This obviously indicates that the national level figures obscure the real situation at the practical utilization level. This explains why there are lots of conflicts among the farmer with regards to sharing of water resources. On the other hand so called assured irrigation systems failed to be called assures because most of the irrigation water sources are small streams or springs which needs to be recharge by rainfall. Generally there are water shortage problem despite a very rich endowment at national level.

Therefore, this paper will provide how to increase the people's (generally rural poor) capability to command over the rich endowment of water resources through formulation of watershed management policies and programmes. The ultimate aim is not only to bring the benefits of rich endowment of water resources to the rural people who are poor and powerless but also to ensure that such benefits keeps on benefiting many of our younger generations to come through incentive based watershed /river basin management approaches.

Since the contribution of glacial lakes to dry season flow is likely to decrease due to global warming in the future which will reduce the hydropower generation capacity. Therefore, watershed treatment or increasing the water storage capacity of watershed provides only alternative to combat threat of declining dry season flow of our river systems.

Since Bhutan at the initial stages of developing policies related to watershed management, this article will contribute towards developing such policies and programmes. This article will be developed based on experiences gained from Lingmuteychu, Radhi and Wang Watersheds over the last ten years or so.

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Gone land, gone water: Crossing fluid boundaries in peri-urban Gurgaon and Faridabad, India

Vishal Narain

The Northwest Indian state of Haryana, traditionally one of India's major food baskets, is witnessing a process of urbanization, characterized by large-scale acquisition of agricultural lands for residential, industrial and other urban uses. Though interest in periurban water issues has grown lately, scholars' attention has remained largely confined to periurban agriculture, the use of wastewater therein and its health impacts. This paper examines the wider implications of urbanization for water use and management practices in periurban Gurgaon and Faridabad, two of Haryana's fastest growing districts.

The paper uses a qualitative research design - semi structured interviews, focus group discussions and meetings with key informants - to examine the impact of urbanization processes in two villages in each of these districts. The many ways in which periurban residents lose access to water are described. They are left chasing the water table as pressures on groundwater increase from water-guzzling factories and farm-houses. Access further diminishes as lands on which local water sources such as village ponds are located are acquired for industrial and urban residential purposes; the periurban residents' routes to water sources get disturbed as they are dissected by lands acquired for construction of highways; people migrate to cities to the detriment of local CPR institutions; the location of sewage treatment plants to supply water to the city disturbs the local quality of life. At the same time, the relocation of factories from the city core to the peripheries has contaminated groundwater aquifers. Sewage based agriculture emerges as an important form of urban-rural resource flows, but only a few farmers are able to benefit from it, depending on the location of their fields. There are strong equity implications, as poorer and minority groups suffer disproportionately.

The current debate in the media on the subject has centered on financial compensations to land-owners for land acquisition, but in the absence of a property rights structure for water, the diminishing access of periurban residents to water has received little attention. There are signs, however, of growing conflict and resentment against urban authorities and elite sections of urban population have moved judicial authorities to challenge the pattern of development. The paper concludes with certain public policy challenges. A property rights structure for water, separating water and land rights, though essential, remains difficult to implement. Institutions for mobilizing civil society along with rural and urban government collaboration shall be essential to address some of these concerns.

Sustainability of water supply in the hill town of Shimla, India

Renuka Thapliyal

Shimla is an old colonial hill town with its traditional water-supply system. Municipal Government was first introduced into Shimla in December 1851 under the provisions of Act xxvi of 1850. The history of water supply in Shimla relates to great engineering feats. Prior to 1880 Shimla depended partly on local 'baolies' (springs) and partly on a reservoir fed by the water issuing from two tunnels bored a short distance into jakko. Probably Shimla is one amongst the better managed town in India, where the Municipal Committee has consistently tried to pursue the wise policy. However, in summers, the crisis of water is tremendous and each year the problem is increasing with increasing population of the region and floating population pressure, and negligence to the traditional cost-effective techniques towards the water-supply system. With aging distribution systems, high economic costs are incurred for resource-strapped municipality. It is noticed that in most of the cities in the developing countries about one third of all water in the distribution system remains unaccounted through illegal hook-ups, abuses of the right to free water, and, most importantly, leakage, either through public mains or household connections. The wastage becomes more with the erratic nature of timing for water supply. Together they put a prospective threat to the sustainability to the water-supply system in the city.

However, a quick diagnosis of the present water supply and distribution system offers small investment opportunities that have high economic paybacks, merely by nudging the system toward practical operability and cost recovery through innovative approaches like public-private partnerships, the institutional efficiency. The result would be a better focused cost-recovery strategies, along with billing and collection procedures that are both more accurate and better accepted by the stake-holders. Such benefits and savings can be plowed back into investment in system expansion and modernization that will minimize the crisis in the hill town. However, private-sector participation in urban water supply is also liable to be abused in absence of a proper regulatory framework that rewards the provider for meeting important public benchmarks, such as defined coverage ratios for the urban population, reductions in leakage and unaccounted-for water, and continued attainment of water quality standards.

In this background, the present paper tries to examine the water management situation and its sustainability in the Shimla municipal area of India. It also provides an overview of the city's draft water policy and its implications for water supply in the long run.

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The Indian Sundarbans – Need for a Balanced Resource Management Policy

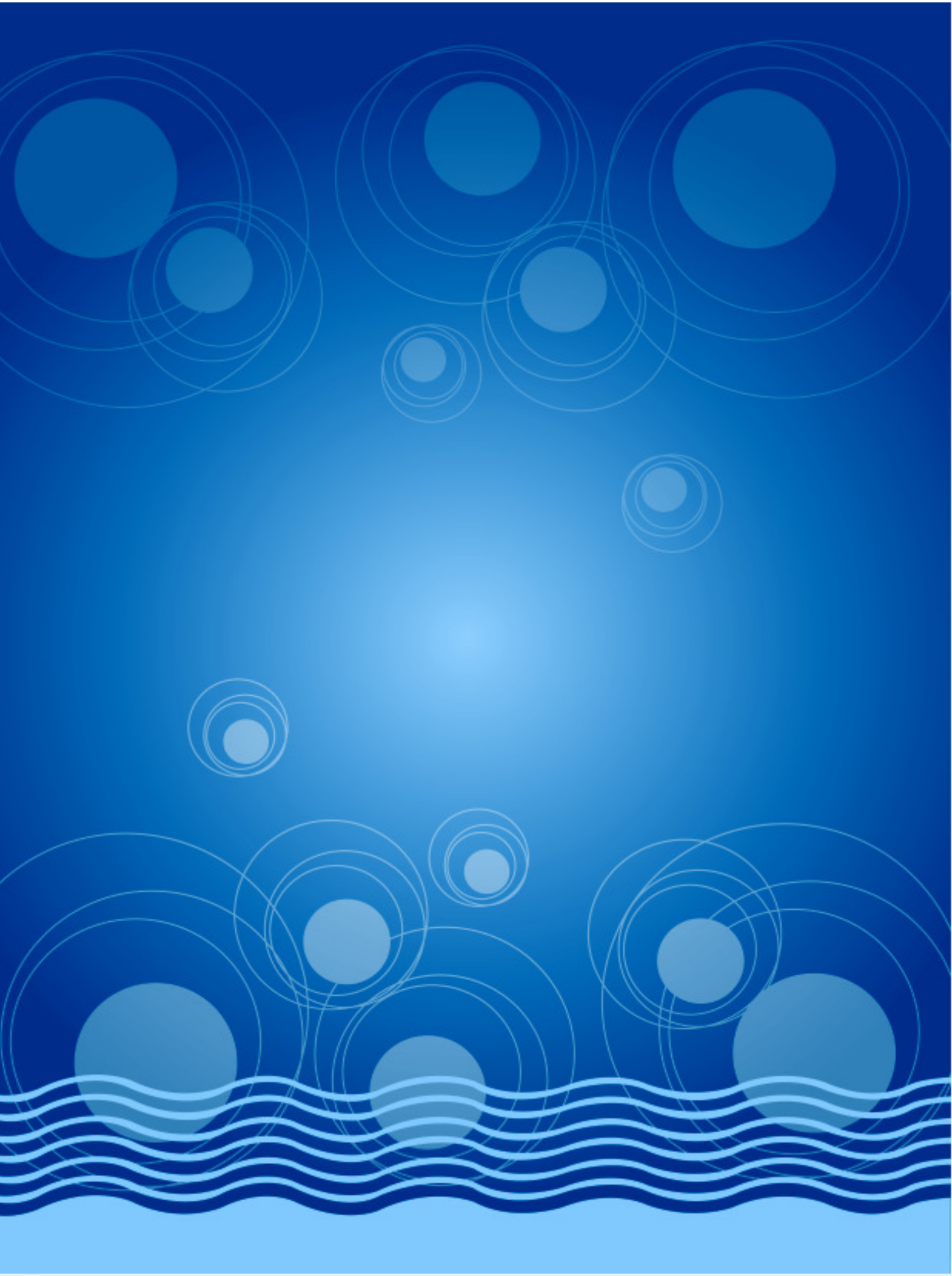
Prof. Sumita Sen

Situated at the north of Bay of Bengal, the Indian Sundarbans,a world heritage site, is located in the southern fringe of west Bengal, falling within 19 blocks of the two districts of North and South 24 Parganas. The area is bordered by Bangladesh in the east,the river Hugli in the west,the dampier Hodges line in the north and Bay of Bengal in the south.Stretching over an area of9630 sq. km.,Sundarbans have 106 islands.

The area of Sundarbans is located in the estuarine section of the Ganga-Brahmaputra river system with the major north-south rivers such as Saptamukhi, Thakuran, Matla, Gosaba, Herobhanga, Raimangal, Jhilla and Bidya flowing through them. Beside these, a number of rivulets, canals and creeks intersect all the major rivers to from a large deltaic zone followed by the continuous process of erosion and accretion.

Currently the upstreams in the Sundarbans delta are faced with the problem of siltation,salinity and tidal action . A serious problem in the region is the gradual reduction of freshwater flow into the river system which is reducing the conveyance capacity of the rivers leading to riverbed elevation triggering increase in salinity from sea water ingress during high tide.The changes in the hydrography is due to a) natural processes in the ganga delta,b)effects of river water resource management in the ganga upstream of the sundarbans,c) increasing economic development activities in the districts,d) increasing sea water levels, etc. One may find in the western part of the sundarbans the disappearance of the connection between ganga and the matla, saptamukhi and thakuran rivers making them essentially inlets of bay of Bengal. Freshwater flow is absent in the dry season.

In the eastern part fresh water reaches the rivers of sandeshkhali, raimangal, gosaba and haribhanga from monsoon rains and from the channels of ganga to the ichhamati river.On the other hand, besides the present river conditions,the problemsof cyclones and flooding continuously bring in breaches in the embankments and intrusion of saline waters into the land. Moreover, water quality information in the Sundarbans is mostly inadequate for Bidyadhari, Matlaor Thahuran to cite a few. Hence Sundarbans region continues to make use of the rivers, creeks, rivulets for transport purposes as well as for discharge of waste or for aqua farming only. The trend in climate change is more to mean water and other resource crisis in the region. A comprehensive river management guideline could not be found during few visits to concerned authorities.



Future Water Tunnels at Cross roads: A case Study in South India

Kulbhushan Balooni, A. H. Kalro and Ambili G. Kalamma.

Water scarcity due to the seasonal variation of rainfall in India imposes limits on agricultural production. To overcome this problem, water harvesting is being given a prominent place with greater emphasis on developing strategies for the revival of traditional water harvesting systems.

This study analyses the present status of dependency of farming community on water tunnels ('surangams' in local parlance) and the water availability from this traditional water harvesting system. The study focuses on Enmakaje panchayat in the Kasaragod district in the state of Kerala in India, where the practice of digging surangams is most prevalent. Water tunnels which are privately-owned help to meet the water requirements for irrigation and domestic purposes. The study focuses on the farmers' dependency, water availability and some technical aspects, and identify various issues that affect the sustainability of water tunnels.

The study reveals that the future of surangams as a perennial source of water is on the decline and this will have an impact on marginal and small farmers as they are more dependent on surangams. The major reason for decline is the increasing number of bore-wells. The farmers are switching to bore-wells as they find surangams unreliable due to reduction in water discharge and also due to unavailability of skilled labour for building them. Given their localized occurrence, the water tunnels are not supported by any government programmes. The strategy would essentially be to enhance the potential of water tunnels through groundwater recharge by implementing watershed management programmes in such scenarios in India and elsewhere. To revive this traditional water harvesting system, the government needs to provide appropriate incentives to farmers for construction and maintenance of surangams. Another alternative is to increase the water availability of surangams through ground water recharge by reviving other complementary water harvesting structures like ponds and dug trenches in agricultural/common land. Implementation of watershed management projects in the study area would be the best strategy to revive the surangams.

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Traditional Wisdom and Changing Pattern of Water Management: A Case in Tribal India

Niharranjan Mishra

Water, an inalienable element of life on earth, is used, shared, preserved and regulated as per cultural norms of the people everywhere Cultural traditions, indigenous practices, and societal values determine how people perceive and manage water in the world's different regions. Earlier people used to conserve water for their multifarious use, both individually and communally, following age-old traditions. Even the traditional system of community management and local governance was the result of the ideas, values and beliefs. In the traditional system, participation was evolved over centuries as a culture and was enforced by social institutions. Social mechanisms were there to ensure participation of several social groups in the maintenance of natural resources. The peoples from the traditional rural and tribal societies used to use their valuable technical knowledge in acquiring and controlling water. The present day's participatory approach in management of resources was quite significant in traditional societies. The culture specific factors in the form of traditional practices, values and beliefs used to play an important role in using, sharing, managing and conserving water resources.

Using some PRA methods and anthropological techniques like participant observations, interview and case study, the present paper attempts to see the Saura perceptions, cultural practices, beliefs in managing, sharing and also in conserving the water resources in Rayagada district of Orissa. This paper analyses the information on the traditional system of water management, the role of community and the importance of cultural practices, religious beliefs and pattern of agricultural practices in water management It also critically examines the impact of intervention of developmental initiations, new institutions in water management, agrarian reforms on age-old traditional system of resource management.

It is observed in our study that there was a wonderful tradition of terracing system in water management among the Saura. Their day-to-day system of water management and its use was also surrounded with cultural practices and belief system. They had a rich ecological knowledge, which had its influence on their system of water management. The community cohesion and social capital played their most important roles in this traditional system of water management. Though this traditional system is still there, most of the traditional methods and practices in water management have been disturbed due to the interventions of outsiders and introduction of new institutions or developmental initiation in water management Even the PESA (Panchayat Extension to Scheduled Areas) Act, which emphasises on the importance of the traditional practices among the indigenous cultures, is quite silent on this in the study area.

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Filtering dirty water and finding fresh one: Engaging with tradition in dug-well intervention in north-Bihar

Luisa Cortesi

This paper aims to discuss some of the process-based learning of Megh Pyne Abhiyan (literally meaning Clouds' Water Campaign), a functional network of grassroots NGOs and social development professionals working on water management in flood affected North Bihar. The discussion will focus on the comparison of two main activities of the network, i.e. temporary rainwater harvesting and dug well revival, through an anthropological understanding of tradition and knowledge.

Analysing the meaning and the impact of these two concepts in the area, the discussion will entail a critique of some largely accepted practices of development. In fact, the network explores tradition and knowledge through a mechanism of continuous ethnography in order to gain a nuanced understanding. Second, this mechanism aims to prevent from falling into the traps and the fallacies of traditionalist or modernist discourse. Third, and possibly most important, the organization takes action, incorporating on a continuous basis the ethnographic outcome in the programs, altering therefore the mainstream project cycle.

Through an analysis of these two programmatic activities, with diverse historical perspective and societal connotation, the paper will therefore show the understanding of the network of local tradition and knowledge as incoherent and contested corpora and as delicate political arenas for commercial and political interests. Consequently, the network's "taking action" will be debated, as to say the modus operandi of proposing context specific interventions that deeply presuppose tradition and innovation in the context of water management in a recurrent disaster area.

Finally, the "dialogic" concept of expert offered by the network will be considered. In this modality of action, the professionals or the local staff do not arrogate the condition of experts, nor delegate it to ambiguous groups like "the people" or "the community", instead propose a dialogue between different context specific outlooks and practices, identify trends determined in a larger areas, deliberate innovations with people, and therefore reinterpret the meaning of "participatory approaches". The presented work will eventually debate the role of the network as a facilitator of the transmission of knowledge between different social sectors and different meanings of water use, and presents its learning on the issue.

Locally Managed Small Water Bodies in West Bengal, India

Bahnisikha Ghosh and Samrat Goswami

India is in a comparatively better position in terms of available water resources compared to many other countries but suffers from water related problems due to the uncertain nature of water availability. Agriculture obtains most of the required water from various perennial surface sources but significantly depends upon monsoon, thereby, largely guided by its spatial and temporal variations. Hence, farmers are compelled to depend upon ground water and ground water exploitation has become a common practice in different parts of the country.

Similar trend is apparent in West Bengal, the state situated in the water-blessed region fed by the Ganges and her tributaries. Groundwater has emerged as the most important source of irrigation in the state. The over exploitation of groundwater raises the question of sustainable fresh water availability in future where possible substitution and support can be achieved through locally managed water bodies. Against this background, the paper is an attempt to explore the status of the locally managed water bodies in various parts of West Bengal and their management practices.

The state of West Bengal is divided into six agro-climatic zones which differ in terms of their geographical, climatic and hydrological differences. Generally, the zones are well furnished with both surface and underground water. However, among them semi arid zones covering the districts of Purulia, parts of Bankura and Birbhum have significant dependence upon surface water due to dearth of ground water. Locally managed water bodies play a crucial role in providing water to the rural communities in these areas. The current study is based on the experiences collected from some of the aforementioned districts of West Bengal where the present status of locally managed water bodies, their ownership and management pattern and policy implications for their better, effective and sustainable use are being considered.

This paper is structured upon secondary information collected on such water-stressed districts and also the primary information collected from the field survey conducted in the block Purulia of West Bengal. From the study it is expected that the status of a water body depends upon level of education of the local people, tank ownership, community involvement in tank management, number of uses obtained from the tanks etc and some policies have also been added for the better management of these water bodies.

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Role and Implications of Ambiguity in Transboundary Water Treaties: Case Studies of Disputes over Mahakali and Ganges Treaty

Rakesh Tiwary, Itay Fischhendler and Mark Giordano

Conflicts and cooperation over transboundary water among developing countries of Asia in particular, have won increasing attention of late. Transboundary water resources utilization and management poses slightly different challenge as compared to national water resources because of large size, heterogenous socio-economic and cultural conditions, significant degree of variability among laws, regulations, national policies and priorities. No wonder, while the national water resource planning is primarily the domain of economic planning, regional development, law and governance; the transboundary water resource inevitably assumes the overriding bearings of international relations, organization and diplomacy.

Here international treaties are the major tools of managing transboundary waters. Although cooperation over transboundary environmental resources has been analyzed from various perspectives, each identifying the problems of cooperation differently and hence suggesting different mechanisms to enhance it, the role of ambiguity in treaty design in resolving border disputes has thus far been overlooked. This is surprising, since many international agreements pertaining to regulating the use of natural resources are ambiguous in their schedule of resource delivery during crisis events and in their cost-sharing arrangements, and may even include contradictory resource allocation principles while being vague as to how to settle the contradictions.

This study aims to examine why and how ambiguity is employed to resolve transboundary water disputes. Two bilateral treaties to harness Ganges- Brahmaputra- Meghna Basin: Indo-Nepal Mahakali Treaty 1996 and Indo- Bangladesh Ganges Treaty 1996 are used as case studies. It was found that several types of deliberate ambiguities were incorporated in the treaty. Among them issues not addressed in the treaty, issues addressed but not defined in the treaty and issues addressed but defined ambiguously. The role of ambiguity was to allow each side to interpret the treaty differently at home while accepting the main allocation of the resource. It also enabled negotiation deadlocks to be overcome by postponing disagreements to the future and by allowing each side to make different assumptions concerning the treaty liabilities and procedures. Despite the constructive role of ambiguity in bringing this treaty negotiation to closure, there is a need to further examine whether such "constructive ambiguity" is not in fact destructive, as it may have detrimental implications at the management phase of the regime.

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Sustainable Water Resources Management and Cross-Border Cooperation in the Himalaya Region

Rameshananda Vaidya and Madhav Bahadur Karki,

Water should be allocated judiciously and efficiently among its users by taking an integrated approach to address the multi-dimensional usage of water as well multi-disciplinary nature of resources management. This approach includes, among others, a focus on integrated land and water management, which refers the integration of land-use planning as well as practices in the upstream watersheds and its effects on quantity and quality of water available downstream. This approach also recognizes the scare nature of the water resources with competing uses and conflicting interests of the users thus warranting best possible resource management paradigm and institutions. This approach is based on the need to take advantage of "externalities" while planning water management: the externalities reflected in the upstream-downstream linkages, whether it is for communities, districts and provinces within national borders, or across international boundaries. Furthermore, due to the public-good characteristics of water resources, "free-rider" tendencies and opportunities for downstream nations also discourage upstream nations from taking a lead in water resources conservation and management, thereby creating inefficiencies in water allocation. However, increasing concern regarding quality and quantity of water, not to speak of potential natural hazards risk of water-induced disasters and energy potentials, by the downstream countries and possible `costs' upstream countries can impose have indicated potentials for cross-border co-operation.

In the Greater Himalayan Region, river basins of the nine rivers originating in the Region, also known as the Third Pole or Water Towers of Asia are home to more than 1.3 billion people. For the countries in the region, rapid change in Himalayan glaciers and its consequence in fresh water supply point out the need to think and act seriously about cross-border cooperation for conserving and managing water, even more urgently than the environmental and economic literature summarized above, might suggest.

A review of treaties among riparian nations on international rivers in the Himalayan region and their poor implementation, however, does not seem to reflect a good prospect. This paper suggests the perspective of regional economic framework to expedite the implementation of cross-border cooperation with a central focus around cross-border economic exchange, primarily trade in water as a commodity, source of energy and ecosystem services

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The Management of Inter-State Rivers as Demands Grow and Supplies Tighten: India, China, Nepal, Pakistan, Bangladesh

Ben Crow and Nirvikar Singh

International cooperation over the major rivers in South Asia took a new turn with the signing in 1996 and 1997 of five innovative water, power and economic cooperation agreements. The innovations include four elements: (i) the transfer of some previously diplomatic questions into the sphere of the private economy, (ii) bringing third parties, other than governments, into the design and negotiation of cooperative projects, (iii) the principle of sharing costs and benefits, and (iv) taking steps toward multilateral discussion. However, political and implementation challenges have remained, and have been exacerbated by looming water shortages as economies grow and climate change occurs.

The great rivers of South Asia, particularly the Ganges and Brahmaputra, have been the subject of five decades of discussion between governments of the region. While those discussions have continued, these rivers have contributed, through flood and drought, to the uncertainty and impoverishment of the lives of the largest concentration of poor people anywhere in the world. Prosperity will come from harnessing the potential of these rivers for irrigation and power, by controlling their perils (such as floods), and managing them in the face of increasing demands and threats to supplies from climate change. This paper explores some of the possibilities opened up by recent innovations in international cooperation, as well as the new challenges. This paper addresses two challenges in particular. The first is that water flows are being changed by global warming. Glaciers and accumulated snow bodies are beginning to melt as global temperatures rise, and the pattern of monsoon and other precipitation may be changing. These changes will affect both the quantity of water supplied by South Asian rivers and the seasonal pattern of flows; river flows vary significantly between dry and monsoon seasons. The second challenge we seek to address concerns industrialization. Both India, and its large neighbor to the North, China, have been rapidly industrializing in recent years with sustained rates of economic growth in double figures.

There are substantial issues to be addressed by an expanded group of countries depending on Himalayan rivers. This paper suggests that an independent regulatory agency could facilitate rational development, assist in the management of substantial uncertainties about future flows, and reduce the potential for conflict.

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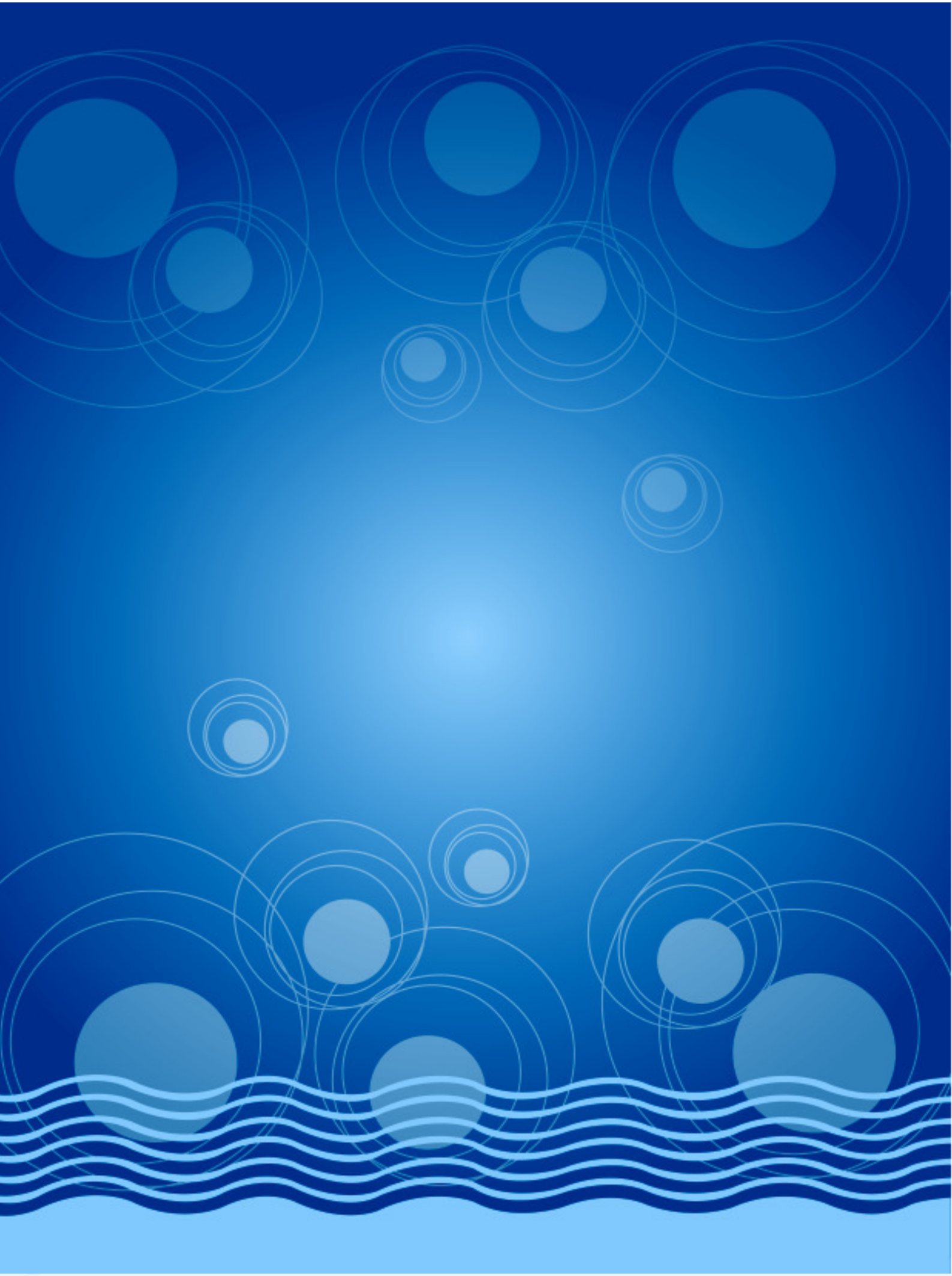
Flood management in Brahmaputra-Barak basin: a mechanism for regional co-operation between co-riparian

Priyanka Mallick

Flood Management in Brahmaputra-Barak Basin: A Mechanism for Regional Cooperation between Co-Riparian Floods is an integral part of the inherent variability of nature. It is an attribute of the physical environment and thus is an important component of hydrological cycle of a drainage basin. It plays a major role in replenishing freshwater resources, recharging wetlands and groundwater and supporting agriculture and fishery systems, thereby making flood plains preferred areas for human settlement and various economic activities. However, floods have negative impacts as well, such as on lives, livelihoods and economic activities and in extreme cases they cause devastation. The way we deal with floods co-determines whether water remains a life-providing element or becomes a destructive force against human life and economic development.

This paper focuses on the Northeast region of India and Bangladesh. It argues that water could be 'building-block' of the region's prosperity using of multi-track diplomacy in the framework of regional cooperation. India's North East has all the attributes of a huge powerhouse and reservoir that could transform the region, ameliorate poverty, and generate enormous national wealth. However, unregulated waters currently vent their fury in destructive annual floods. The Brahmaputra basin in India, particularly its valley in Assam, represents an acutely flood-prone region characterised by awesome hazards of flood and erosion that create an annual mayhem of devastations bringing untold miseries to the people and causing colossal loss and damage to public property and infrastructure Bangladesh, being the lower riparian, suffers even more causing enormous loss of lives and properties. It is ironical to note that though water is gradually becoming a scarce material globally, and its preservation and proper utilisation has become more and more important, its abundance in limited space and time has become so destructive in this part of South Asia. Therefore, harnessing of this abundant natural resource for the benefit of this region has become an absolute necessity in the present geographical scenario of the two countries.

Several approaches, like Brahmaputra Board in 1980, established to alleviate flood misery, have been pursued in the past, but with limited success. The problem seems to defy solution. Individual efforts of each country to mitigate the flood hazards by adopting preventive measures did not prove much effective. Hence, a fresh approach based on regional cooperation is clearly needed.



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Evolution of Property Rights Regimes in the Groundwater Economy of India – Theoretical and Empirical constraints on moving from open access to common property regime.

G. Ananda Vadivelu

The 'open access' regime of groundwater has resulted in the over-exploitation and near-depletion of the resource due to the negative externalities imposed by the self-interest maximising behaviour of individual agents on society, which increases the social cost. The International Water Management Institute (IWMI) estimates that India's grain harvest could be reduced by upto one-fourth as a result of aquifer depletion. The institutional changes in the agricultural sector especially after the Green Revolution have only aggravated the situation of groundwater exploitation, which has led to a policy concern that groundwater resources should be shifted to a Common Property Rights regime (CPR).

However, the shift from the open access to a CPR regime would take place only if the 'perceived' transaction costs are lesser than the 'perceived' benefits. This is unlikely and therefore raises doubts whether a shift to a CPR regime would take place given the empirical constraints involved. Even if this transition does take place, the cost of negative externality is bound to persist because of 'bounded rationality' and 'information asymmetry' among the agents. While policies towards undertaking community management of groundwater as a common property resource have been initiated in Spain and Mexico, this shift in the property right regime has not lead to much success in these countries due to 'resistance' from the stakeholders. Similar problems would be encountered in the Indian context due to the coordination and collective action problems involved in regulating the behaviour of dispersed individual agents across geographical locations. However, this policy concern, although well-intended, will have to encounter the externality problem and in this context, the paper would examine (a) theoretical and empirical constraints involved in shifting the present regime to a CPR regime and (b) if the transition to a CPR regime does take place, what would be the transaction costs that such a regime would meet. The lessons learnt from this exercise would help the Indian policy makers in making informed decisions in terms of devising appropriate "rules of the game" so that the self-interest maximizing behaviour and coordination problems involved in a CPR regime could be minimized.

The present study would provide some new insights into the current debate on property rights regimes for groundwater management, apart from providing some policy implications on this issue to help the decision makers devise appropriate strategies (in particular in developing appropriate institutional mechanisms) to facilitate the optimum use of this increasingly scarce resource.

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Does Distributional inequality lead to degradation of natural resources? An Analysis of Groundwater in Villages of Uttar Pradesh, India

Sanatan Nayak

The most important development of irrigation sector during the post-independence period especially after 70's in India is the rapid growth of groundwater irrigation. The proportion of area under canal and tank irrigation to net irrigated area has been declining over time on the one hand, where as the proportion of irrigated area under tube well alone to the net irrigated area has increased substantially since 1970's. The share of both tube well and other wells to the net irrigated area has increased from 37 percent in 1970-71 to nearly 64 percent in 2003-04 at all India level. Apart from its positive impact on agriculture vis-à-vis economic development, the groundwater has faced numerous negative consequences. First, there has been over-extraction of groundwater leading to depletion in several areas. It leads to alarming depletion of groundwater aquifers. Second, the costs of groundwater irrigation due to over exploitation are being increasing alarmingly. Third, inequities appear to have been accentuated in many ways; as a result free riding externalities occurred and large farmers got higher share of groundwater and it is not treated as a common pool resources.

Considering the above approach on groundwater irrigation in India, the study would like to focus on the following issues. Firstly, to assess the extent of land led inequity vrs accessibility to groundwater and its depletion and the factors held responsible for its consequences across the states in India. Secondly, to estimate the level of inequity in cost of irrigation and the impact of increase in cost on various categories of farmers in selected villages in Uttar Pradesh, India. Thirdly, to examine the extent of inequity in the accessibility of water in an ecological and social embedded exchange system by surveying villages in Uttar Pradesh.

The study would be examined by two sets of data, i.e., secondary and primary level data. The inequity in land Vs Groundwater accessibility and depletion at different states level would studied by using secondary data. Primary level data would be used for the analysis of the second and third objectives. The study has been conducted in the Central, Eastern and Western regions by selecting one district in each region. All the objectives have been captured by preparing a systematic questionnaire for 480 households in 12 villages through proportionate sampling design method. However, statistical techniques would be applied for capturing the linkages between groundwater depletion and inequity in land vrs groundwater schemes and the impact of depletion on various categories of farmers in the states. Some of the important finding may emerge from the analysis of the study. No doubt, the land led inequity vrs groundwater accessibility has severely led to groundwater depletion. Small and marginal farmers are the immediate victims of increase in depletion let costs of irrigation. As a result, that badly affected the agricultural productivity of the respective farmers. The inequity in accessibility has also tremendously increased among the farmers.

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Metering of agricultural power supply in West Bengal, India: Who gains and who loses?

A Mukherji, B Das, N Majumdar, N C Nayak, R R Sethi, B R Sharma and PS Baneerjee

Indian policy discourse on the most suitable mode of agricultural electricity tariff has come full circle. Until the early 1970s, all state electricity boards (SEBs) charged their tubewell owners based on metered consumption. However, as the number of tubewells increased manifold during the 1970s and the 1980s, the SEBs found the transaction costs of metering to be prohibitively high as compared to the total revenue generated from the agricultural sector. In response, during the 1970s and 1980s most states introduced flat tariffs for agricultural electricity supply. While this solution lowered the transaction costs of bill collection, it resulted in a set of still graver problems affecting both the electricity and the groundwater sectors. In view of several criticisms of flat tariff system, there is a growing pressure from the electricity utilities and the international donor agencies such as the World Bank and the Asian Development Bank (ADB) to revert to metering of agricultural electricity supply. This is also articulated in the Electricity Act of 2003.

The World Bank and the Asian Development Bank (ADB) have also made increase in tariff coupled with universal metering a pre-condition for financing power sector reforms in any state. However, several states such as Haryana and Gujarat have resisted any attempt to meter agricultural power even at the cost of foregoing loans from the World Bank and the ADB respectively. The reason these governments are unwilling to accept metering in the agricultural sector is the tremendous pressure from their rural vote-bank. Two Indian states, viz. Uttarakhand and West Bengal have however accepted the policy of universal metering and are in the process of metering all its agricultural pumpsets.

The purpose of this paper is to understand the impact of metering of agricultural pump sets on the groundwater irrigators in the state. The findings show that two states have taken vastly different attitudes and procedures to metering. The West Bengal has adopted a high-tech way of metering aimed at reducing transaction costs of metering, while Uttarakhand has made no such effort. It is therefore likely that the government of Uttarakhand will soon face the old problems (meter tampering, collusion between meter readers and villagers etc.) that had plagued the system before. The impacts of metering too would different, with small and marginal water buying farmers being harmed in the state of West Bengal through changes in the groundwater markets, while all sections of the agricultural population are likely to be winners in Uttarakhand state if the current tariff rates are continued. This paper will analyse these differences in outcomes in terms of different attitude of the state vis-à-vis metering and through context specific factors such as groundwater availability, types of crops grown, existence and importance of groundwater markets, farm size, farmers lobbies etc.

Arsenic safe Drinking Water Supply in rural West Bengal (India): An Evaluation of Decade long Story

Abhijit Das

In a world of unprecedented wealth almost 2 million children die for want of clean water and adequate sanitation. Millions of women and young girls are forced to spend hours collecting and carrying water, restricting their opportunities and their choices. And waterborne infectious diseases are holding back economic growth and poverty reduction in some of the world's poorest countries. Water is the basic need for human survival and hence it has got its natural right. The United Nations Human Rights statement (2002) on right to water says "The human right to water entitles every one to sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic uses. An adequate amount of safe water is necessary to prevent death from dehydration, reduce the risk of water-related disease and provide for consumption, cooking, personal and domestic hygienic requirements".

In India, the right to safe drinking water is part of the right to life which is contained in Article 21 under fundamental rights in the Constitution. The primary allocation of water for human consumption has also been established through the National Water Policies, and huge investments have been made to provide adequate infrastructure to supply water for drinking, and for domestic use. An effort has been made to provide 100% coverage of rural and urban areas through institutional reforms, efficient operation and management, and equitable distribution in the Tenth five Year Plan (2002-2007).

In spite of the importance given to the provision of drinking water in Constitution of India, National Water Policies and Five Year Plans, still more than 480 million people in India are not yet facilitated with safe drinking water. India has been ranked 133rd among 180 countries for its poor water availability of 1880 cubic metres per person annually by the United Nations. The water service delivery is far from adequate and the sector is facing complex problems for which there are no easy solutions.

A case study is done in the Murshidabad district of West Bengal (India) to see (a) the present water supply scenario (b) the water quality problems in the areas.

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Session 15:

WATER SUPPLY AND SANITATION POLICY PROCESSES AND REFORMS IN SOUTH ASIA

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Sustainable Water Supply and Sanitation Services in Sri Lanka through Policy Interventions

Sunil Thrikawala and E. R. N. Gunawardena

With the commitment to the Millennium Development Goals, Sri Lanka is palming to provide clean drinking water and safe sanitation to 86% and 93% of the population respectively by 2015. Apart from that the National Water Supply and Drainage Board (NWSDB), the main service provider of water supply and sanitation in Sri Lanka, has set its own target to provide safe drinking water to 85% of the whole population by 2010 and to 100% by 2020. Sri Lanka has been considered as a welfare state by the development economists and hence the provision of safe sanitation and drinking water was considered as a service to be provided by the government. To achieve this objective, the NWSDB has been expanding its services primarily through foreign funded projects which currently stand at 15. ADB, JICA, DANIDA and GTZ are the major donors.

In 2005 NWSDB obtained 10,187 million rupees as foreign funds and the government of Sri Lanka provided 3,945 million rupees as counterpart funds. However, the revenue generated by the NWSDB appeared to be inadequate to recover the capital investments in addition to meet the cost of operation and maintenance. The differential block tariff system presently in use addresses equity issue while discouraging heavy users. However, the overall sustainability of the service provider will depend on the cost recovery of at least the operation and maintenance component of the water supply and sanitation services. The proposed water policy has also not provided any specific direction as to how this overall sustainability would be achieved. In order to advocate policy reforms, a thorough understanding is required to assess the factors which influence the sustainability of NWSDB. Information on, a) financial assistance received by the government such as treasury allocation, grants and loans, b) expansion of service coverage, c) technological improvements, quality of the service and cost of treatment, d) how vulnerable groups were served, d) tariff structures for different types of consumers such as domestic, commercial/industries and government institutions etc., and e) how other players in the market, such as private owners, impacts on NWSDB etc are required for the analysis. In addition to NWSDB, a large number of Community Base Organizations (CBOs), through World Bank and INGO funding, have developed community water supply services.

At present, the institutional mechanisms to sustain these CBOs to manage the water supply systems are also being debated. The institutional arrangements of such CBOs with NWSDB or local government bodies to strengthen and sustain the services provided by them to the community will also be considered in this paper. The financial and institutional assessment of NWSDB and CBOs will be used to advocate policy guideline to the proposed water policy so that water supply and sanitation services to the Sri Lankan population can be assured in the long run.

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Access to Sanitation in South Asia: uphill Mission?

Sakshi Chadha Dasgupta & Anamika Barua

Good sanitation is a foundation for health that affords protection from a wide range of infections including diarrhea, a leading cause of child deaths. As per WHO and UNICEF, around 921 million people without access to sanitation, resides in South Asia. This represents more than a thirds of world's total. The importance of sanitation in preventing cholera and other diarrhoeal diseases was recognized in the Millennium Development Goals (MDGs), which set a target of halving the number of people without access to basic sanitation by 2015. In tune with the Millennium Development Goals (MDGs), countries of South Asia along with other developing countries all over the world, geared up to formulate new approaches and policy imperatives for an effective solution to increase access to improved sanitation facilities to deprived millions. To achieve the laid targets the governments and other agencies across the region undertook several ambitious and innovative approaches.

Significant investments have been made in this sector over past several decades yet progress in sanitation has been limited and has resulted into lower coverage of sanitation in comparison to water supply. Thus underlining the fact that, a blanket or a universal approach is not the answer to the complex issue. This realization is gradually setting in and newer paradigms for improving access to sanitation are being explored including localized approach to mobilization, technologies, financial options, improving managerial and networking capacities of authorities and civil society etc. Since there exists a commonality in the socio economic milieu in South Asia, therefore case studies and parallel have been drawn from the region so that there are realistic learning's from the experiences and are formative in scaling up sanitation in the region.

The background study has enabled an understanding that the issues related to sanitation are more to do with sharing and scaling up localized success stories to achieve universal access. Based on the exhaustive literature review, including case studies across South Asia, following paper attempts to explore probable reasons behind low coverage and demand supply gap in the access to sanitation, along with a future road map to its fulfillment.

Sanitation Situation in Bangladesh: Issues, Challenges and Options

M. Shafiq-Ur Rahman and Kasphia Nahrin

Water and sanitation associated diseases are the major cause of mortality and morbidity in Bangladesh. Each year almost 36,000 children of below five years old die because of diarrhoea whilst 88% of the diarrhoeal diseases attributed by unsafe water and sanitation. A survey results of 2003 shows that only 32% of the households use a sanitary latrine and 25% are unhygienic whilst 43% households have no latrine. Even, majority of the people of the nation has no understanding about the relationship between sanitation and health. Proper sanitation is a universal need of each community irrespective to the members and socio-economic conditions of the community. Despite having a number of plans and programs taken by national and local government and NGOs, the national sanitation situation has not yet improved at satisfactory level.

In response to the Millennium Development Goal (MDG), government has declared the national target of achieving 100% sanitation, whereby, every household in Bangladesh will have facilities of sanitary latrine by 2010. The notion sanitation refers to achieve sanitary latrine and hygiene practice for all. However, having the existing sanitation coverage 40% of the country and the current rate of coverage only 1% per annum (whilst required rate should be around 8% per annum to achieve by 2010), this is an ambitious target. The vast majority of the people living in urban slums and a little over half of people living in other areas continue to use unsanitary latrines or practice open defecation. Traditional approaches for improving sanitation is focused on technological and financial patronize rather than awareness for hygiene practice and health.

Based on the secondary information the paper aims to present sanitation condition of the country. The paper explores the shortcomings and potentials of the plans and programs of present and past. Based on the existing scenario, the paper provides some guidelines for improving the public health through improved sanitation. Partnership of the government organizations, local government bodies, NGOs and community-based organizations could improve the situation. Awareness of the community should be increased to integrate the sanitation with hygiene promotion. Empowerment of the people's capacity, skill, mobilization of local resources and reorganization of indigenous knowledge should be promoted.

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Political Ecology of Urban Water-supply: Case of Susuwahi, Varanasi city, India

Bikramaditya Kumar Choudhary

Access to clean and safe water in sufficient quantities is the prime challenge for survival for many in cities of the third world countries, one of them being India. This crisis situation and its implications has been part of a larger global debate related to water, and ecology, which cannot be isolated from larger political questions regarding right to this basic resource. The challenges related to water, associated with broader environmental concerns are quality and quantity and therefore appropriate strategies for sustainable management of water is an urgent need (Hunt, 2004; Gleick, 2005; Alam and Murray, 2005). Like other elements of the environment, water has been a source of conflict within nations and regions. The control over water has been a symbol of social and political power everywhere in the world.

Water supply and sanitation in India were added to the national agenda during the first five-year plan. With increase in urban population from 62 million in 1951 to 285 million in 2001, the demand for urban water supply has been increasing. The major bottleneck is an effective policy formulation and implementation within the current institutional set-up, which is not only inefficient in meeting demands for water in the urban areas especially in the outskirts but also incapable of generating adequate revenue for improvement in the supply system. This problem is fueled with unplanned urbanisation in Indian cities, where population moves towards the areas which are technically villages and are not covered by municipal service provision.

In the context of the above, this paper examines the water management situation in Susuwahi, an urban sprawl in Varanasi. The paper provides an overview of the draft water policy and its implications for water supply and moves on to understanding household's adaptation strategies in accessing water in the face of 'water scarcity' in the city, based on the survey of 279 households in Susuwahi. An analysis has been done comparing the municipal cost of water and the actual cost incurred in procuring safe drinking water. The actual expenditure exceeds the production and maintenance cost of potable water supply scheme suggesting that a water tariff is economically justifiable. If a tariff is properly collected and managed, the operation and maintenance cost of the system could be covered by the services provided. This will not only save the household's operational cost, but also reduce the overexploitation of ground water, which is otherwise environmentally unsustainable.

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Gender Participation in Water Governance and Management in Earthquake Affected Areas of North Western Frontier Province of Pakistan and Azad State of Jammu and Kashmir

Zeb u Nisa and M. Akhtar Bhatti

The earthquake of 8 October 2005 damaged severely drinking water supply schemes in the five districts of North Western Frontier Province of Pakistan and four of Azad State of Jammu and Kashmir (AJK). Water supply infrastructure got badly damaged and many sources got buried under land slides completely or their yields were substantially reduced as a result of the earthquake.

The Earthquake Rehabilitation and Reconstruction Authority (ERRA), the agency responsible for rehabilitation and reconstruction of earthquake affected areas, has devised a Strategy for Rehabilitation and Reconstruction of Water Supply and Sanitation Sector to ensure that essential water and sanitation facilities are accessible and available to the affected people in support of the government policy of "Building Back Better". The strategy calls for rehabilitation and reconstruction of all the damaged water supply schemes. A key element of the strategy is the participation of all the communities concerned especially the women in site selection, planning, designing, implementation, monitoring and management of the schemes to promote community ownership and empowerment as well as the sustainability. Active involvement of community based organizations especially women will be promoted in design and implementation of the water supply schemes.

This paper reviews the implementation of ERRA's Strategy for Rehabilitation and Reconstruction of Water Supply and Sanitation Sector and presents a summary of the participatory interventions being implemented to ensure community involvement especially the women at all stages including site selection, planning, designing, implementation, monitoring and management of the schemes to promote community ownership and socio-economic and political empowerment as well as the sustainability. Also, presented are lessons learnt in terms of success, failures and difficulties faced by ERRA in implementing the strategy especially in terms of women participation.

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Session 16:

APPROACHES TO WATER POLICY ANALYSIS IN SOUTH ASIA

Developing Water Policy in a Multi-Party System

Rajindra de S Ariyabandu

Over a decade of efforts to develop a holistic Water Resource Management policy have failed. Sri Lanka is a classic case of attempting to develop policy, nationally demanded but designed by external actors without adequate attention to context and consultation. Thus, the policy process generated intense controversy and became both the tool and victim of national policies.

Due to inherent tradition of paddy cultivation, water has a powerful social, cultural and a political role. Although water scarcity is not an immediate problem, increase urbanizations and industrialization, demands a rational system of water allocation. Water resources management in Sri Lanka faces a number of challenges including multiplicity of institutions dealing with water, inadequate laws and lack of a comprehensive data base. Consensus emerged in early 1990s to formulate a comprehensive water resources policy. Subsequently, number of donor agencies including the Asian Development Bank played a key role in investing to establish a comprehensive policy. Despite over a decade of investments and efforts, these initiatives were never implemented largely due to poor understanding of the country context with its multi-party system of government, strong cultural values, vocal civil society and a politicized media willing to exploit controversies.

The Comprehensive Water Resources Management Project (1992) which assessed the institutional capacity of WRM, recommended a single overarching policy, law and an apex body to manage water resources. In the years to follow these efforts were supported by donor agencies, culminating in the Water Resources Management project (2001), which attempted capacity development of the new institutional arrangement for CWRM. Although the guiding principles of CWRM was institutionalizing IWRM through an overarching policy, the new policy attempted to introduce several unfamiliar approaches like, entitlements (ownership rights) to water, transferability and water pricing. Following controversial land reforms and cases of water privatization elsewhere in the world, these measures were strongly opposed by civil society as commodification of water. Institutional arrangement proposed under the new policy also caused controversy and confusion among traditional institutions. Besides, the policy was used as a political tool both by politicians and media. Further, the policy development process was always piecemeal subject to political interruptions. Finally, the process was never underpinned by strong stakeholder consultation or effective communication to solicit support.

In the face of mounting difficulties and lack of political commitment, policy development process effectively collapsed with the withdrawal of financial support for CWRM in 2006.

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Water Management in Peri Urban Areas- from Policy To Program in Punjab Pakistan – Case Study of Change Pani and enabling its Institutional Environment

Abid Hussainy, Dr. Nasir Javed , Nazir Ahmed Watto and Asghar Bhalli

CHANGA PANI (GOOD WATER) is a policy learning program of the Government of Punjab, Pakistan in partnership with communities, civil society and the water utility (Water & Sanitation Agency) in per urban area of Lahore to develop, implement and evaluate participatory water and sanitation intervention in the peri urban un-served poor area. This model is based on the world renowned model of Orangi Pilot Project with health promotion program & community mobilization component in which government is taking a lead for its rolling out. Learning of the internal and external institutional design and enabling context is key learning for the international development actors working in developing countries specially the pubic sector water utilities.

Changa Pani will demonstrate policy level intervention in health of communities through intervention in health promotion and awareness integrated with the water and sanitation intervention in an un-served area of urban Punjab in five large cities. This program is rolling out of National Sanitation Policy and Punjab Urban Water and Sanitation Policy 2008 which has created a policy environment for supporting this program. This paper will present the overall policy context and its development which has shaped the development of this program. This case study will be learning for developing countries about taking a policy to program approach for change and sustainable development

The Changa Pani Program aims to empower 3000 low income households in each city by creating enabling environment for communities and other stakeholders for developing, implementing and evaluating Changa Pani through a participatory process to improve health and environment of communities. Objectives of this program include policy learning from the program and its internal and external institutions interaction and design; to provide water and sanitation infrastructure for 24/7 water supply with 100 % metering; to design an effective and culturally relevant behavioral change communication strategy which reaches 90% of households within selected area; to design and implement capacity building activities for the community, teachers, community volunteers and program staff to support health promotion; to organize community through social mobilization for Water and Sanitation Services (Changa Pani) so communities can participate is program across eight neighborhoods within UC 60, Lahore; and design governance structure for water supply and sanitation services in cities which are pro poor, accountable and gender sensitive

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Water Sector Reforms and their Implications in Madhya Pradesh

Rehmat and Gaurav Dwivedi

The paper is based on the continuous monitoring and study of the water sector reforms process, through the legal and institutional changes in Madhya Pradesh (MP), India both in the urban water supply and water supply for irrigation needs. The significant changes included in the reforms process are carried forward in Madhya Pradesh largely through two projects – the Asian Development Bank's (ADB) loan for Urban Water Supply and Environment Improvement Project (UWSEIP) and the World Bank Loan for Water Sector Restructuring Project (WSRP).

Under the water supply reforms process in the urban centers, where the project is being implemented in four cities in MP, the paper would largely look at the issues from two aspects one the social obligations such as disconnection on non-payment, removal of public stand posts, increase in water tariffs in poor areas and their implications. The other, the financial obligations such as rate of interest of loan to the respective cities, expenditure on the consultants, increases in various taxes to reduce the water pool deficit and financial sustainability of water supply operations and their implications. The reforms process in the irrigation sector is taken forward through the World Bank loan for Water Sector Restructuring Project to the Government of Madhya Pradesh (GoMP).

Under this project among the several issues included, the paper would try to evaluate in details the retrenchment of Irrigation and Drainage Department employees as proposed in the World Bank project documents, privatization of irrigation schemes and the legislation for formation of Water Regulatory Authority in the state, experiences from other places and its larger implications. This paper is based on the on-going monitoring and study of the reforms processes in the water sector in Madhya Pradesh. The paper therefore makes an effort to flag certain critical issues that are significant and need to be monitored and evaluated further. The reforms process in the water sector in MP is undertaken largely through twin simultaneous loan projects by the Asian Development Bank (ADB) and the World Bank for the reform of the urban water supply and the water sector respectively. Overall, the paper would also try to place these under the fundamental issues of water as a right, water as a common property resource and water supply as one of the state obligations.

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Scale, Diverse Economies and Ethonographies of the State: Concepts for Theorising Water Policy

Priya Sangameswaran

The domain of water has seen a wide variety of changes in the last decade. Often euphemistically labeled as 'water sector reforms', they include elements such as participatory irrigation management, cost-sharing by users, greater power to local bodies, the establishment of regulatory bodies, greater involvement of corporate bodies, and the growing importance of the economic dimension of water provision. These changes have been the subject of much debate, with protagonists taking one of two broad normative positions. On the one hand, the reforms have been viewed as positive attempts towards change because it is believed that they would lead to greater efficiency, equity, and sustainability. On the other hand, the reforms have also been viewed as part of a discourse of neoliberalism and as attempts to extend capitalist exploitation to newer arenas such as water, a move that is considered inevitable as other sources of profit dry up.

Analyses of the current water reforms can be broadly distinguished into two categories. The first includes normative/ ideological positions which focus on the metanarrative of the reforms; at one end of the spectrum in this category are the proponents of market reform and at the other end are those who view the current reforms as an instance of capital seeking yet another avenue of exploitation. The second category includes analyzes where the focus is more applied in nature and typically deals with concerns that are perceived to be more immediate and (such as how best to design and implement a particular project). Both categories of analyses are useful for different reasons, but they also suffer from shortcomings. Applied analyses which do not take into account larger processes risk institutionalizing processes whose long-term effects are unknown (at best) and negative (at worst).

Metanarratives sometimes present an over-simplified teleological story, thereby losing sight of the complex trajectories of many of the reforms as well as of the spaces that the reforms might open up (albeit inadvertently) for progressive change. Further, interaction between the two categories of analyzes are also limited. This paper argues that many recent developments in social science theory (including those from geography) offer useful conceptual tools to deal with some of the above shortcomings. This paper would focus on three such developments – the concept of scale, the diverse economies approach, and ethnographies of the state – and show how these could be used to generate more nuanced analyzes of the current water reforms in India. These concepts would also help engage with concerns about metaprocesses while at the same time suggesting points of immediate intervention

National Water Policy: Bangladesh towards an Integrated Water Resources Management

Saiful Alam

National Water Policy: Bangladesh towards an Integrated Water Resources Management in Bangladesh Themes/Topics: Sectoral assessment of policy processes/reforms Abstract Government of Bangladesh issued the National Water Policy (NWPo) in 1999. The Policy forms the first point of reference for any sectoral plan that directly or indirectly links with water. The Policy identifies the issues and options, and often directs planners in certain directions to aim the development of sectoral plans. Water resources management in Bangladesh faces immense challenge for resolving many diverse problems and issues. The most critical of these are alternating flood and water scarcity during the wet and the dry seasons, ever-expanding water needs of a growing economy and population, arsenic in groundwater, drainage congestion in urban areas and massive river sedimentation and bank erosion.

There is a growing need for providing total water quality management, and maintenance of the eco-system. There is also an urgency to satisfy multi-sector water needs with limited resources, promote efficient and socially responsible water use, delineate public and private responsibilities, and decentralize state activities where appropriate. All of these have to be accomplished under severe constraints, such as the lack of control over rivers originating outside the country\'s borders, the difficulty of managing the deltaic plain, and the virtual absence of unsettled land for building water s! tructures.

The National Water Policy will be reviewed periodically and revised as necessary. It will guide management of the country\'s water resources by all the concerned ministries, agencies, departments, and local bodies that are assigned responsibilities for the development, maintenance, and delivery of water and water related services as well as the private users and developers of water resources. The National Water Resources Council (NWRC) is responsible for coordinating all aspects of water management, and issue directives through its Executive Committee. Under the NWPo, WARPO has been made secretariat to the NWRC and is responsible for preparing the NWMP and subsequent updates, and monitoring implementation. Agencies are responsible for preparing their own sub-regional plans within the framework established by NWMP. The National Water Policy sets new paradigms for the water sector, which include: decentralized water management; cost sharing and cost recovery; private sector participation; community participation; nontraditional financing modalities; regulation separated from supply; and new rights, obligations and accountability. These will have considerable bearing on the existing institutions and the way in which they manage their affairs and inter-act with others. A new National Water Law is now under preparation for the implementation of the Policy in the country.

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Water Policy and Water Law Formulation Process: No Space for Commons
The Case of South Indian States

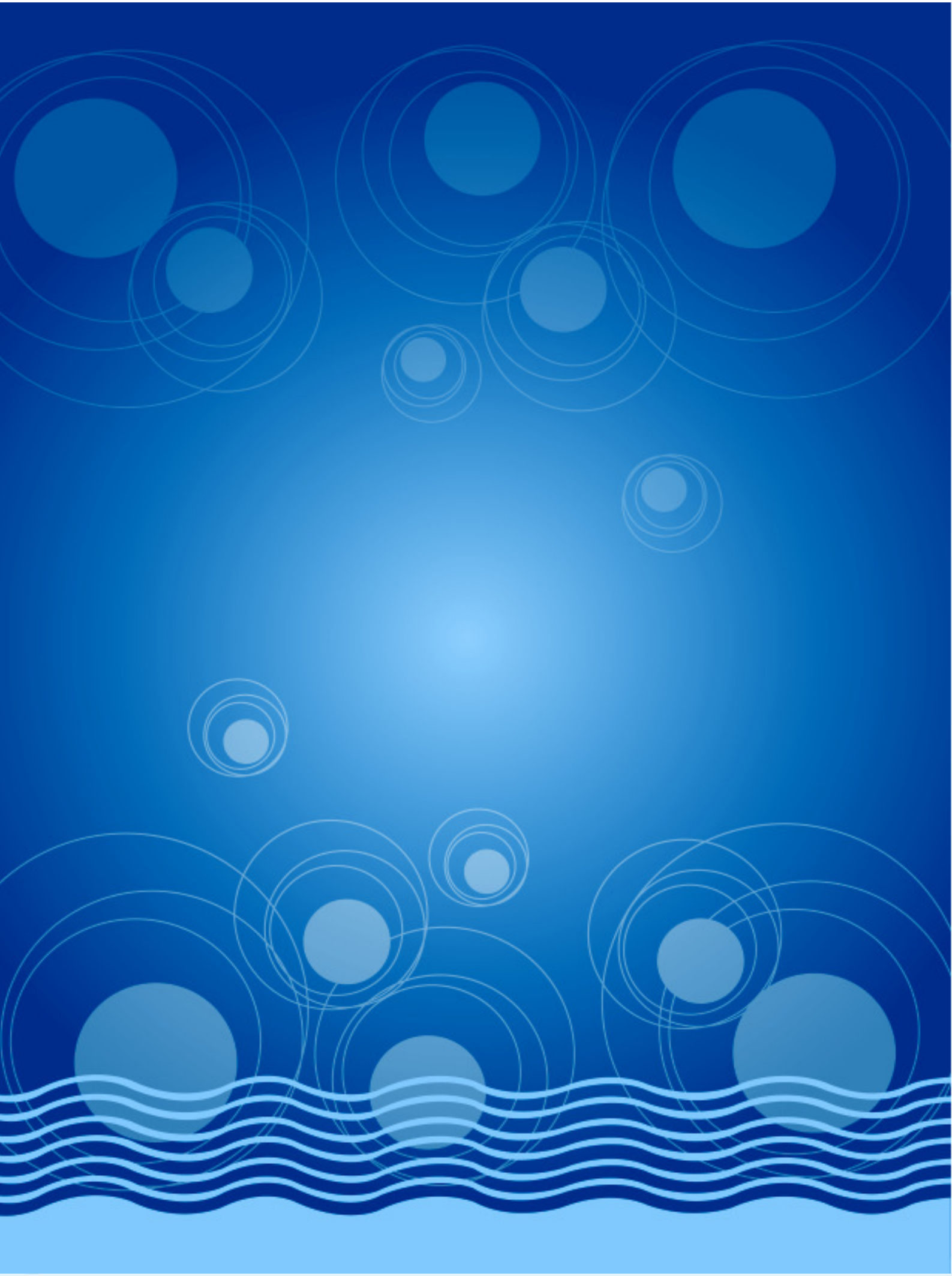
Jos C Raphael

The present attempt is to propose local people's involvement in Water Policy and Water Law formulation process in the Indian sub continent on the growing realisation that policies and laws so far the state governments either visualised or implemented seems remain paper tigers. The policies and institutions in the water sector are seen responding indifferent to ensure sustainable water use in many Indian states.

Often institutions backed up with law and regulations follow a fragmented, sectoral and supply side approach. They seem centralised in nature, top-down in approaches and vague in planning water development, water allocation and management either at higher echelons or at grassroots level. Such vacuums in water institutions and lack of coordination in water administration calls for people's water policies and water laws which has not been tried out countrywide in India. In this backdrop the present paper attempts to analyse the existing water policies, water laws, institutions and administration from three south Indian states viz., Kerala, Karnataka and Tamil Nadu and suggests recommendations for policy adoption of state and national level governmental planning agencies.

Analysis shows that Water laws mainly are centred on Participatory Irrigation Management and water user associations. Ground water laws are the lowest emphasis given by the state governments where majority of the Indian population depends upon it especially for domestic uses. It indicates that the entire process of evolving water policy and laws is devoid of its stakeholders' participation particularly from the grassroots level. Institutional framework to facilitate local people's participation like Gram Sabha and Panchayati Raj Institutions are grossly underutilised for this purpose.

On this background it examines the recent attempt of Kerala Government in facilitating stakeholders' participation in law formulation in water related Bill, called The Kerala Conservation of Paddy Fields and Wetlands Bill 2007.



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Status of Water Education Policy in South Asia

Peter P Mollinga

This study of the status of water education in south Asia seeks to evaluate the current status of water resources education, assess the demand for inter-disciplinary water professionals and identify challenges, opportunities and new initiatives in the realm of higher education for water resources in the region. The study has three components. First component is to assess the status of higher education for water resources in the region. The exiting programmes from sample institutions in South Asia were evaluated, from a perspective of whether they seek to groom professionals with an inter-disciplinary orientation on IWRM (Integrated Water Resource Management), as against conventional engineering/natural science-oriented approaches. The basic goal was to review the extent to which an inter-disciplinary orientation, across the physical/natural and social sciences, was imbibed in the programme curriculum and pedagogy. The second component assesses the demand for water professionals with an IWRM type profile. The aim of assessing this component is to understand whether there is a demand in the region for inter-disciplinary water professionals, as against professionals trained conventionally in engineering and hydrology. The third component includes collecting and assessing literature and policy decisions on water resources education for identifying any recent policies /initiatives on the front of water education, especially since 2000, the experience with their implementation, potential of further such initiatives and likely constraints. Informants for this work component cut across different sectors – government, NGOs, academics, bureaucrats and regulators.

Finally, the study, seeks to examine the demand for inter-disciplinary water professionals. The key thesis is that at present the demand for such professionals is confined to the development sector, namely, donors and funders and some NGOs, particularly, large ones with an international presence, though some demand for these skills can also be seen to emerge in the corporate sector. A growing need for inter-disciplinary professionals is felt in the government as well, both by those who are in as well as outside the Government; however, a visible demand still needs to be created. The study is synthesis of the larger study done by

Building global capacity in implementing IWRM - Progress, Challenges and Pathways?

Shahbaz Khan

Water-related education relates to the knowledge of the hydrological cycle spanning across water resources assessment, monitoring, and management. Water education needs to cover the whole scope of education, including the formative years at pre-school, primary and secondary educational levels, vocational training, university and professional education at undergraduate and postgraduate levels, lifelong continuing education and training, as well as the informal and innovative ways of knowledge and information transfer. Beyond the scientific knowledge of the natural processes the water education needs to address the demographic, technological, economic, social, environmental, governance and gender related aspects of water and its interrelations with the human society. While there is a range of materials and projects focusing on water-related education, these are not well connected to offer customised solutions to individual countries. Some of the limitations identified with the existing water education include use of outdated, biased or irrelevant information; poor medium of instruction; lack of continuity between different levels of water education; lack of integration with the wider curriculum and with local knowledge; lack of practical relevance to local and community needs; lack of resources; and poor linkages with locally available professional bodies. This paper will identify gaps in order to prepare appropriate responses to the local and global water education needs

Within the United Nations water education is now considered a key step towards achieving the Millennium Development Goals. The United Nations Decade on Education for Sustainable Development (DESD) was prepared to provide strategic focus to UNESCO initiatives that integrate Education for Sustainable Development with related dimensions of UNESCO's activities in order to help create an enabling environment for capacity-building according to the needs of the Member States and other partners to achieve the objectives of the DESD. The Action Plan envisages several thematic programmes, defined as long-term inter-sectoral programmes, one of them on education for sustainable water management.

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Towards inter-disciplinary water resources education: a perspective from North India

Vishal Narain

This study sought to assess the status of higher education in the realm of water resources management from a perspective of inter-disciplinarity, assess the demand for inter-disciplinary water professionals and identify recent initiatives, constraints and challenges in moving towards inter-disciplinary water resources education. Of the five programmes from the North Indian region selected for study, only one programme was found to be of an inter-disciplinary character, imparting an IWRM (Integrated Water Resource Management) perspective, combining managerial and social aspects of water resources education with the natural and technological. The remaining four programmes tended to be of a technical orientation, confined to the engineering domain. The demand for inter-disciplinary water professionals seems to be confined to the development sector, namely donors, funders and large NGOs, especially those with an international presence, or with a research and academic orientation. There is a need for inter-disciplinary approaches in the government, but a visible demand still needs to be created. The technical orientation in the government needs to be steered away from. There are some recent initiatives in the realm of short-term training programmes, that point to the emerging demand for inter-disciplinary water resources education. However, several constraints in the overall education system and the government need to be overcome.

As water becomes scarcer and competing pressures on it multiply, an IWRM perspective in higher education, research and training will become all the more necessary. Given the relative inertia in conventional education systems and programmes, networking among individuals and institutions engaged in IWRM training and research will need to be strengthened to develop programmes and curriculum for inter-disciplinary water resources education. Efforts also need to be directed towards shorter term inter-disciplinary training and capacity-building programmes in the government, particularly at the grass-roots level. Networking with curriculum regulatory authorities might facilitate in some measure the transition towards more inter-disciplinary formal water resources education.

New generation of water professional - An experience of PGIA, University of Peradeniya

M.I.M.Mowjood

The Board of study in Agricultural Engineering introduced a postgraduate degree program on Integrated Water Resources Management (IWRM) in 2001 at the Postgraduate Institute of Agriculture (PGIA), University of Peradeniya, Sri Lanka to produce the required capacity to address the new challenges in the water sector. Many organizations in Sri Lanka identified PGIA as an appropriate organization to launch this programme in view of its long years of experience, availability of competent staff and the involvement of professionals in the water sector in teaching and research programmes. The IWRM program of the PGIA aims at producing multi-disciplinary professionals in water resources management with knowledge and skills from technological, economic, social and environmental perspective for sustainable use of water resources. The integration of different disciplines are made to assess, analyze and improve water resources, water allocations and hydro-ecosystems while developing methodologies to implement policies and legislations related to all aspects of water in the country.

The programme has been strengthened with the support from various institutions. One of the notable contributions came from Unilever Sri Lanka, which provided 5 fellowships per year including research funds until 2005. The PGIA has succeeded in obtaining further support through a regional initiative for Capacity building on IWRM and gender & water in South Asia under the Crossing Boundaries (CB) Project. This project funded by the DGIS of the Government of Netherlands, implemented by SaciWATERs in India, has helped the programme at the PGIA through curriculum development, fellowships for students (SAWA Fellows), facilitate students to participate in regional programmes, training of staff, funds for research from 2006 – 2012. The Cap-Net, the international programme for Capacity Building in IWRM, hosted at the PGIA has provided an added value for out reach through networking capacity building institutions and some line ministries in Sri Lanka.

Availability of experienced and competent staff, regional recognition and exposure through the CB project are greater strengths for the program. Research in IWRM is a new dimension for the staff members teaching the IWRM courses at PGIA. Interdisciplinary research is a challenge for the program and need further support and improvements. It was identified that coordination among the courses are necessary to avoid repetition and identifying the missing gaps. Visibility of the program has to be increased at the high level of policy makers and at the relevant institutions. Advocacy for recruiting the IWRM graduates in water sector is essential for marketing the programme.

In addition to fresh graduates, working water professionals from institutions\organisations have enrolled in the program. The programme was able to attract people with different back grounds such as agriculture, engineering, social science, medicine, etc., A total of 77 students have been registered up to 2006 and out which 26 have graduated while others and still continuation their degree programme. The first SAWA batch has graduated in 2008. At present, there are 39 students following the courses. When we look back the whole process of formulation of our postgraduate degree program on IWRM and the successful implementation for the past seven years, we realize that we have gone beyond the conceptual stage and work towards implementing IWRM on the ground. We are confident that with the stakeholder partnership, a new generation of water professionals produced through the IWRM program can take the challenges to solve the problems in water sector in this country as well as in the region.

Address of Participants

1	Dr. Amita Baviskar	Associate Professor, Institute of Economic Growth, Delhi University Enclave Delhi - 110 007, India. Phone: +91 11 2766-7288, 9811874547 Fax: +9111 27667410 E-mail: baviskar@iegindia.org , amita.baviskar@gmail.com
2	Prof. Mohan Munasinghe	Chairman, Munasinghe Institute for Development (MIND) and Vice Chair, Intergovernmental Panel on Climate Change (IPCC) 10/1 De Fonseka Place, Colombo 5, SRI LANKA. Phone: +94 11 255 1208; Fax: +94 11 255 1608 Email: mohan@mindlanka.org
3	Prof. Jayanta Bandyopadhyay	Centre for Development & Environment Policy, Indian Institute of Management (Calcutta), D H Road, Joka, Kolkata 700 104. Phone: +91 33 24678300 Email: jayanta@iimcal.ac.in, bandyopa@hotmail.com
4	Prof. Tushaar Shah	Principal Scientist International Water Management Institute Elecon, Anand 388001 Gujarat, INDIA Tel.: +91 2692229311 Email: t.shah@cgiar.org
5	Mr. Dipak Gyawali	Director, Nepal Academy of Science & Technology GPO: 3323, Khumaltar Kathmandu, Nepal Telephone: +977 5547715, 5547717, 5547720-21 Email: dipakgyawali@wlink.com.np
6	Dr. Rajindra de S Ariyabandu	8, Rue Carqueron, Avenchets 1220 Geneva Switzerland Phone: +41 0798433892 (Mobile), +4122 7968869 (Home) Email: rajindra.ariyabandu@yahoo.com
7	Mr. Md. Mehmood Ul Hassan	Senior Researcher, Center for Development Research University of Bonn, Germany. Tel: +49 228 734918/1971 Email: mehmood00@hotmail.com

8	Ms. Begum Shamsun Nahar,	Apt. E#5, BUT Villa, 92-93, Kalabagan 2nd Lane Dhanmondi, Dhaka-1205, Bangladesh Tel. 880 2 9135786 / 912 6763 Mobile: +88 01715101981. Email: rahans@gmail.com
9	Dr. Philippus (Flip) Wester	Assistant Professor Water Reforms Irrigation and Water Engineering group Centre for Water and Climate, Wageningen University Wageningen, The Netherlands Tel: +31 317 484190, fax: +31 317 419000 Email: flip.wester@wur.nl
10	Dr. Jessica Budds	Lecturer in Geography, Faculty of Social Sciences The Open University, Walton Hall Milton Keynes, MK7 6AA UK. Tel: +44 1908 654431, Fax: +44 1908 654488 Email: J.R.Budds@open.ac.uk
11	Ms. Eiman Karar	Director: Water resources Management Water Rsearch Commission, South Africa Private Bag X03, Gezina, 0031, Pretoria. Tel: +27 12 330 9029, Fax +27 866572295 Email: eimank@wrc.org.za http:/www.wrc.org.za
12	Prof. Claudia Pahl-Wostl	Professor for Resources Management Unversity of Osnabrueck, Barbarastrasse 12 49069 Osnabrueck Germany Tel: 0049 541 9692536, 0049 160 90751008 Email : pahl@usf.uni-osnabrueck.de
13	Mr. S P Tucker	Principal Secretary, Irrigation ENC Building Jal Sauda Erra Manzil Hyderabad. India Tel: +91 40 23300046 Fax +91 40 233 04120 Email: sptucker@rediffmail.com
14	Mr. Shital Babu Regmee	Joint Secretary, Ministry of Water Resources, Singha Durbar, Kathmandu, Nepal Tel: +977 1 4211523, 977-1-4436713 Email: regmeesb@yahoo.com, sbregmee@mowr.gov.np

15	Mr. Ranjith Ratnayake	Dr. Ranjith Ratnayake, International Water Management Institute 127, Sunil Mawatha, Pelawatta P.O. Box 2075 Battaramulla, Sri Lanka. Tel: +94 11 2 87404 Fax: +94 11 2 786854 E-mail: r.ratnayake@cgiar.org
16	Mr. Shafqat Masood	Member (Punjab), Indus River System Authority (IRSA) G-7 MArkaz, Sitara Market, Islamabad.Tel: +51-2202973 Fax: +51-9201282 Email:
17	Mr. Hossain Shahid Mozaddad Faruque	Director General, Bangladesh Water Development Board WAPDA Building (2nd Floor), Motijheel C/A, Dhaka-1000, Bangladesh. Tel : +880 2 9552194, 9564665, 9871933, Fax : +880 2 9564763 E-mail : cm-bwdb@bangla.net
18	Mr. G Karma Chhopel	Water Resources Expert National Environment Commission Thimphu, Bhutan Tel: +975 17624118, Fax +975 2 323385 Email: gkchhopel@hotmail.com
19	Prof. S Janakarajan	Director, Madras Institute of Development Studies 79, Second Main Road, Gandhinagar, Adyar, Chennai – 600 020. Tel: +91 9444026533 Email : janak@mids.ac.in
20	Dr. N. Nagaraj	Dept of Agricultural Economics University of Agricultural Sciences GKVK Campus Bangalore-560065 India Tel: 91-80-23637002, (Mob) 9880004823 Email: nagarajnareppa@yahoo.com
21	Mr. Prakash Nelliyat	Research Coordinator, Centre for Water Resources Anna University Chennai. Tel: +91 9840165462 Email: Nelliyatp@yahoo.co.uk
22	Dr. J. Cyril Kanmony	Scott Christian College Nagercoil- 629003 Tamil Nadu, India Tel: +91 4652 236228, +91 4652 231807 Email: Jcyril@Dataone.In, cyrilkanmony@ymail.com

23	Dr. Chirodip Majumdar	Senior Lecturer, Barjora College Circus Maidan Katwa, Burdwan - 713130 West Bengal, India. Mobile: +91-94343-11689 Email: chiro_m @ rediffmail.com; chirodipmajumdar@yahoo.in
24	Dr. Kumudini Abeysuriya	Senior Research Consultant, Institute for Sustainable Futures University of Technology Sydney Tel: +61 2 9514 4950 Fax: +61 2 9514 4941 Email: kumi.abeysuriya@uts.edu.au
25	Ms. Kusum Atukorala	Associated Development, Research Consultants (ADRC) No.7 St. Mary's Lane, Mattakkuliya Colombo 15, Sri Lanka. Tel: + 94 11 2546653 Email: kusum@itmin.net, adcr@itmin.net
26	Dr. Sahajahan Mondal	Associate Professor, Institute of Water and Flood Management BUET Dhaka - 1000 Bangladesh. Tel: +880 2 9665650-80, 8616833-38, 8614640-44, 8618344-49 Email: mshahjahanmondal@iwfm.buet.ac
27	Ms. Sonia Binte Murshed	Graduate Student, Institute of Water and Flood management Bangladesh University of Engineering and Technology Dhaka 1000 Bangladesh. Tel: +880 2 9665650 Email: sonia_murshed@yahoo.com
28	Ms. Poulomi Banerjee	Research Scholar, Centre for the Study of Regional Development School of Social Sciences I, Jawaharlal Nehru University New Delhi- 10067, India. Tel: +91 9868787149 Email: poulomi_jnu@yahoo.co.in
29	Mr. B.K. Harish Kumara	No.202, Riviera Apartment Dwarakapuri Colony, Panjagutta Hyderabad-500 082. India. Mobile: +9177370279, + 91 40 42617392 Email ID: harish.bk9@gmail.com
30	Mr. M T M Mahees	PhD Candidate, IWRM, Dept of Agricultural Extension - Dept of Agricultural Engineering, University of Peradeniya, Srilanka. Tel: +94 714188710 Email ID: mahees@soc.cbm.ac.lk

31	Mr. Animesh Kumar Gain (BUP)	Research Associate, Bangladesh Unnayan Parishad House # 50, Road # 08, Block # D Niketon Gulshan 1 Dhaka 1212. Bangladesh Tel: +880 2 8853958-60, 8853962 Cell.+8801920163719 Email: animesh.gain@gmail.com
32	Md. Sydur Rahman	(SAWA fellow) Scientific Officer, Agricultural Engineer) Irrigation & Water Management Division Bangladesh Agricultural Research Institute (BARI) Joydebpur, Gazipur-1701 Bangladesh Email: srahman_bari@yahoo.com
33	Mr. D. J. Bandaragoda	449 Temple Road, Thalawathuigoda Sri Lanka. Tel: +94 11 2773360 Email: jayaband@dialogsl.net
34	Dr. Madar Samad	Regional Director - South Asia International Water Management Institute ICRISAT Campus Patancheru 502 324. Hyderabad, Andhra Pradesh, India. Tele: +9140 30713739/3735 Fax: +9140 30713074 Email: m.samad@cgiar.org
35	Dr. A. Narayanamoorthy	Professor and Director, Centre for Rural Development Alagappa University Karaikudi Tamil Nadu, India, Tel: +914565 225842; Fax: +914565 225202 Email: na_narayana@hotmail.com; narayana64@gmail.com
36	Mr. Nitin Bassi	Scientific Officer IWMI, 2nd Floor, Office Block B NASC Complex DPS Marg, Pusa, New Delhi 110 012, India. Phone: +9111 25840811-2, 65976151 Email: N.Bassi@cgiar.org
37	Dr. C. E. Ajith Kumar	Programmer, Department of Agricultural Extension, Department of Economics, Govt of Kerala "MADHAV", TC - 17/1704, POOJAPURA, Thiruvananthapuram - 695 012. Kerala . Tel: +91 9447155345, 471 2355345

		Email: ajitkumarce@gmail.com
38	Mr.Venkata Ramamohan Ramachandrula	Joint Director NRM Program Centre for World Solidarity, Secunderabad, India. Mobile: +919440194866 Email: Ramamohan@cwsy.org, rvrm2@yahoo.com
39	Dr. Jayanath Ananda	School Of Business La Trobe University, Wodonga, Vic 3690. Australia Email: J.Ananda@Latrobe.Edu.Au
40	Dr. Firdaus Fatima Rizvi	Associate Fellow, Council for Social Development 53, Lodhi Estate, New Delhi-110003, India Tel: +91 11 24615383, Mobile: +91 9871711489 Email ID: firdausrizvi@gmail.com
41	Prof. Nimal Gunawardena	Postgraduate, Institute of Agriculture, P.O.Box 55, Old Galaha RD, Peradeniya, Sri Lanka. Tel: +94 812386542, Fax : +94 812388318 Email: nimalgun@pdn.ac.lk
42	Dr. V S Saravanan	Senior Researcher, Centre for Development Research Walter Flex Strasse D-53113, Bonn Germany. Phone: 0049-228-734908 Email: s.saravanan@uni-bonn.de
43	Mr. Sultan Ahmed	Center for Environmental and Geographic Information Services Institute of Water And Flood Management (IWFM) Bangladesh University Of Engineering And Technology (BUET) Bangladesh Phone : +880 1552 328617, +880 2 8817648 Email: Suahmed@cegisbd.Com; Sulbul2002@yahoo.com
44	Mr. M.G.T.S. Amarasekara	Postgraduate Institute Of Agriculture University Of Peradeniya, Peradeniya , Sri Lanka. Email: Thusithaamarasekara@yahoo.com
45	Mr. M S Umesh Babu	Research Assistant Centre For Ecological Economics And Natural Resources Institute For Social And Economic Change Nagarbhavi, Bangalore – 560072. Phone :+91 80 23215468 (extn 232), +91 9886768175

		Email: umesh@isec.ac.in
46	Mr. Nawaraj Basnet	Nepal Water Partnership/Jalsrot Vikas Sanstha, Nepal General Post Box No. 20694 Anamnagar, House No. 723/67 Tanka Prasad Marg Kathmandu Nepal. Tel: +977-1-4229582, Email ID: jvs@wlink.com.np
47	Mr. K. J. Joy	SOPPECOM 16, Kale Park, Someshwarwadi Road, Pashan Pune - 411 008 Maharashtra, India. Tel: +91-020-2588 0786, 2588 6542 Email ID: joykjjoy@gmail.com
48	Dr. A.Gurunathan	Chief Executive, DHAN Vayalagam (Tank) Foundation, 17, Vellai pillaiyar Koil Street S.S. Colony, Madurai – 625016, India. Tel: +91 452-2601673/83 Email: dhantank@airtelmail.com, dhantank@gmail.com
49	Dr. Sanjukta Das	Reader in Economics, Sambalpur University Jyotivihar, Burla Sambalpur, Orissa India PIN-768019 Tel: +91 663 2431548, 0663 2405484, Tel: +91 9438438998. Email: sanjuktam03@yahoo.co.in
50	Prof. Padmaja Mishra	Professor of Economics, Department of Economics , Utkal University, Bhubaneswar, India. Tel: +91 9437006683 Email ID: Padmajamishra_2000@yahoo.com
51	Dr. Suman Ranjan Sensarma	Assistant Project, Coordinator UNDP, New Delhi. India Tel: +91-11-23061519, 919873467801 Email ID: suman.sensarma@undp.org, sumansensarma@yahoo.com
52	Dr. Sara Ahmed	Chair, Gender and Water Alliance Faculty Residence # 320 IIM(A) Campus Vastrapur, Ahmedabad, Gujarat 380 015, India. Tel: +91 79-66325320, Mobile: +91 9998034731 Email ID: sara@sustainablewater.org, sarahmedin@yahoo.co.in
53	Dr. Margreet Zwarteveen	Assistant Professor Water Reforms Irrigation and Water Engineering group Centre for Water and Climate, Wageningen University Wageningen

		The Netherlands . Telephone: +31 317 484190 Email: margreet.zwarteveen@wur.nl
54	Mr. Nazir Ahmed Memon	Social Development Specialist, Sindh Irrigation and Drainage Authority, Government of Sindh, Left Bank, Barrage Colony, Hyderabad , Sindh Pakistan Tel: +92-333-2628305 Email: nzessani@hotmail.com
55	Ms. Pranita Bhushan Udas	61 Daksinmurthymarg, WN 7 Mitrapark, Kathmandu Nepal. Tel: 009771-4486696 Email: pranitabhushan@yahoo.com
56	Dr. S. K. Lal	Senior Lecturer, Department of Economics University of Allahabad 5 G, Shiv Nilay, Alopibagh Road, Allahabad - 211006, Uttar Pradesh India. Phone: 0532 2502755/ 2508236, 09839160117 Email ID: henchard007@yahoo.co.in
57	Prof. Amita Shah	Gujarat Institute of Development, Research Gota Char Rasta, Ahmedabad - 380 056. Gujarat India. Tel: 0091-2717-242366/7, Fax: 0091-2717-242365 Email: amita@gidr.ac.in, amitagidr@gmail.com
58	Ms. Seema Kulkarni	SOPPECCOM, SOPPECOM 16, Kale Park, Someshwarwadi Road, Pashan , Pune 411008 Maharashtra, India Phone: +91 20 2588 0786 Email: seemakulkarni2@gmail.com
59	Ms. Sayeda Asifa Ashrafi	Development Professional Action Aid International House #8, Road #136 Gulshan 1, Dhaka 1212 Bangladesh. Tel: +88 02 8837796, 9894331 Email: asifaashrafi@gmail.com
60	Dr. Jyotirmayee Acharya	Assistant Professor, School of Rural Management KIIT University, Bhubaneswar India.

		Phone: 09438677761, 091 674 2725742 Email: jacharya9@gmail.com, jyoti@ksrm.ac.in
61	Ms. Nazmun Naher	57, Sultangonj Road (1st floor), Rayer Bazar Dhaka-1209, Bangladesh. Tel: +88-02-9125324, 88-01912386728 Email: scaler_136@yahoo.com
62	Dr. Daanish Mustafa	Department of Geography King's College London Strand London WC2R 2LS United Kingdom Tel: +44 207848 1667 Email: daanish.mustafa@kcl.ac.uk
63	Prof. Vishwa Ballabh	Centre for Rural Management XLRI School of Business and Human Resources Jamshedpur (Jharkhand), INDIA. Tel: +91-657-398-3194, +91-657-398-3494 Mobile: +91-94-317-04691 E-mail: vishwa@xlri.ac.in
64	Ms. Kamal Melvani	Managing Director, Neo Synthesis Research Centre 18/7, Polgasowita Road, Siyambalagoda Polgasowita Sri Lanka. Tel: +9477 3304969 Email: neosynth@sltnet.lk, nsrc@sltnet. lk
65	Mr. Thinley Gyamtsho	RNR RC Bajo, Council for RNR Research of Bhutan Ministry of Agriculture, Wangdue. Bhutan Tel: +975 2 481209, Fax: +975 2 481311 Tel: +975 17832090, +975 77250025 Email: tgyamtsho@druknet.bt, tgyamtsho@yahoo.com
66	Dr.Vishal Narain	Associate Professor, School of Public, Policy and Governance MDI School of Public Policy and Governance MDI, Sukhrali, Gurgaon. Tel: +91 124 4560330 E-mail: vishalnarain@mdi.ac.in
67	Ms.Renuka Thapliyal	Lecturer, Geography Department Rajkiya Kanya, Mahavidyalaya

		Shimla, Himachal Pradesh, India. Tel: +91 177-2842032, Mobile- +91 9968408072 (Delhi) Email: go4renuka@yahoo.co.in, go4renuka@gmail.com
68	Prof.Sumita Sen	Department of International Relations Jadavpur University Kolkata - 700032, India. Phone: +91 33 2414-6344, 2414-6666 Email: senmita@yahoo.co.in
69	Dr. Kulbhushan Balooni	Associate Professor, Indian Institute of Management Kozhikode IIM Kozhikode Campus P.O. Kozhikode - 673570 Kerala, India. Phone: +91-495-2809116 Email: kbalooni@yahoo.com, kbalooni@iimk.ac.in
70	Dr. Niharranjan Mishra	Faculty, Member Council for Social Development Southern Regional Centre 5-6-151, Rajendranagar, Hyderabad 500030. Tel: +91-40-24016395, Mobile: +91-9441187927 Email: niharhcu@gmail.com
71	Ms. Luisa Cortesi	Ms. Luisa Cortesi (Megh Payne Abhiyan, Patna) via Zara 12 24058 Romano L.do (BG), ITALY. Tel: +91-9931105566 (India) Email: mpa.luisa@gmail.com
72	Mr. Samrat Goswami	Research Scholar, Department Of Economics University Of Kalyani Kalyani, Nadia Pin-741235, Mobile: +919831409547 Email: Sam449@Rediffmail.Com
73	Dr. Rakesh Tiwary	Independent, Researcher Dubey Campus Patna, Bihar, India. Mobile: +91 9771024080 Email: Rakeshtiwary1@gmail.com
74	Dr. Madhav B Karki	Deputy Director, General - Programmes International Centre for Integrated Mountain Development, GPO Box 3226, Khumaltar, Lalitpur

		Kathmandu, Nepal. Tel +977-1-5003222 Direct Line 5003318 Ext 208 Fax +977-1-5003277 Email: mkarki@icimod.org
75	Dr. Ben Crow	Associate Professor (Sociology) University of California Santa Cruz. USA. Tel: +831 459 5503; 650 245 6769 Email: bencrow@ucsc.edu
76	Ms. Priyanka Mallick	Research Scholar, South Asian Studies Jawaharlal Nehru University New Delhi - 110067, India. Phone : 09868474099 Email: pmallick.jnu@gmail.com.
77	Dr. G. Anand Vadivelu	Post Doctoral Research, Associate Centre for Interdisciplinary Studies in Environment, Institute for Social and Economic Change Nagarabhavi Bangalore – 560072 India Tel: +91 9448517238, 080-23215271, 080-23215804 Email: vadielu@isec.ac.in, vadivelu26@rediffmail.com
78	Dr. Sanatan Nayak	Fellow Giri, Institute of Development Studies Sector 'O', Aliganj Lucnow- 226024. Uttar Pradesh, India. Tel: +91-522-2328233,2321860, +91 9452142761 Email: sanatan5@yahoo.com
79	Mr. Abhijit Das	Senior Lecturer, Department of Economics Kandi Raj College, Kandi - 742137 Murshidabad, West Bengal, India. Tel: + 913324183750, 09433449642 Email: abhijit_dasecon@indiatimes.com
80	Dr. Aditi Mukherji	Researcher -- Social Scientist International Water Management Institute Colombo, Sri Lanka Tel: +94 11 2880000 Email: A.MUKHERJI@CGIAR.ORG
81	Dr. Ravi Narayanan	Advisor, Araghyam, Bangalore, India and, Ex-CEO WaterAid Internaional UK, 2nd Floor, 840, 5th Main, Indiranagar

		1st stage, BANGALORE, Karnataka, INDIA 560038 Tel: +91 (080) 41698941 / 42, +91 (080) 41698943 Email: ramnarayanan1@gmail.com
82	Mr. Sunil Thrikawala	Postgraduate, Institute Of Agriculture University Of Peradeniya Peradeniya, Sri Lanka. Tel: +94-77-3892160 Email: sthrikaw@gmail.com
83	Ms. Sakshi C. Dasgupta	Research Associate TERI, India Habitat Centre, New Delhi, India. Tel: +91 9212737811 Email: Sakshic@Teri.Res.In, Sakshi.Chadha@Gmail.Com
84	Dr. Kasphia Nahrin	Lecturer, Department of Urban and Regional Planning Jahangirnagar University, Dhaka,• Bangladesh. Tel: +88 01711 398754 Email ID: Kasphia_Urp@yahoo.com
85	Dr. Bikramaditya Kumar Choudhary	Lecturer, MMV Benaras Hindu University, Benaras Uttar Pradesh, India. Tel: +91 9935467846 Email: bikramadityac@gmail.com
86	Ms. Zebu Nissa	Director,•Pakistan Water Partnership, Karachi.
87	Dr. N C Narayanan	Associate Professor, Center for Technological Alternatives for Rural Areas (CTARA), Indian Institute of Technology, Mumbai, India. Tel: +22-25767842, +91 9869659510 Email: ncnarayan@iitb.ac.in
88	Mr. Abid Hussainy	Water & Sanitation, Specialist Urban Unit (Urban Sector Policy & Management, Planning & Development Department, Government of Punjab, Pakistan 4-B, Lyton Road, Lahore, Pakistan. Email: abid.hussainy@gmail.com
89	Mr. Gaurav Dwivedi	Manthan Adhyayan Kendra

		Dushera Maidan Road,Badwani– 451551. Madhya Pradesh India Tel +91 7290 222857 Email: Manthan.Kendra@Gmail.Com, gauravd1977@gmail.com
90	Dr. Priya Sangameswaran	Fellow in Environmental Studies Centre for Studies in Social Sciences, Calcutta R-1, Baishnabghata Patuli Township, Kolkata -700 094, India Tel: +91 (0)33 2462 7252 / 5794 / 5795 / 2436 8313/7794/95/97 Email: psangameswaran@gmail.com,priya@cssscal.org
91	Mr. Saiful Alam	Principal,• Scientific Officer Water Resources Planning Organisation Ministry of Water Resources House no.-103, Road No.-1, Banani Dhaka - 1213 Bangladesh Tel: + 88-02 8631461 Email: saif314@bdonline.com
92	Mr. Jos C Raphael	Consultant,•IWMI-Tata Water Policy Programme Icrisat Campus, Patancheru, Hyderabad. Mobile: 09447016400 Email : joscraphael@cancharnet.In
93	Dr. Peter P Mollinga	Senior Researcher , 'Natural Resources and Social Dynamics' ZEF Center for Development Research, Department of Political and Cultural Change Walter Flex Str. 3 53113 Bonn Germany Phone: +49-228-734918/1971; residence: +31-70-3253257 Fax: +49-228-731972, Email: pmollinga@uni-bonn.de Webpage: http://131.220.109.9/staff/289.html
94	Prof. Shahbaz Khan	Chief-Sustainable Water Resources Development and Management Section UNESCO Division of Water Sciences 1, rue Miollis, 75015 Paris France Tel: +33 1 45 68 45 69 Email: s.khan@unesco.org
95	Dr M.I.M.Mowjood	Department of Agricultural

		Engineering, Faculty of Agriculture, University of Peradeniya, Peradeniya. Sri Lanka Tel: +94 - 81 -2388923; Fax : 94 - 81 -2380125 Email : mmowjood@pdn.ac.lk
96	Dr. B V Mudgal	Associate Professor,•Center for Water Resources Anna University, Chennai - 600025, India. Tel: +91 944441065 E-mail: bvmudgal@annauniv.edu
97	Prof. Subodh Waghle	Professor and Dean, IITB-TISS School for Habitat Studies, Tata Institute of Social Sciences, Mumbai, India Adjunct Professor, CTARA, IIT Bombay, Mumbai, Adjunct Faculty, CEEP, University of Delaware, USA Trustee, PRAYAS, Pune. Tel: + 91 22 2556 3289-96, 2552 5324, Pune: +91 20 6561 5594, 2538 4662 Email: subodhwagle@gmail.com
98	Dr. Deepak P. Bhattarai	Principal, Nepal Engineering College (nec) GPO Box 10210, Kathmandu, NEPAL Tel: +977-1-6611744 Email: yasmine@wlink.com.np
99	Prof. Vishwa Ballabh	Professor, (Economics) & Coordinator Centre for Rural Management XLRI School of Business and Human Resources Jamshedpur (Jharkhand) INDIA Tel: +91-657-398-3194, +91-657-398-3494 Mobile: +91-94-317-04691 Email: vishwa@mail.xlri.ac.in
100	Mr. Sunder Subramanian	Advisor, Environment,•ICRA Management Consulting Services Limited Building No. 8, 2nd Floor, Tower-A DLF Cyber City Phase-II Gurgaon-122002, India Tel: +91 124 4545 800 Fax: +91 124 4545850 Website: www.imacs.in E-mail: sunder.subramanian@imacs.in
101	Ms. Kencho Wangmo	Department of Botany/Life Sciences, Shreubtse College, Kanglung, Trashigang, Bhutan. Ph no: +975 4 17640363

		Email: kencho.wangmo@gmail.com
102	Mr. Karma Chhophel	Specialist, Hydro-Net Services Division Department of Energy, Ministry of Economic Affairs, Thimphu, Bhutan. Tel: +975 – 2- 328280, 17600203 Fax: +975 – 2- 324834 Email: hsmd@druknet.bt
103	Mr. Ugyen Dorji	Department of Civil Engineering., College of Science and Technology, Rinchending, Bhutan. Tel: +975 17752130 Email: ugyen.dorji@cst.edu.bt
104	Dr. Mercy Dikito-Wachtmeister	Network Officer, GWP Southeast Asia/ GWP South Asia/ the Caribbean,•Global Water Partnership Secretariat Drottninggatan 33, SE-111 51 STOCKHOLM, SWEDEN Tel +46 (0) 8 -522 126 48 Mobile+46 (0) 73 914 26 48 Fax +46 (0) 8-522 126 31 Email: mercy.dikito-watchtmeister@gwpforum.org
105	Ms. Aarti Chataut	Executive Producer,•Nepal Television Singha Durbar Kathmandu Nepal Tel: 009 77 9851043111, 009 77 9851001072 Email: aartichataut@gmail.com
106	Ms. Bahar Dutt	CNN – IBN, Global Broadcast News Ltd. Plot No. 15-16, Sector-16A Noida - 201301 Uttar Pradesh India. Telephone : +91-0120-5341818, 3987777, Mobile: 9810904748. Email : Bahar.Dutt@network18online.com
107	Ms. Swapna Majumdar	C-18, Green Park (main), New Delhi 110016. Tel: +91 9868108972 Email: smaju@vsnl.com
108	Mr. Mostafa Kamal Majumder	Editor, The New Nation 1 Ramkrishna Mission Road Dhaka Bangladesh.•Tel: +880 27122654, 7122655, 7114514 Email: n_editor@bangla.net, mkm@bangla.net,

		mostafakmajumder@yahoo.co.uk
109	Mr. Feizal Samath	Journalist, Sunday Times P.O. Box: 1136 Colombo 2. Sri Lanka. Tel: +9411 777 728590, +94112304179 Email: ft@sundaytimes.wnl.lk
1		
110	Ms. Nimashi Fernando	Media Representative, The Sri Lanka Wildlife Conservation Society (SLWCS) 38 Auburn Side,•Dehiwala Srilanka Tel: +94112714710 or 0777-885330 Email: nimashi.fernando@yahoo.com
11	Dr Dammi Dayawansa,	Research Programme Coordinator CB Project, Postgraduate Institute of Agriculture, P.O.Box 55, Old Galaha RD, Peradeniya, Sri Lanka. Tel: +94 81-2386542, Fax : +94 81-2388318
112	Dr Keethipala, RC, CB project	Postgraduate,•Institute of Agriculture P.O.Box 55, Old Galaha RD Peradeniya, Sri Lanka. Tel: +94 81-2386542, Fax : (94)81-2388318
113	Prof. Kapila Goonasekere	Prof.Kapila Goonasekara 430/11,Sarasawigama Road Mahakanda Hindagala 20414 Sri Lanka.Email: kapila2911@yahoo.com
114	Dr L.W.Galagedera, CB Coordinator	Postgraduate Institute of Agriculture, P.O.Box 55, Old Galaha RD, Peradeniya, Sri Lanka. Telephone : (94)81-2386542, Fax : (94)81-2388318
115	Prof. Ranjith Premalal,	Head, Agricultural Engineering, PGIA, Postgraduate Institute of Agriculture, P.O.Box 55, Old Galaha RD, Peradeniya, Sri Lanka. Telephone : (94)81-2386542, Fax : (94)81-2388318

	SaaciWATERs Staff	SaciWATERs, Plot No 125 & 126, S.P.Colony, Tirmulgherry, Secunderabad - 500 015, Andhra Pradesh, India Tel: +91 40 27990139, 65762865, Tele Fax: +91 40 27796721, Email to: info@saciwaters.org
1	Dr. Dibya Ratna Kansakar	Project Director, Crossing Boundaries Email : dibya@saciwaters.org
2	Dr. Chanda Gurung Goodrich	Senior Fellow - Research, Crossing Boundaries Project Email : chanda@saciwaters.org
3	Dr. Anjal Prakash	Senior Fellow - Research and Outreach, Crossing Boundaries Project Email : anjal@saciwaters.org
4	Ms. Hemalatha Paul	Office Manager, Crossing Boundaries Project Email : hema@saciwaters.org
5	Ms. Sreoshi Singh	Research Associate - Water Policy, Crossing Boundaries Project Email: sreoshi@saciwaters.org
6	Ms.Anu Maheshwari	Communication Specialist, Crossing Boundaries Project Email: anu@saciwaters.org
7	Ms. Jayati Chourey	Research Associate, Water and Health, Crossing Boundaries Project Email: jayati@saciwaters.org
8	Mr. Arun Mallick	Research Associate, Water and Education Policy, Crossing Boundaries Project Email: arun@saciwaters.org

SaciWATERs

SOUTH ASIA CONSORTIUM FOR INTERDISCIPLINARY WATER RESOURCES STUDIES
Plot No 125 & 126, S.P.Colony, Trimulgherry,
Secunderabad- 500 015, Andhra Pradesh, India.
Tel: + 91 40 27990139, 65762865,
Tele Fax: 91 40 27796721,
Email to: info@saciwaters.org www.saciwaters.org