SAWAS
South Asian Water Studies

SAWAS

South Asian Water Studies

Volume 1, Issue 2, 2009

Adaptation to Climate Change Impacts and Regional Cooperation on Water and Hazards in the Himalayan Region

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Abstract

Water should be allocated efficiently taking advantage of externalities in the upstream-downstream framework. Its public-good characteristics means 'free-rider' opportunities need to be factored in. The Himalayan river basins will be impacted due to rapid glacier melting and temperature rise. The need for cross-border co-operation is more urgent now than the conventional rationale 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.

Keywords; Himalayan river basins, riparian nations, water trade, cross-border cooperation, Nepal.

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I. Introduction

The rapid retreat of the Himalayan glaciers has consequences for water-related hazards, such as glacier lake outburst floods, and for water stress, as a result of the decline in fresh water supplies during the lean season. Thus, there is a need to think and act seriously about cooperation among the countries in the Himalayan region for managing water resources and water-related hazards. According to the Fourth Assessment report of the Intergovernmental Panel on Climate Change (IPCC), the incidence and intensity of floods in the Himalayan region are expected to increase as a result of an increase in precipitation during the monsoon season and glacial retreat, both following from global warming. This poses a challenge for reducing the vulnerability of the more than 1.3 billion people living in the major river basins downstream from the Hindu Kush-Himalayan region. The overriding importance of climate change as a driver of environmental change makes it important to address disaster-reduction and water-management concerns in a holistic manner at the river basin level. Such an approach is considered by the IPCC to be an adaptive measure for climate change impacts.

The economics of water resources management also suggests the need to take advantage of externalities while planning water management, that is the production externalities reflected in the upstream-downstream linkages, whether it is for communities, districts, and provinces within national borders, or across international boundaries. While holistic basin-wide water resources management is an approach currently being promoted by water scientists and economists alike, in the Himalayan region the problem lies in the implementation of such a strategy, because most of the Himalayan rivers are international rivers and involve transboundary water management.

It has been suggested recently that regional cooperation on water and hazards can be facilitated by a perspective of regional economic cooperation that goes beyond the focus on water alone. This perspective would be based on water as a natural resource of central focus, around which cross-border economic exchange, primarily trade, and the development of infrastructure to facilitate it, take place. The present paper looks at these issues under three sections covering: a) conflict and co-operation, b) climate change impacts and regional cooperation on water-related hazards, and c) basin wide regional economic cooperation.

II. Conflict and Cooperation

This section presents an overview of the fundamental factors leading to cross-border water-related conflicts and likely avenues for cooperation and discusses them using examples drawn from the greater Himalayan region. The basic regional statistics related to the major rivers and river basins are summarised in Table 1.

Table 1: Principal Rivers of the Greater Himalayan region – Basic Statistics

	Area, sq km	Mean discharge (m^3/s)	% of Glacier melt in river flow	Population x1000	Population density	Water availability per person m3/year
Indus	1,081,718	5,533	44.8	178,483	165	978
Ganges	1,016,124	18,691	9.1	407,466	401	1,447

Brahmaputra	651,335	19,824	12.3	118,543	182	5,274
Irrawaddy	413,710	13,565	Small	32,683	79	13,089
Salween	271,914	1,494	8.8	5,982	22	7,876
Mekong	805,604	11,048	6.6	57,198	71	6,091
Yangtze	1,722,193	34,000	18.5	368,549	214	2,909
Yellow	944,970	1,365	1.3	147,415	156	292
Tarim	1,152,448	146	40.2	8,067	7	571
Total				1,324,386		

Source: Jianchu Xu *et al*. 2007

Factors leading to cross-border water-related conflicts - Some of the critical indicators of vulnerability to conflict among nations related to water availability are the per capita water availability, the level of water withdrawals for annual use in relation to its availability, and the extent of dependence on water resources that flow in from the borders. Table 2 shows the per capita water availability by country in 2000 and 2005.

Table 2. Per capita water availability in 2000 and 2005 (cubic metres/person/ year)

Country	Basin Name	Population, Thousands	Per Capita Water Availability* 2000	Per Capita Water Availability* 2005
Afghanistan	Indus, Tarim	24,926	2,986	2,610
Bangladesh	GBM**	149,664	8,809	8,090
Bhutan	GBM	2,325	45,564	40,860
China	GBM, Indus, Tarim	1,320,892	2,259	2,140
India	GBM, Indus	1,081,229	1,880	1,750
Myanmar	GBM	50,101	21,898	20,870

Nepal	GBM	25,725	9,122	8,170
Pakistan	Indus, Tarim	157, 315	2,961	1,420

Source: FAO's AQUASTAT 2005

*Water Availability: Total Actual Renewable Water Resources

** Ganges-Brahmaputra-Meghana

The critical stress level of water availability, that is the level at which users start to feel the shortage of water, has been given as 1700 cubic meters per person per year. Some hydrologists have estimated 1000 cubic meters per person per year as the minimum water requirement for a moderately industrialized nation that uses water efficiently. In the region (Table 2), the annual water availability for Pakistan was already below the critical stress level in 2005, and judging from the rate at which it declined between 2000 and 2005, it may soon fall below the minimum level. The data shows that India, China, and Afghanistan are also water-limited nations in the region, where the annual water availability is quickly approaching the critical stress level.

Just as population growth could adversely affect the demand side, climate change may have a serious effect on the supply side of water resources management. Table 3 shows the ratio of annual water withdrawals (demand) to annual renewable water availability (supply) by country. Among the countries in the region, the level of water demand is about three-quarters of the level of supply in Pakistan. This would suggest that there might be a water shortage, if the water supply decreases due to adverse consequences of climate change. Normally, levels of demand greater than one-third of supply are considered risky. On the other end, the ratio is less than 5% in Myanmar and Nepal, which is an indicator of the vast potential of underutilized water resources that these countries might be able to tap without harming the riparian nations.

Table 3. Ratio of Water Demand to Supply by Country

Country	Basin	Water Withdrawals* as a Percentage of Renewable Supply**
Afghanistan	Indus, Tarim	36
Bangladesh	GBM	7
Bhutan	GBM	NA
China	GBM, Indus, Tarim	NA

India	GBM, Indus	34
Myanmar	GBM	3
Nepal	GBM	5
Pakistan	Indus, Tarim	76

Source: FAO's AQUASTAT 2005

*Water Withdrawals: Total Use

**Renewable Supply: Total Actual Renewable Water Resources.

Since the countries in the Himalayan region fall within the three major river basins of the Indus, Ganges-Brahmaputra-Meghana (GBM), and Tarim, the extent to which water resources are shared would be an important indicator of vulnerability to competing interests among the nations in the region. Table 4 presents data on the fraction of the total water supply of the countries that originates outside their borders and that flows across their borders to other nations. Both Bangladesh and Pakistan receive more than three-quarters of their surface water supply from across their borders, mainly from India. Furthermore, although only about one-third of water supply to India originates outside its borders, almost three-quarters of the surface water during the dry season in the fertile and high population density, Ganges basin flows from Nepal. These interrelationships between Bangladesh, India, Nepal, and Pakistan in the Indus and the GBM basins may give rise to frictions and tensions over water in the region.

Table 4. Dependence on Imported Surface Water

Country	Basin	Percent of Total River Flow Originating Outside of Border
Afghanistan	Indus, Tarim	15
Bangladesh	GBM	91
Bhutan	GBM	0.4
China	GBM, Indus, Tarim	1
India	GBM,	34

	Indus	
Myanmar	GBM	16
Nepal	GBM	6
Pakistan	Indus, Tarim	76

Source: FAO's AQUASTAT 2005

A. Potential Areas for Regional Cooperation on Water

The literature suggests that although cooperation can occur when mutual benefits are possible, existence of potential benefits is not sufficient for cooperation to take place. There is a need to ask three questions: (a) are there truly potential mutual benefits, or is it a situation where only one party can benefit at the cost of the other, (b) if the latter, can the situation be redefined to transform it to one of potential mutual benefit, and (c) what are the impediments to actually achieving mutual benefits (Crow and Singh, 2000). Cooperation between India and Pakistan in the Indus river basin is considered as a good example of the situation being redefined to transform it into one of potential mutual benefit by enlarging the size of the pie rather than just dividing it.

The principal potential benefits of cooperation in water resources are: (a) sharing information for flood forecasting and early warning, (b) storing water in upstream river basins for flood moderation, (c) storing water resources for increasing flow in dry seasons, (d) storing water for inland water transport, (e) harnessing water resources to generate hydroelectricity, and (f) managing watersheds to help increase the quality and quantity of water available for irrigation and drinking water by downstream users.

The type of exchange of benefits between countries may be: (a) bilateral barter, which is subject to the need to find a "double coincidence of wants", or (b) a financial transaction based on the payment of a mutually-agreed upon monetary value for the environmental services delivered. Table 5 lists what the governments of Bhutan, India, and Nepal have sought from each other to benefit mutually from the development of water resources in the GBM basin.

Table 5. A simple framework to study potential water-related international transactions between Bhutan, India, and Nepal

Potential parties	Good or service	Type of exchange anticipated
Bhutan to India	Supply of hydroelectric power#	Monetized
Bhutan to India	Supply of water storage benefits*	Barter exchange
India to Bhutan	Navigation and transit#	Barter exchange

India to Bhutan	Provision of finance and engineering for construction#	Partly monetized
Nepal to India	Supply of hydroelectric power*	Monetized
Nepal to India	Supply of water storage benefits*	Barter exchange
India to Nepal	Navigation and transit#,*	Barter exchange
India to Nepal	Provision of finance for construction*	Monetized
India to Nepal	Provision of engineering expertise*	Probably monetized

Source: Crow and Singh (2000)

#: occurring to some extent

*: discussed

**: suggested

B. A Simple Example of Cooperation

The opportunities for cross-border cooperation between India and its neighbours, Bhutan and Nepal, on hydroelectricity were enhanced by two major developments in India related to the power sector, one physical and the other institutional. At the physical level, hydroelectric power-grid interconnections in India evolved from the local level in the 1950s to the provincial level in the 1960s, and then on to the regional level in the 1970s and finally to the national level in the 1990s. For the development of transmission and power-grid interconnections, the Power Grid Corporation was given responsibility for: (a) the development of the national grid by interconnecting the five regional grids, (b) establishing the national load dispatch center, and (c) modernizing the regional and provincial load dispatch centers.

At the institutional level, India promoted the establishment of trading companies, such as the government-supported Power Trading Corporation (PTC), to promote the power market. As these physical and institutional setups succeeded within its borders in India, they started exploring cross-border sources of power for interconnections and trading. From India's perspective, as the PTC sees it, the rationale for long-term cooperation in energy are: (a) to take advantage of the potential for economies of scale as a result of large cross-border projects set up primarily to address opportunities provided by India's shortage situation; and (b) to use cross-border renewable energy sources for environmental and conservation benefits, among others. They have identified the major constraints to cross-border power trading as: (a) transmission infrastructure and wheeling facilities within the boundaries, (b) inter-grid synchronization for cross-border interconnections, and (c) electricity pricing.

Worldwide, cross-border grid interconnections are on the rise. Interconnections already exist in North America, Europe, and Southern Africa, including the Nord Pool (Denmark, Finland, Norway and Sweden), and the South African Power Pool (12 countries). India intends to use its recent domestic experience in regional grid interconnections for expanding to cross-border grid interconnections. India's existing major cross-border interconnections are with Bhutan: Chukha hydroelectric project (336 MW) interconnected at Birpara in India, and Tala hydroelectric project (1020 MW), at Silguri in India.

For electricity pricing, the power trading companies act as "market makers" negotiating prices separately with the producers (generators) and distributors, and thus taking the "market risk", which they tend to diversify by dealing with a large number of buyers and sellers, in what is a suppliers' market as of now. The trades are largely short term, duration less than one year, although efforts are being made to increase the long term ones, towards a seventy-thirty short-term to long-term mix.

However, such cooperation in hydroelectric power can take place only after the necessary legal provisions are agreed upon by the two countries. The India-Nepal Power Trade Agreement signed on June 5, 1997, but yet to be ratified by the Nepalese legislature, is an umbrella agreement for power trading between the two nations. It goes a step ahead of the agreements between Bhutan and India dedicated to the specific hydroelectric projects. The India-Nepal agreement provides unlimited marker access for power trading. Any party in India or Nepal may enter into a power trade agreement: government, semi-governmental, or private enterprise (see, Article1). It also makes a provision for the market mechanism to decide on the price and the quantity of electricity to be delivered at a mutually agreed-upon destination, without any form of government intervention (see, Article 2). In some form, the agreement has already been used as a basis for the power trading agreement between the Power Trading Corporation of India and the Snowy Mountain Engineering Corporation (SMEC) for the sale of power to be generated at the 750 MW West Seti project in Nepal. Once it is brought to full practice, it may be a best practice example of cooperation in power trade between riparian countries. To realize such opportunities for cooperation in hydropower generation, however, it may be increasingly necessary to take adaptation measures to face potential glacier lake outburst floods in the region.

III. Climate change impacts and regional cooperation

Climate change has introduced a new dimension to the potential benefits of cooperation in the context of upstream-downstream linkages. Temperature changes in the Himalayas have been much higher than the global average. In Nepal, an increase has been recorded of 0.6 degrees centigrade every 10 years between 1977 and 1999 (Shrestha, *et al*, 1999). Warming in Tibet has also been progressively greater with elevation (Liu and Chen, 2000). The glaciers of the Himalayas, especially in the eastern and central regions, have been shrinking at an accelerated rate in recent decades, although this drastic reduction in ice cover has not been observed in the north-western Himalayas, Karakorum, Hindu-Kush, or Pamirs (Xu, *et al*, 2007). However, these observations have to be evaluated carefully as they have been largely based on limited case studies.

Climate change may lead to an increase in the frequency and magnitude of glacier lake outburst floods (GLOFs) and flood-related disasters. Scientists have estimated that if the present trend continues, most valley glacier trunks and small glaciers will disappear by 2050. As glaciers retreat, glacial lakes are often formed especially in locations above 4,500 meters. Subsequently, glacier lake outburst flood (GLOF) events may occur as the amounts of melt-water in these lakes increase and the moraine deposits give way. There have been at least 35 GLOF events in Bhutan, China, and Nepal in the past. 204 potentially dangerous lakes have been identified in the Hindu Kush-Himalaya region. In addition, high relief, steep slopes, complex geological structures with

active tectonic processes and continued seismic activities, and a climate characterized by great seasonality in rainfall, all combine to make water-induced disasters a common phenomena in the Himalayan region. Floods and droughts are likely to increase further both due to the decline in glaciated area of the basin causing reduced hydrological modulation and due to an increase in extreme precipitation events.

A Simple Example of Regional Impact of Potential GLOFs

To demonstrate the increasing need for regional cooperation in the context of global warming, an example of upstream-downstream linkages related to potential GLOFs and hydropower stations in the Himalayan region is presented here for the Dudh-kosi sub-basin in the gbm's koshi basin, 54% of whose catchment area falls in china (Tibet) and 46% in Nepal.

The dudh kosi sub-basin is home to about 36 valley glaciers. These glaciers have retreated at rates of between 10 and 74 meters per year. For example, the rate of retreat for the Imja glacier near Mt. Everest, the one retreating fastest, has increased from 41 meters per year from 1962 -2001 to 74 meters per year from 2001-2006. This sub-basin contains 12 "potentially dangerous" glacier lakes, all moraine dammed, including Imja and Dig tso. The basin has experienced glof events in 1977, 1985, 1998 and 2001, including the Dig tso event. The Dig tso glof event on 4 august 1985 caused a 10 to 15 meter high surge of water and debris to flood down the Bhote kosi and Dudh kosi rivers for 90 kilometers. At its peak, the discharge was 5,613 cubic meters per second, two to four times the magnitude of maximum monsoon flood levels (Shrestha, et al, 2006). The flood began in early afternoon and lasted for about six hours. The resulting damage included the complete destruction of the almost-completed hydropower project at Thame near Namche in the everest region, built at an estimated cost of 45 million rupees. To minimize the adverse impacts of such events, it is necessary: (a) to monitor and assess the status of glacier lakes, (b) to install early warning systems, (c) to implement mitigation measures, and (d) to develop estimates of flow-regime changes in different catchments under various likely climate change scenarios, in order to develop a scientific basis for cost-effective adaptation measures (Bajracharya, Mool and Shrestha, 2007).

It is clear from detailed GIS mapping of the Kosi Basin, that GLOFs in China (Tibet AR) and Nepal could have serious consequences for the existing and planned hydropower stations in Nepal (see Figure 1).

Figure 1: Potentially dangerous glacier lakes and hydropower stations in the Kosi basin

The location of the cross-border potentially dangerous glacial lakes in the catchment of the Arun River, on which the Upper Arun (335 MW), Arun III (402 MW), and Lower Arun (308 MW) hydroelectric power stations are planned, is noteworthy. The location of such lakes in the catchment of the Dudh-Kosi River, on which a storage hydropower project (300 MW) is being planned, also deserves special attention. Further to the west, the Tso Rolpa glacial lake is situated in the catchment that can affect the tailrace part of the existing Khimti-Khola hydropower station (60 MW). This is also one of the cases in which mitigation measures have been carried out and early warning systems established by the government, with donor support. Further west of the Dudh-Kosi River is the Tama-Kosi River, on whose catchment several potentially dangerous glacier lakes have been identified across the border in China (Tibet). These examples demonstrate that regional cooperation on managing GLOF risks is essential to reducing project risk, which is vital to raising funds at a reasonable cost of capital, for generating hydroelectricity in Nepal to sell in the Indian market at competitive prices.

Specific areas of action to be considered for regional cooperation include the following:

a) The Himalayan region is considered to be a data 'white spot' (data gap) in the global climate map of the 4AR of the UN's Intergovernmental Panel on Climate Change (IPCC) due to the paucity of data on hydrology and meteorology. There is a need for regional cooperation among the countries in the Himalayan region to gather and share information for assessing and monitoring climate change and its consequences for water resources management.
b) National Adaptation Plans of Action (NAPAs) are currently being prepared by the national governments of the Himalayan region on the initiative of the UN Framework Convention on Climate Change (UNFCCC). These NAPAs need to suggest plans of action to simultaneously utilize satellite-based techniques supported by field-based techniques for monitoring glacier retreat as well as for assessments of the potential impact downstream of glacial lake outburst floods.
c) The principle of integrated water resource management at the basin level, or IWRM, has already been accepted by scientists and policymakers alike. It is considered by the IPCC to be an adaptive measure for climate change impacts. The concern currently is how to implement this approach by incorporating water governance within the framework of national governance. As the national governments of the Himalayan region make preparations to implement IWRM, it is necessary to consider regional cooperation for adaptation to the events occurring in the catchments that lie across the borders. For example, as described above, glacial lake outburst floods in China could affect hydropower stations in Nepal.

Furthermore, the concept of IWRM at the basin level follows an eco-system based framework. Water is considered to be a life-line or blood supply line of the entire ecology, climate, and broader environment. The inherent nature of the geo-morphological make-up of the catchments of the river and the connecting sub-rivers determines the potential of natural siltation. The human induced changes and infrastructure development combined with the regional and global climate change impacts indicate the aggravated nature of hazards that can trigger water-induced disasters. The concept of IWRM at the basin level can promote an integrated management of land, water, and plant resources involving the people within the catchments. Such an approach has already been practiced worldwide including the Tennessee Valley Authority (TVA) and to some extent in the Mekong river basin.

IV. Basinwide regional economic cooperation

The state of international cooperation on water is limited by the fact that governments tend to negotiate agreements on benefit-sharing in very specific areas of cooperation, such as hydroelectric power trade, without considering the holistic approach. While it is a step in the right direction for developing physical and institutional mechanisms for cooperation on water, the limitation of such cooperation is that it does not clearly address the factors leading to cross-border conflicts on water, such as the declining per capita water availability due to increasing demand in both the domestic and industrial sectors, depleting supply, and population growth in urban centres, all increasing the gap between supply and demand.

Treaties on international rivers do not seem to reflect the concerns that the scientific and economic principles discussed above suggest. In an analysis of 145 international treaties related to water, 39 percent included benefit-sharing in hydroelectricity. In only about a third of the cases was the quantum of water allocation considered, with flood control accounting for 9 percent (UNDP, 2006).

There is also a preference among riparian nations to opt for bilateral negotiations, even in river basins shared by more than two countries. Out of the 263 international river basins, 106 have water institutions, and two-thirds of these have three or more riparian nations. However, less than a fifth of the accompanying agreements are multilateral, showing the preference by

riparian countries for bilateral agreements (UNDP, 2006). Furthermore, third party mediation is also discouraged, even when there are asymmetries of power between the countries involved. Here the main issues appear to be those related to property rights and externalities. The fact that international river water is a common property with a high `free rider' tendency by the lower riparian countries, it has limited exclusion potential, especially the economically weaker parties.

Many international river basins have shown interest to follow an approach of cooperation at the basin level. Such cooperation may be in the form of (a) coordination of activities, such as sharing information; (b) collaboration among the nations, such as developing adaptable plans; or (c) common action among the riparian countries, such as developing infrastructure facilities jointly. Nepal's statement at the U.N General Assembly Meeting in September 1998 probably sums up the interests of both the upstream and downstream nations in the Himalayan region (UN General Assembly Statement of Nepal, 1998):

> "Mr. President: On our march towards a democratic and just society, we face many challenges, such as pervasive poverty, mass illiteracy, environmental degradation, population explosion and, above all, gender inequality. We believe that many problems related to economic development can be more effectively tackled through regional or sub-regional cooperation among nations. Tremendous opportunities are available for sub-regional cooperation in our part of the world among the countries in the Ganga-Brahmaputra-Meghna basin. These opportunities include water resources development, flood control, energy supply, forestry management and environmental protection, among others. Development efforts in water resources, for example, would help irrigate the fertile fields in the plains of India, improve the waterways so vital for the transportation sector of Bangladesh, and generate hydropower in Nepal to meet the energy needs of the region as a whole. Such a development strategy may be the key to future prosperity in the region."

The issue is how we could create an environment conducive to optimal utilization of water resources at the basin level. While IWRM is an approach currently being promoted by water scientists, donors, and economists alike, the overriding importance of climate change as a driver of environmental change makes it even more important to address disaster-reduction and water-management concerns in a holistic manner. However, the problem is in the implementation of such a strategy.

Interestingly enough, such an environment may be feasible only if we can also consider within the basket of benefits resulting from cooperation, indirect economic benefits 'beyond water', although water will be the natural resource of main focus. Table 7 presents a simple framework on the basket of benefits resulting from cooperation among nations in the basin. This framework has adapted the classification of the benefits into four types: political, environmental, direct economic, and indirect economic benefits. All four are defined and illustrated in Table 7 (Sadoff and Grey, 2002). The table shows how the domain of treaties may expand from those based on (a) the conventional practice of water-sharing; to (b) the optimum utilization of water resources in the basin through IWRM; and finally to (c) regional economic cooperation through the integration of regional infrastructure, trade, and markets.

The success of all these treaties, however, will depend on the strength of the institutional mechanisms the riparian nations in the basin adopt for water governance. It appears to us that, in the changing context of regional integration for trade and investment among nations, institutional mechanisms for regional economic cooperation with a focus on water may have the highest probability of success.

The Greater Mekong Sub-basin (GMS) program in the Mekong basin may be a good example of adopting an institutional mechanism towards regional economic integration. The basin is shared

by the six nations of Cambodia, China, Laos, Myanmar, Thailand, and Vietnam. Along the lines of the classification in the framework on Table 7, while there have been major disputes in the region 'because of the Mekong', significant benefits have also been derived 'from the Mekong' through the lower basin's cooperative management. Furthermore, sharing these benefits has not only been an important stabilizing factor in the lower basin, but it has also brought substantial benefits 'beyond the river', both directly and indirectly. These benefits 'beyond the river' include the hydroelectric power trade between Laos and Thailand, even during the periods of conflict, and natural gas purchase by Thailand from Myanmar, creating ties that bind the countries in a web of mutual dependency (Sadoff and Grey, 2002).

Table 7. A simple framework on the benefits of cooperation

Taxonomy of benefits	Definitions	Examples	Domain of treaties	Probability of success
Political benefits	Reducing costs because of the river	Policy shift to cooperation and development away from conflicts	Conventional practice of water-sharing	Low to medium, e.g., Indus Waters Treaty
Environmental benefits	Increasing benefits *to* the river	Improved water quality, river flow characteristics, soil conservation, biodiversity	Based on the principles of integrated water resources management (IWRM)	Medium, e.g., Mekong River Basin Agreement
Direct economic benefits	Increasing benefits *from* the river	Improved water resources management for drinking-water, irrigation, navigation, and hydropower; for the conservation of freshwater ecosystems; and for risk-management of water-related disasters	Based on the principles of integrated water resources management (IWRM)	Medium, e.g., Mekong River Basin Agreement
Indirect economic benefits	Increasing benefits *beyond* the river	Integration of regional infrastructure, markets, and trade	Based on the principles of regional economic cooperation	Medium to high, e.g., Greater Mekong Subregion Program

An Example of basin wide cooperation on the Mekong River

The Mekong River Basin Agreement of 1995 is an example of a treaty that emphasizes IWRM. The purpose of the Agreement is to support (a) the sustainable development and management of the Mekong River basin's water and related resources, and (b) institutional, financial and management issues relating to the mechanism of coordination between the member countries. Prior to the signing of the 1995 Mekong River Agreement, the MRC's forerunner, the Interim Mekong Committee examined legal and institutional structures in other river basins (Mekong Secretariat, 1994). In particular, there was a direct input from the Murray-Darling Basin Commission in Australia, the MRC's counterpart organization in the Murray-Darling River basin, to the development of the 1995 Mekong River Basin Agreement. The final institutional structures adopted in the Mekong basin contain many similarities to those of the Murray-Darling Basin, with membership, frequency of meetings, and decision-making structures of the three permanent bodies being similar.

Four of the basin countries, Cambodia, Laos, Thailand, and Vietnam, have cooperated in their management of the basin by establishing the Mekong River Commission (MRC), created by the 1995 Agreement on the cooperation for the sustainable development of the Mekong River Basin. The MRC consists of three permanent bodies. In addition, as outlined in the Agreement, there are National Mekong Committees in each of the participant countries which act as liaison bodies between the MRC Secretariat and the national organizations. The three permanent bodies are as follow;

1. The Ministerial Council is the senior body which is made up of one member from each participating country at the Ministerial or cabinet level, who is authorized to make policy decisions on behalf of their government (MRC, 1995, Article 15).

2. The Joint Committee consists of country representatives from relevant government ministries at the Head of Department level (MRC, 1995, Article 23). It is expected to be much more active in the day-to-day running of the organization than the Council.
3. The MRC Secretariat, based in Phnom Penh in Cambodia, provides technical and administrative services to the Council and the Joint Committee, according to the direction of the Joint Committee (MRC, 1995, Article 28).

Based on the experiences gained in sub-Saharan Africa, Southeast Asia and South Asia, the constraints to the management of such regional basin organizations have been identified as (a) constrained autonomy; (b) weak institutional capacity; (c) insufficient financing; (d) the inability of the institutions to enforce agreements; (e) the lack of expertise for the technical, social, and environmental analyses required to formulate regional water resource development plans; (f) the unavailability of financial resources to provide appropriate levels of support for planning studies and to manage and operate the river basin organizations; (g) the lack of institutional concentration on project implementation due to the pressure of vested interest groups as opposed to regional development planning; and (h) the limited authority vested by the national governments in the regional basin organizations to implement policies and programs within its mandate (Gould and Zobrist, 1989; Salman and Uprety, 2002).

However, the greatest constraint is often the non-participation of some of the important basin countries in the basin initiatives. In the case of the MRC, for example, the absence of China and Myanmar has prevented basin-wide management. Nevertheless, these countries have joined with the MRC countries in the Greater Mekong Sub-region (GMS) program, which is envisaged from the perspective of regional economic cooperation. Such a perspective of regional economic cooperation goes beyond the focus on water alone, but would be based on water as a natural resource of central focus, around which cross-border economic exchange, primarily trade, and the development of infrastructure to facilitate it, take place.

All the six nations in the Mekong river basin, known as the Greater Mekong Sub-region (GMS) nations, have agreed to promote trade and investment in the region. The Asian Development Bank, through the GMS program, has supported regional cooperation for strengthening cross-border physical connectivity. The key activities of the GMS include development of economic corridors, focusing on road investments to improve access; institutional and policy changes for trade facilitation; and transit policy harmonization to reduce logistics costs across the sub-region. Five economic corridors have been identified and several road investments are under way in these corridors, while feasibility studies are addressing prospective improvements in railway networks. In addition to hard infrastructure facilities, ADB has also focused on cooperation through trade and transit harmonization (Kuroda, 2006).

V. Lessons learned for regional cooperation

In the changing context of the regional co-operation scenario brought about by climate change and economic globalization and their consequences for water stress and water-related hazards, the importance of wise management of transboundary rivers cannot be overemphasised. The international protocols and conventions as well as best practices and experiences discussed in this paper provide good models to conceptualize, design, and promote future cross border co-operation. Based on the analysis of this paper, the following policy implications and conclusions can be drawn.

1. Comprehensive ecosystems framework: We need a comprehensive ecosystem framework for the development and management of water resources in the Himalayas.
2. Adaptation to climate change impacts: The impacts of climate change could be a major problem. We need to focus holistically on the river basins and act fast; this may mean working across boundaries. In the context of upstream-downstream linkages, it is necessary to consider the benefits of transboundary cooperation for coping with the events occurring in the catchments that lie across the borders. (Glacial lake outburst floods in China, for instance, could affect hydropower stations in Nepal.) There is also a need for transboundary cooperation among the countries in the Himalayan region to gather and share information related to water-related hazards. To this end, an institutional mechanism for sharing data through a regional inter-governmental institution needs to be strengthened; such an institution already exists in the form of the International Centre for Integrated Mountain Development (ICIMOD).
3. Regional cooperation in water should be made part of the total regional economic cooperation and infrastructure development strategy. The establishment of power grid networks and the proliferation of power trading companies in India have helped develop the physical and institutional mechanisms necessary for trans-boundary trade in electricity. The imperatives of globalization and climate change are also strongly driving countries to embark on regional cooperation encompassing trade, commerce, and other economic exchanges along with regional sustainable development strategies. The perspective of regional economic cooperation may help to expedite the implementation of institutional mechanisms for regional cooperation on water and hazards for which good potentials exist in the Himalayan region.

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The Conception, Design, and Implementation of IMT in Pakistan's Punjab: A Public Policy Reflection[1]

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Abstract

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 argues that irrigation management transfer proved to be a policy irritant, because Bank adopted a coercive approach to lesson drawing and policy transfer. The policy transfer was un-informed, incomplete, and inappropriate, and therefore, the partial success was inherent in the design of the approach to policy transfer. 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.

Key Words: Irrigation Management Transfer, Lesson Drawing, Policy Transfer, Public Policy, Development Practice, Pakistan

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[1] An earlier version of this paper was presented at the International Conference on Water Resource Policy in South Asia, organized by South Asia Consortium for Interdisciplinary Water Resources Studies (SaciWATERs) at Colombo, Sri Lanka, on December 17-20, 2008.

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Introduction

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 revived 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, caused water logging and salinization 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.

The developments have not only been in infrastructure, but also in policies, laws, and institutional arrangements, to cater to the needs of emerging landscape and new realities. Most often, such changes have been coincidental to the development projects, and contributed to the perceptions amongst the population and civil society that the development donors push the policy changes. Since the macroeconomic reforms pushed by the International Financial Institutions (IFIs) have generally affected the poorest segments more adversely, it has become a natural tendency for the public to oppose and resist any advice that can be seen to come from IFIs. The mass media and civil society organizations in general and the staunch critiques, such as Bosshard (2007), tend to even blame the development cooperation between the government and IFIs to pursue high-risk strategies, that have instead triggered conflict, reinforced the deadlock in Pakistan's water sector, and wasted valuable time and financial resources.

The latest water policy was drafted in 2004 (GOP, 2004), but still awaits its implementation in full. The policy draws heavily on the mainstream principles of Integrated Water Resources Management (IWRM)[3], the contemporary and perhaps the most influential water resource management paradigm. The 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.

Irrigation sub-sector is by far the largest water user, and the current water policy document confirms to expand and further deepen the on-going reform in irrigation-drainage sub-sector. This paper therefore examines the emergence and implementation of water policy related to Irrigation Management Transfer (IMT), which had been a bone of contention amongst various actors in water policy arena. 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. Section 2 of the paper briefly introduces the conception of IMT in Pakistan; section 3 presents a few key design features of

[3] The IWRM inspired guiding principles of Pakistan's water policy can be summarized as a) holistic development, planning, and management of water resources; b) decentralization of development, management, planning, and service provision; c) separation of regulatory and service provision functions; d) autonomy of service providers organizations and ability to recover full cost of the service from consumers; e) use of incentives for inducing efficiency, conservation, and environmental protection; and e) inclusiveness, accountability, and transparency amongst the service delivery organizations.

IMT and its implementation. Section 4 of the paper examines Punjab's IMT experience through the prism of key concepts in public policy research and concludes the discussion.

The Conception of IMT in Pakistan

In the 1990s, on the advice of the World Bank, Pakistan's government embarked on major institutional reforms in irrigation management. The original reform proposal by the World Bank, devised through a detailed analysis of the situation, (World Bank, 1994) was too revolutionary. It proposed: a) to treat water as a tradable commodity rather than a public good; b) to create private water markets by giving farmers water property rights disconnected from land; c) to divide the four Provincial Irrigation Departments into 43 autonomous Public Utilities (PUs, one each for 43 canal commands) and to create Farmers Organizations (one for each distributary); and d) PUs should have company style management and be registered with the Corporate Law Authority under the Companies Act.

The Pakistani government sought comments from provincial governments on the proposal, who dismissed the analysis, and provided highly critical comments. All the provincial governments reacted that the Banks' proposals were too much divorced from reality, and the ideas did not match the prevalent socio-economic conditions. The federal government initiated discussions with the Bank for improving the reform model. The discussions and debates continued for another three years, when finally the World Bank and the federal government agreed on a revised reform model. The Bank rigorously pursued the reform through an 800 Million Dollar loan to the government under its National Drainage Program (NDP). The federal government pushed the provincial governments to accept the reform by attaching the further disbursement of NDP funds with the progress of the passage of legislation. Consequently, all the four Provincial Assemblies passed Provincial Irrigation and Drainage Authority (PIDA) Acts in 1997.

The revised model envisaged a three-tier irrigation and drainage management structure. The Farmer Organization (FO), established through the representation of watercourse level water users, was to supply water to irrigators, be responsible for operation and maintenance (O&M) of secondary irrigation canals, to levy and collect water charges, and to make payments to the canal level Area Water Board (AWB) for cost of supplying bulk water to the FO. The operating public utility would be the AWB, with an average command area of a million hectares (ha) who would manage and distribute irrigation water, through formal volume-based contracts with FOs, and trade water with other utilities. The Provincial Irrigation and Drainage Authorities (PIDAs) would be responsible for such functions as province-wide water delivery, system maintenance, and development, and sales of water beyond amounts contracted with AWBs.

The reform, however, remained quite controversial throughout the implementation of the NDP (1994-2003), and both the donors and the governmental staff were uncertain whether its progress would be realized smoothly or not (Dinar, et. al, 2004).

The Design and Implementation of IMT Policy

This section presents some of the key design features and implementation of IMT in the Punjab Province of Pakistan.

Objectives of IMTs

Global experience shows that either a serious breakdown in services, or an environmental failure, which affects large numbers of people, or a fiscal crisis, which makes the status quo untenable, or a combination of some of these, usually drive IMTs. Vermillion and Sagardoy (1999) in their global analysis of IMTs have reported objectives that propelled IMTs in various countries. The irrigation and drainage sector of Pakistan has gone through profound changes in recent

decades, and was found to be trapped in the vicious cycle of "poor funding, poor maintenance, poor infrastructure condition, poor supply, poor productivity, poor recovery, and poor funding" (World Bank, 1994). The water management and use habits resulted into lack of trust, anarchy, inequity, and lack of transparency, which evolved over time and have, at some time, fitted the particular prevalent economic, social, and environmental circumstances. The Bank's analysis identified these as the symptoms of deep-rooted problems of poor accountability (Dinar, et. al., 2004).

The formal irrigation and water supply services in Pakistan have been managed as exclusive monopolies of government agencies, which did not provide services to many – especially the poor and tail-enders – and provided poor quality services to those who had access. Merry (1997) associates the lack of accountability to the scale of irrigation systems and management by bureaucracies. The overall situation in Pakistan has been that the public irrigation supplying monopolies faced no competition, and the accountability was only upwards (Dinar, et. al, 2004). The status quo of unclear entitlements, discretion, and lack of transparency suited important groups in society. The essence of the reforms would be to reduce monopoly power, and introduce transparency, thus greatly reducing the space for deception and corruption. The reforms had to be introduced with the explicit objective of re-designing irrigation management institutions from a government monopoly to a public utility that would be responsible for sustainability of its assets, provision of quality irrigation and drainage services to its clients, and that would discharge its responsibilities in a business-like fashion, and would be accountable to the clients. However, Punjab's reform legislation overlooked the essence of accountability. The preamble of PIDA Acts of 1997 (Government of Punjab, 1997) conceived four key objectives of reform:

a) to implement the strategy of the Government for streamlining the irrigation and drainage system;
b) to replace the existing administrative setup and procedures with more responsive, efficient and transparent arrangements;
c) to achieve economical and effective operation and maintenance of the irrigation, drainage, and flood control system in the Province; and
d) to make the irrigation and drainage network sustainable on a long-term basis and introduce participation of beneficiaries in the operation and management".

A discourse analysis of the statements would reveal that while references to responsiveness, transparency, and efficiency were implicitly related to accountability, there was no explicit reference to making the bureaucracies accountable to users, thus defying the essence of reforms at the outset of reforms.

Lack of political will and resistance from stakeholders

The media picked up the proposed reform and various stakeholders engaged themselves in a hot debate, questioning the rationale, modalities, as well as the perceived outcomes. For example, it was reported in the newspapers that the government was going to sell the irrigation canals to the World Bank (Nakashima, 2005), and the farmers had the perception that the World Bank would charge much higher rates for irrigation water, and in advance (Bandaragoda, et. al. 1997).

People did not like, above all, the idea of a utility company, which would disconnect a water supply just because water charges were not paid properly (Nakashima, 2005). There was strong resistance to the proposed reform programme by all the key stakeholders. The Provincial Irrigation Department (PID) feared to lose authority to distribute water and maintain irrigation systems. Big landlords and influential farmers feared to lose extra water than authorized and poor farmers feared water rates would go up and influential farmers would exploit them.

While the federal government agreed to the need for reform by signing the loan agreement with the bank after some degree of resistance, the provincial governments did not share the same feeling equally. The federal government also gave mixed signals initially, for example, by delaying the acceptance of offer from Asian Development Banks (ADBs) for formulating water sector strategy, which offered support to develop comprehensive national and provincial institutional and policy reforms and infrastructure development plans for all water sub-sectors. "The Government's perceived lack of interest" led to a delay in its execution by almost 3 years and "only after a drought raised awareness of water issues," the follow-up missions of ADB could convince the Government of the need for the TA", and then the Government supported the TA. (ADB, 2005).

The staff of provincial irrigation departments (PIDs) not only opposed the reform, but resisted and felt as if the reform were being pushed onto them and feared that they would entail dissolution of their service, and a breakdown in existing rent relationships (Shafique, et. al. 2004). Another disincentive for the PID staff was that of leaving the relative security of service with the government, for a novel contractual work with more transparent and accountable institutions (World Bank, 2005). The PID staff obstructed the reform initially by delaying the passage of legislation till the donors threatened to withdraw the loan (van der Velde and Tirmizi, 2001). Once the legislation was in place, there was no option to not test the reform. PID happened to choose one of the most challenging irrigation systems in Punjab to pilot the reform.

Equally, those segments of the farmers who were benefiting from the status quo had opposed the reform (Nakashima, 2005). Larger landowners were the most opposed to change, since they had been gaming the system for decades. Clearly, they exercised political influence, and benefited most from the deinstitutionalized politics that were in vogue. Many accounts of reform in earlier years (for example by Nakashima, 2005; Shafique et. al., 2001; van der Velde and Tirmizi, 2001) indicated that the reforms were felt to be failing because of inadequate top level support, technical support to the farmers and vested interests of bureaucracy and big farmers. However, such opposition to reform was not unique to Pakistan, as Mollinga, et. al. (2001) reported similar experiences in India's Andhra Pradesh.

3.3 Legal pluralism and the resultant controversies

According to Pakistan's Constitution, water is largely a provincial subject, but the federal government has also to perform functions and responsibilities relating to inter-provincial matters. There are a myriad of legislative acts that govern irrigation and drainage systems in Pakistan, namely:

a) Provincial Irrigation and Drainage Acts of 1873
b) Water and Power Development Authority Acts of 1958
c) Indus River System Authority Act of 1992
d) Environmental Protection Act of 1997
e) The Punjab Soil Reclamation Act, 1952,
f) Water Users Association (WUA) Ordinance, 1981
g) The Provincial Water Accord, 1991
h) Provincial Irrigation and Drainage Authority Act of 1997

Enactment of reform legislation was perceived as the major success of PIDA. Besides introducing the PIDA Act of 1997, a number of other legal regulations were prepared, approved and translated to local language. These range from devising rules of business for PIDA, AWB, and FOs to election rules for FOs, and guidelines for system operation and maintenance, etc. However, formalizing everything endangered the flexibility, innovativeness, and dynamism especially amongst FOs.

Besides, there are contradicting, overlapping and overriding provisions in the laws mentioned above, which in certain cases cause confusions, misunderstanding and remain susceptible to misinterpretations (Government of Pakistan, 2004). There are clear tensions between the main irrigation and drainage legislations of provinces.

For example, the Irrigation and Drainage Acts do not foresee farmer's role beyond the tertiary canals and any interference by farmers in the main system management would be a legal offence, whereas PIDA acts require farmer organizations to manage secondary canals. The former would require farmers to report any interference by other farmers to irrigation departments, whereas the latter would require them to settle it themselves. The PIDA Act provides no hint about a legal course to be taken if its provisions contradicted earlier legislation.

Besides, PIDA act specifies that, "[a]*ll employees of the Irrigation Wing of the Provincial Irrigation and Power Department except such employees as may be specified by the Government in this behalf shall, subject to any other provisions contained herein, on coming in force of this Act, become the employees of the Authority*" and "the *Area Water Boards have to become financially self-sufficient in 7-10 years from the passage of this act*".

As of 2008, the Irrigation Wing of the PID still operates as it used to operate during the past century in canal systems other than the one where AWB operates. Even the pilot AWBs have not been made financially self-sufficient, as these have failed to generate enough revenue to finance their operations. One can argue that the lack of progress in converting the governmental monopolies into efficient public utilities was a rather deliberate attempt, as the PIDs "kept on debating modalities rather than focusing on instituting arrangements for transition management" (World Bank, 2005). Any smart lawyer could take the government to a court for violating the law.

IMT implementation

The Punjab became the first province to present PIDA legislation in its provincial parliament and got it passed, albeit in a hurry through a single "stroke of pen" (World Bank, 2005) and without much debate and understanding amongst the legislators. The reason given by the then chief minister at the time for speedy passage of PIDA Act was not the felt need for reform; rather fear of cancellation of loan by the Bank. Other provinces had just waited for Punjab to pioneer, and then followed suit. Even after passage of the legislation, the political support for reform was mixed, indicated by the frequent changes of the leadership of Punjab PIDA. The first leadership had provided a championing discourse in early years of reform, and the reforms slowed down and changed course after his replacement. The Punjab government replaced the leadership of the PID to speed the reforms up once the World Bank again threatened to exclude Punjab from the future investments.

Then the PIDs recruited its own social mobilizers and quickly organized farmers into FOs within a span of one year, but these FOs proved to be rather symbolic and lacked enthusiasm for managing the irrigation and drainage systems. Blaming their willingness and capacity, the PID assigned simpler, but socially negative roles of reporting offenders to FOs and called it "the Punjab Model of Reforms". Since 2003, the PIDA has installed an AWB and formed 85 farmer organizations in the Lower Chenab Canal (LCC) East. PIDA did not attempt until 2007 to ensure farmer's representation in the AWB, and the AWB played only an advisory role.

The current reform design only guarantees greater participation of farmers in the system management, but achievement of all other stated objectives of transparency and efficiency are not guaranteed. The entire focus of reforms remained on the establishment of FOs, and to some degree on establishing the AWBs. The contractual arrangements between FOs and AWBs remained one sided and top down, where FOs were accountable to AWBs and PIDAs, but not the other way

around. The PIDA and AWB's rights to water remained unchallenged, while its obligations to deliver water to WUAs were rarely legally binding (World Bank, 2005).

PIDAs still retain a number of discretionary powers, for example, to cancel the contract, to declare some canal commands exempted from water payments, etc. For the emerging AWBs and PIDAs to be accountable and transparent to their respective clients, it would require a clear contract between the AWBs and the FOs, which would define the rights and responsibilities for water and for payments of both parties as well as sanctions for non-fulfillment of obligations and responsibilities. The absence of such contracts is one of the major reasons why the PIDAs and AWBs still act as monopoly-providers, as they remain unaccountable to users, and information sharing remains so poor and opaque.

The later assessments of the Bank showed that "the reform effort failed to address the realities of political economy embedded in the profound changes the reforms sought" and that the overall performance of the effort "remained unsatisfactory" (World Bank, 2005)., due to following reasons:

a) The reforms focused too much on organizations and organizational designs, but completely ignored the instruments and incentives;

b) Lack of a detailed strategy for implementing the key elements of the reforms; the PIDA Acts envisaged a "stroke of the pen" conversion of PIDs into PIDAs but lacked important details for implementing the reform strategy. The reform legislation did not address the fundamental issues of legalizing water markets, or clarifying communal and individual water rights.

c) The donor's underlying assumption that transition plans, severance packages, and change management arrangements would be defined and developed during implementation did not materialize due to constant distraction by other implementation issues and battles of turf and jurisdiction among the various participating agencies. Similarly, the naïve expectations that AWBs and PIDAs would introduce transparent volumetric measurements, bulk water sales, and water charges based on volume during implementation also did not materialize as they received far lower priority by the implementers than the easier to implement rehabilitation works.

d) From 1999 onwards, the prevailing drought and resulting water shortages dominated the water sector debate in Pakistan and the issues surrounding new storage proposals distracted Government's attention away from drainage and institutional reform issues. The assessments also concluded that an infrastructure rehabilitation project covering all the provinces and envisaging a major civil works component was not the right vehicle for implementing reforms that sought to focus on improving irrigation service delivery through participatory management, a system of property rights and incentives. A more focused irrigation project would probably have been a more appropriate vehicle.

Apart from Bank's own assessment above, major implementation issues resulted from lack of political will. For example, passage of enabling legislation for reforms was strategically delayed, and so were the arrangements for establishment of FOs and AWBs. Frequent leadership changes within PIDAs kept on frustrating the direction and momentum of reform. At the initial stages the reform was interpreted by PIDAs as a usual infrastructure project as enough funds were allocated for civil works and the provisions for capacity development and institutional change for farmer organizations and the provincial irrigation departments, which were rather new activities under the reform programme, received much lower funds. Since PIDAs deliberately wanted to frustrate reform, non-infrastructural developments would only take place when the

Bank would threaten to withdraw funds. The half-hearted progress by PIDAs on institutional aspects resulted into major focus on organizational designs, rules, and regulations, and complete oversight on reform instruments such as incentives and accountability. One could even argue that the PIDAs deliberately avoided or significantly delayed commissioning studies on framing transition strategy for irrigation departments to shift to the new management paradigm. PIDAs also avoided addressing the details of issues such as staff displacement, staff reporting, financial flows and sustainability, or improved management and system operations during the post-transfer period.

Discussion and Conclusions[4]

There is a growing tendency amongst IFIs, development donors, and technical cooperation agencies to undertake "lesson drawing[5]" (see Rose, 1991 for a detailed account of the concept) from policy initiatives and practices of various sectors by looking at the potential for innovation by cross-national learning, and then carrying out "policy transfers". "Policy transfer" refers to the process in which knowledge about policies, administrative arrangements, institutions, etc in one time and/or place is used in the development of policies, institutional arrangements, and institutions in another time and/or place (Dolowitz and Marsh, 2000). The earlier or contemporary reform efforts sponsored by the IFIs in Chile, Mexico, Turkey, and Egypt inspired the IMT policy in Pakistan to a large extent, and thus provide an interesting case of application of the above concepts.

The lesson drawing exercises are useful as these identify both, the symptoms and the root causes of the existing policy failure, as these base themselves on a detailed analysis of the existing contextual setting, as was the case with the World Bank's analysis of the situation in Pakistan. While in Bank's interpretation, the anarchy, chaos, and deterioration, etc, were all the symptoms, the core of the problem was related to monopolistic nature of irrigation institutions, that lacked transparency in their operations and accountability to the clients (World Bank, 2005). Therefore, it tried to argue for a reform model that does not only treat symptoms, but also the core problem of inducing accountability to clients. However, the Banks' own assessments indicate that the reforms have failed to address the fundamental issues (ibid).

It is argued that a number of problems that have frustrated the reform effort could have been avoided, if the Bank itself would have learned from the "lessons" of public policy research.

First, as is clear from the above analysis, the IMT policy in Pakistan was largely seen as a "policy irritant" (Tuber, 1998), at least by the PIDs, as the Bank tried to transfer a policy based on its experience in countries having little to do with the prevalent socio-economic context in Pakistan. The World Bank's, and other donor's, style of carrying out "lesson drawing" exercises contributes much to such perceptions. A team of pertinent international and local consultants is engaged to carry out such exercises, generally comprising disciplinary sectoral experts, socio-economic experts, environmental experts, and the like. The local consultants are usually highly knowledgeable and highly experienced people about the local situation and its evolution, and the current challenges and issues facing the particular sector, whereas the international experts bring knowledge about similar situations elsewhere. However, the staff of organizations under study sees the consultants as "outsiders". As in case of carrying out a diagnostic analysis of irrigation service, a local consultant from federal government's Water and Power Development Authority, a university, or a research institute not affiliated with PIDs would always be an

[4] The paper deliberately does not provide references to the statements made by officials for the sake of respect for anonymity of information sources.

[5] James and Lodge (2003) opine that the concept is limited from the public policy research perspective

"outsider". Thus, the PID staff would regard his/ her contributions to the analysis of situation as "partial and biased" and based on "half reality". Besides, the international experts role is associated with connotations of not contributing anything substantial, rather crunching the old information provided by the organization in a new fashion. Commenting on World Bank's proposal of 1994, a high-level technocrat in Pakistan characterized the consultant in 1997 as, "a person, who borrows your watch, looks at it, tells you the time, and charges a very high fee for his service, and the Bank pays it in the name of service to our country". Therefore, the first reaction from the key PID staff to the critical recommendations and suggestions coming from such a team would be met by statements like, "it will not work in our conditions", "Pakistan is not Mexico or Turkey", "the recommendations suit more to the Banks wishes rather than our reality", etc. These perceptions reflect how the key decision makers from the recipient country receive the lessons from the "lesson drawing" exercises carried out in usual World Bank style. One way of avoiding such perceptions would be to ensure that institutionalized arrangements exist for inclusion of the perspective of the recipient organizations in the "lesson drawing" exercises.

Second, the adoption of IMT policies in Pakistan represents a case of a "coercive policy adoption" as opposed to a "voluntary policy adoption" (Dolowitz and Marsh, 1996) at all levels. State bureaucracies are a key to the success of the reform in countries with large irrigation and drainage infrastructure like Pakistan (Scheumann, 2002). The perceived lack of political will and support by state bureaucracies can be attributed to the coercive nature of the reform. The Bank forced the federal government to adopt IMT policy by attaching conditionality to further loan disbursement, and the federal government pursued the same strategies for ensuring compliance by the PIDs. One can argue that the partial success of IMTs was very much inherent in the coercive approach followed by the Bank, who tried to push its design against the willingness of the recipients. Dolowitz (2000) identifies three main reasons for policy failure in "policy transfer" cases; a) uninformed transfer, b) incomplete transfer and c) inappropriate transfer. In case of Pakistan, it appears that all the three reasons were quite evident when the debate started. The staff of the federal as well as provincial water administrations had little or no knowledge of how to transform governmental monopolies into accountable corporate style PUs beyond enactment of legislation. The IMT policy simply ignored the crucial elements of the PUs, such as accountability-based contractual arrangements, and detached property rights to water. Since the policy transfer was coerced, the PIDs focused more on relatively "harmless" elements of the policy lessons, i.e., organizational designs and arrangements of FOs and AWBs (World Bank, 2005); to demonstrate compliance with loan conditionality, but completely ignored devising and introducing reform instruments that could reduce its monopoly power. The PIDs ignored attending to a) assignment of clear water rights for FOs, b) making AWBs accountable to FOs, and c) putting in place strategies for capacity building of FOs, AWBs, and PIDAs to undertake their jobs in the new fashion.

Third, as pointed out by the classical literature on organizational theory (see for example, Deutsch, 1963), the Bank and the government should have considered the initial opposition and resistance from the bureaucracy and farmers alike, as a proxy indicator that the policy learning by the implementing PIDs would be rather overly backward and conservative. PIDs would never transform unless their current path dependencies (Pierson, 2000) were altered before the reforms.

Finally, and perhaps more importantly, a governmental bureaucracy, that has its roots in the colonial system of administration, and is imbued with its imperialistic pride of 'owning' the massive Indus Basin irrigation system as the 'Royal Irrigation Department' lacks capacity and will to reform itself. A reform design expecting a bureaucracy to reform itself would be too naïve to attain the targeted service-oriented PU that is accountable to its users. It might require a facilitated in-depth problem analysis, but together with various groups of providers and users of the service. Such a problem analysis should focus on yielding a joint action plan for addressing

and eliminating both the symptoms and deep-rooted causes of under performance, and then putting in place transparent mechanisms to undertake proposed actions. The implementation of such actions should be jointly monitored and evaluated by all stakeholders; the criteria and indicators should address both the quantity and quality aspects of performance.

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Gone Land, Gone Water: Crossing Fluid Boundaries in Periurban Gurgaon and Faridabad, India

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Acknowledgements

An earlier version of this paper was presented at the First Annual International Conference on Water Resources Policy organized by SaciWATERs, South Asian Consortium on Inter-Disciplinary Water Resources Studies, Hyderabad, at Colombo, Sri Lanka, December 17-20, 2008. Thanks are expressed to an anonymous referee for his comments on that paper that provided direction for further development and refinement of its contents

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Abstract

The northwest Indian state of Haryana, one of India's major food baskets, is witnessing a process of urbanisation characterized by large-scale acquisition of agricultural lands for urban uses. This paper examines the implications of this process for water use and management practices in periurban areas of Gurgaon and Faridabad, two of the state's fastest growing districts. The many ways in which periurban residents lose access to water are described; falling water tables because of competing pressures, relocation of polluting factories in the vicinity, longer routes for water collection and the acquisition of common property water sources. The current debate in the media over land acquisition has centred on financial compensations. However, since rights to water are de facto tied to rights to land, the acquisition of lands also implies a loss of access to water sources.

The paper uses a qualitative research design – semi-structured interviews, focus group discussions and meetings with key informants – to examine these issues in two villages in each of these districts. A property rights structure separating land and water rights, though essential, is difficult to implement. Institutions for mobilising periurban residents in collaboration with rural and urban governments shall be needed to address these concerns.

Keywords; periurban, common property resources, institutions, property rights, India

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Introduction: Conceptual Groundwork for the Analysis of Periurban Issues

Urbanisation and economic growth are recognized to be the most distinguishing features of the past century (McGranahan, 2006).There is currently a demographic shift world-wide, characterized by the movement of people from rural to urban areas at an increasing rate (World Bank, 2000). In the mid-1970s, less than 40 percent of the world's population is estimated to have lived in urban areas; by 2025 the figure is likely to be 60 percent. Changes in the urban population are particularly likely to affect low income countries. In 1950, 41 of the world's 100 largest cities were in developing countries. By 1995 the number rose to 64 and the proportion has increased ever since.

Rapid urban expansion in many nations proceeds concomitantly with the growth of periurban areas that have elements of both ''urban'' and ''rural'' characteristics and present new challenges to urban growth management (Tacoli, 2006). Though there is no consensus on the definition of the word ''periurban'', the word is generally used in three different ways, namely, to denote a place, concept or a process (Narain and Nischal, 2007). As a place, periurban refers to rural fringe areas surrounding cities. These are villages near the administrative and geographical boundaries of cities. This conceptualisation is, however, challenged by such scholars as Iaquinta and Drescher (2000) who underpin the importance of the underlying institutional contexts; it is the co-existence of rural and urban activities and institutions that defines periurban, rather than the sheer proximity to towns or urban centres.

Brook et al. (2003) note that ''periurban'' is better understood as a process, representing a transition between rural and urban and the flows of goods and services between villages and urban centres. These flows sustain periurban livelihoods.

More broadly, ''periurban'' could be understood as a concept used to refer to an interface between three systems, namely, the agricultural system, the urban system, and the natural resource system (Allen, 2003). As an analytic construct, ''periurban'' allows us to study the relationship between rural and urban activities, processes, and institutions.

In this context, we often talk of periurban as an "interface", a sort of meeting ground for the "rural" and the "urban". The PUI (Periurban Interface) is understood to have certain environmental, social, and institutional characteristics. Environmentally, it represents a heterogeneous mosaic of natural ecosystems, productive or agro- ecosystems, and urban ecosystems affected by the material and energy flows demanded by both urban and rural systems (Allen, 2003). Socially, the PUI is dynamic and heterogeneous; local residents, migrants, farmers, real estate agents, industrial entrepreneurs, and the urban middle class may all co-exist in the same territory. Social forms are constantly created, modified, and discarded (Iaquinta and Drescher, 2000).

Institutionally, the PUI is complex, since many administrative activities may fall within the purview of neither rural nor of urban governments. In the Hubli-Dharwad region, for instance, it was difficult to install a sewage treatment plant as it was not clear, who - the urban or the rural government - would pay for it (Brook et al., (2003). At the same time, periurban dwellers are confronted with both urban and rural laws and institutions, breeding a situation of legal pluralism. Periurban issues tend to be low on the priority of policy makers and planners, who tend to think in terms of the conventional dichotomy of urban and rural development. Besides, periurban boundaries, like the resource that is the subject of this paper, namely, water, tend to be fluid; they keep shifting geographically, as a village gets reclassified as a town, and a medium-sized town grows into a city.

Tacoli (2006) notes that the administrative specialisation and segregation between the ''rural/agricultural/natural resources'' sector and the ''urban/manufacturing and services/infrastructure'' sector does not seem to allow policy makers and officials to fully recognize the significance of the linkages between ''rural'' and ''urban'' locations, people, and activities. Several regional studies show a marked increase among most rural households of the time devoted to, and the income share derived from non-farm incomes. While households remain central units of production and consumption as assumed by much rural development theory and practice, they are probably better defined instead as multi-activity and multi-local units, in which members engage in a variety of income-generation activities in a number of different locations.

In this paper, the word ''periurban'' is used not only in its geographical sense, but more widely as an analytic construct to study the relationships between urban and rural activities, processes, and institutions. The villages chosen for this study were located at varying distances from the nearest towns and urban centres, and it is not possible to delineate a specific distance around a city that would constitute ''periurban''. However, all four villages had strong linkages with the nearest urban centres and in all four, water access and use patterns were impacted upon in different ways as a consequence of urban expansion. The focus of this paper is on these implications of urbanisation for rural water use and access and a "periurban" conceptual lens is used to look at these interactions and linkages.

These problems, further, are shown to emerge as a result of an institutional lacuna arising from the absence of a mechanism to integrate rural planning with urban development. The dichotomous nature of the two results in a situation that fails to provide a framework for dealing with the impacts of urbanisation on the rural periphery. Further, in a situation where rights to water are de facto tied to rights to land, the acquisition of lands for urban expansion – a common phenomenon that has sustained urban expansion not only in India but in several other countries of the world - also implies the loss of access to water sources.

The Context of this Research: Delhi's Growing Population and Periurban Spillover into Gurgaon and Faridabad

The Delhi UA (Urban Agglomeration) has grown by over 4 percent annually in every decade since 1931 (Kundu, 2008). Among metropolitan cities in the country, this pattern has been perhaps unique to Delhi. Even in the 1990s, when there was a deceleration in urban growth in the country, the Delhi UA maintained a high growth and reported acceleration.

The population of Delhi has risen steadily over recent decades (NCRPB, 2001): from 1.7 million in 1951, to 4.1 million in 1971, 9.4 million in 1991, and 13.4 million in 1999. The 2001 census put Delhi's total population at 13.8 million; it is now expected to be of the order of about 15 million. It is expected to grow to over 19.5 million by 2011.

It is interesting to note that a substantial proportion of this increase is accounted for by migrant population. Over the period 1981-1991, for instance, almost 50 percent of the population growth was due to migrants; over 70 percent of these were from neighbouring Uttar Pradesh, Haryana, and Rajasthan (Kundu, 2008). Urban Delhi has expanded over geographical space as well. The census of 2001 reported an addition of 33 new towns that were rural settlements in 1991 (Kundu, 2008). This growth dynamic has brought in large chunks of village land within Delhi's urban fold, creating a new set of dynamics of rural-urban transition and relationships.

This growth has taken place both within as well as outside the urbanizable limits (Kundu, 2008). It is, however, the peripheral areas that have absorbed the majority of the migrants. This trend,

along with a real estate boom and the development of major transport corridors, has led to the emergence of a PUI in all directions around Delhi.

Urban transition in India reflects a metropolitan region, comprising UAs, or cities and their outgrowths (Kumar, 2001). The spilling over of population from India's major cities into these areas has occurred since the 1990s, sustained by a middle class housing demand that has caused the population to move to the outskirts of the city where land is cheaper (Shaw, 2005). Typically, rapid population growth in the main city results in increased demand for land and higher housing costs which in turn result in the outward movement of people from the main city to the city fringes, where they look for cheaper accommodation and residential land (Kumar, 2001). This phenomenon is now happening in several metropolises in India.

Increases in urban population and the need for better connectivity to cities, in turn, fuel the growth of urban related infrastructure. This drives up land prices and changes land use patterns. As a consequence, land in the periurban areas gradually becomes monetized (Brook et al., 2003; Kumar, 2001). This can be witnessed in districts such as Gurgaon and Faridabad where a real estate boom has transformed the pace of development. There has been a massive land acquisition process; land has been acquired by the state and private corporations for several industrial, residential and recreation purposes, changing land use away from agriculture and allied activities.

While once a sleepy town at the outskirts of Delhi, the potential of Gurgaon city - the headquarters of the district - was quickly realized soon after the Indian economy embarked upon a process of economic reforms and liberalisation in the 1990s. There have been several reasons for the growth of Gurgaon city (Narain, 2007). The first of these is the proximity to Delhi, the National Capital, located about 32 km away and in particular, the international airport, located just about 12 km away. Further, the State Government of Haryana took several policy initiatives to invite industries in Gurgaon following the phase of economic reforms and liberalisation initiated in 1991. The most recent such initiative has been the setting up of SEZs (Special Economic Zones).

Gurgaon has seen a real estate boom since the 1990s and the landscape of the new city is dominated by skyscrapers housing the offices of corporate giants, modern shopping malls and residential facilities. It has emerged as one of India's major outsourcing hubs, housing major multinationals. Following this industrial growth, thousands of professionals have made their home in Gurgaon. The fast growing population with an ever-increasing purchasing power has created a huge demand for housing, and property prices have escalated steadily in recent years.

Following closely on the heels of Gurgaon is Faridabad, located, too, in the state of Haryana (Narain and Nischal, 2007). Faridabad is about 25 km from Delhi. It is the most densely populated district in the state. With a share of about 5 percent of the total land, it accommodates 10 percent of it's population. The population density, as per the 2001 Indian population census, is 1020 persons per sq. km, as against 372 for Haryana as a whole.

The growth of Faridabad has been fuelled by a well-connected network of road and electricity. The Delhi-Mathura National Highway No.2 (Shershah Suri Marg) passes through the centre of the District. A broad gauge railway line of the Central Railways passes through the district, as do most of the trains going to south and west of India. A Railway Station is located in Faridabad city on the Delhi-Mathura double track broad-gauge line of the Central Railways that runs parallel to the highway No. 2. Faridabad has lately emerged as a major industrial hub of North India.

Methodology and Research Sites

This paper describes the implications of the trends for water use and management in two periurban villages in each of these districts. The study adopts a qualitative research design, relying on an ethnographic approach; a mix of semi-structured interviews, meetings with key informants, direct observation and focus group discussions. A brief profile of the villages chosen for study is presented below.

Basai

Basai lies in Gurgaon district of Haryana, about 3 km from the Gurgaon city, on the road that connects Gurgaon to Farookhnagar. It is located adjacent to sectors 9 and 10 of Gurgaon, two of the city's major residential areas that have been developed by acquiring land from the village. Basai has also provided land for the water treatment plant of HUDA (Haryana Urban Development Authority) that supplies drinking water to most of Gurgaon city. In all, about six-seventh of the village's agricultural land has been acquired for urban and residential purposes over a period of two decades.

As regards social composition, the village is dominated by the *Jaats* – the agriculturists - numerically and in terms of land ownership. The village also has a substantial migrant population comprising migrant labour from Rajasthan and Bihar. The main crops grown are wheat, sorghum, pearl-millet, and fodder crops. In addition, some farmers are able to cultivate paddy that is irrigated by a sewage canal emanating from the Gurgaon city. There is a large number of *pucka* (concrete) houses that have been built or renovated recently, as a result of fresh cash inflows from large-scale sale of agricultural lands. However, with the acquisition of agricultural lands and the erosion of a basis for livelihoods, idleness and alcoholism have been on the rise.[1]

The village has a railway station that provides a transit point for residents of the adjoining districts of the state to come into Gurgaon. On account of its proximity to the city, Basai provides an important transit point for travel into the more "rural" areas of Gurgaon with its local bus stand and auto-rickshaw stand. A large number of jeeps and auto-rickshaws can be seen parked at the entrance of Basai, providing an important means of semi-public transport between Gurgaon and the more ''interior'' villages.

Sultanpur

Sultanpur is located 9 km from Gurgaon city, further down from Basai on the road to Farookhnagar. The village is dominated by the *Rajputs* - the agriculturists - numerically, and in terms of land ownership. The village is not served by an irrigation canal and the groundwater is saline. Under these circumstances, farmers cultivate the less water consumptive crops, namely, pearl-millet, sorghum, wheat and mustard.

This village is located adjacent to the Sultanpur National Park, a wetland known for its population of resident and migrant birds that was developed by acquiring land from this village. Sultanpur National Park was accorded this status in 1971. Being located close to the Sultanpur National Park, the agricultural fields of this village are threatened by recurrent attacks from the *Nilgai* (blue bull) - an antelope - and the villagers often face penalty on account of the straying of their cattle into the National Park.

Sultanpur village, much like Basai, has seen land acquisitions for a variety of purposes over the last two decades; further land acquisition is on the anvil for the development of an SEZ by Reliance Industries, the corporate giant. A distinguishing feature of the village is the

[1] For more on the implications of land acquisition in this village, see Narain (in press).

concentration of a large section of its population in *dhaanis* (hamlets). These are settlements near or in the agricultural fields, wherein village residents have moved in order to be closer to the agricultural fields. However, at the time of this research, the agricultural lands were to be acquired for the development of the SEZ. This raised questions about the security of land tenure, and was a source of much angst and apprehension among the periurban residents.

Shahpur Khurd

Shahpur Khurd is a village in Ballabhgarh block of Faridabad district. The village is reached via a short unmetalled road that takes off from National Highway 2. It has a population of about 1000 people. The village is inhabited by four social groups; Jaats, *Harijan*, *Koli* and *Outcaste.* The Jaats are the most powerful socially and economically. They constitute 70 percent of the village population; the Harijans represent 25 percent. The other inhabitants, that is, the Kolis and Outcastes, are in a minority.

The *kharif* (monsoon season) crops are pearl-millet and sorghum, while the *rabi* (winter) crops are wheat, *burseem* (a fodder crop) and mustard. This cropping pattern prevails predominantly on account of the limited availability of irrigation; the groundwater is saline and only about 10 per cent of the cultivated land is served by a canal. The village is located at the tail-end of the canal and the farmers often do not receive their authorized share of water. Under these circumstances, only a small minority of farmers is able to cultivate such crops as paddy or sugarcane.

Borewells are the predominant source of irrigation. Diesel-powered borewells are common. Almost all farmers own private borewells. Groundwater is also sold at the rate of Rs. 40 per hour of water pumped.[2] In recent years, a large number of brick kilns have come up in the vicinity. The residents of Shahpur Khurd maintain strong ties with Ballabhgarh and Faridabad, and commute to these urban centres to sell their agricultural produce as well as for purchases of their household needs.

Karnera

Karnera also lies in Ballabhgarh Block of Faridabad district. It has a population of 2000 people, comprising about 200 households. Of the 200 households, about 80 comprise *Tyagis*, the agriculturists. They are the dominant group in the village, socially, numerically, and in terms of land ownership. The other groups are *Brahmans Khati, Kumbhaars* (potters)*, Harijans, and Gowariyas*. The village has about 400 electoral votes.

The main crops grown are wheat, potato, and burseem in the rabi season and pearl-millet, paddy, sorghum, and some vegetables in the kharif season. Inadequate water availability was cited as the major factor restricting sugarcane cultivation. Another factor was the distance of the nearest sugar mill; it is located at Palwal, about 30 km away. There is a dairy in the village that procures milk from the farmers; the adjoining town of Ballabhgarh also provides a market for the dairy produce.

The net cultivated area is about 400 hectares, all of which has been brought under irrigation. Both surface and groundwater are used. Another source of irrigation is the Gurgaon Sewerage Canal originating from Delhi. Like Shahpur Khurd, the residents of this village maintain strong links with Ballabhgarh and Faridabad and these linkages play a crucial role in supporting their livelihoods.

[2] 1 US dollar is approximately 50 Indian Rupees.

Implications of Urbanisation for Rural Water Use

Urban settlements have always been dependent upon their hinterlands, as a source of natural resources and rural products, as a sink for wastes and as sites for expansion (McGranahan, 2006); urban expansion transforms not only the land that becomes urbanized but also the land whose use is determined by demand both for land based products and for resources such as water whose appropriation changes land use patterns. Periurban settlements, thus, tend to be at the receiving end of urban development and bear the brunt of the development of urban residential and industrial areas. Pressures on water can come from many quarters; farmers' access to water for irrigation may be adversely affected as groundwater succumbs to other competing uses, such as those from industry, farm-houses, recreation and conservation. At the same time, the deteriorating access to power, that is diverted to meet the requirements of the growing city, reduces the effectiveness with which water can be used for agricultural purposes.

Competing pressures on groundwater resources

These effects are particularly evident in the case of Sultanpur. The context of vulnerability as shaped by the limited availability of water described above has been aggravated by developments and changes in land use patterns around the village over past decades. On the one hand, the mushrooming of farm-houses and the development of the Sultanpur National Park in 1971 in the vicinity has aggravated the stress on the village's groundwater resources; on the other hand, the erratic supply of electricity – that is diverted to meet the growing requirements of the expanding city - hampers with the operation of tube wells. The reduced availability of power also affects the quality of life of the villagers in other ways.

The water table depth is about 60 feet and the water table is falling further. A rough estimate, based on discussions with the villagers, was that the water table level has been falling by five to seven feet every year. The state had a flood in 1977 after which the water table rose steadily. After the 1980s, however, the water table has fallen steeply and recent efforts at locating groundwater have even reported tube well failure. The main reason for this is the mushrooming of farm-houses in the vicinity that pump local groundwater and the digging of tube wells to release water into the Sultanpur National Park.

The erratic availability of power also interferes with the water pumping activity. This problem has become more acute in recent years as electricity supply has been diverted to meet the city's requirements. In the absence of reliable power supply farmers are forced to pump water whenever power is available, rather than when their crops need it. The erratic availability of power and falling water table levels were repeatedly identified by periurban residents as the most important problems confronting them.

Location of water treatment plants: local effects

The location of water treatment plants in periurban areas to supply water to the city may also have adverse impacts on local conditions. The Basai water treatment plant that came up to supply water to Gurgaon city has been a mixed blessing for Basai's residents.

Although, it has made available drinking water to the residents of Basai and has provided irrigation to some farmers as well, the location of the water treatment plant has led to a rise in the local water table level, posing a threat to buildings in the region. Broken pipes and leaks from the water treatment plant have led to an increase in the mosquito population and are a cause of several vector borne diseases. With the rise in the water table the adjacent agricultural fields are known to be losing their productivity. Farmers are unable to grow wheat on this tract of land and it seemed that in the years to come, they would be unable to grow any crop at all.

"HUDA has given water, but has not paid attention to other problems", was a perspective often expressed in field interviews.

Impact of polluting industries on local water sources

The process of industrial decentralisation and the imposition of a strict judicial policy of reducing environmental pollution of central cities to match the requirements of global cities have also contributed to the growth of UAs. The failure of the State Executive and polity to effect changes in the urban environment, combined with the pressures of investment agencies, multinational and transnational corporations, can be seen in the relocation of polluting industries to the peripheral areas. Supreme Court directives have often been issued in India for the closure of hazardous polluting industries in the urban core and their relocation to the peripheries, preferably in the extended metropolitan zone or the periurban regions (Kumar, 2001).

Many industries are located at the edge of the city because the wastes that they produce rarely receive adequate treatment. Community members often take advantage of the fact that in periurban areas the regulatory capacity of the government authorities is weak, particularly in those areas that are outside the municipal boundaries (Parkinson and Tayler, 2003).

The location of factories near the *phirni* (boundary) of the Shahpur Khurd village was identified as a perpetual source of noise and groundwater pollution; the untreated wastes from the factories found their way into the groundwater aquifers. These factories had been relocated from Delhi and were identified as a nuisance by periurban residents. Residents complained of a vibrating sensation in the ground throughout the day caused by their operation. They strongly felt that these factories should be located at least a certain distance away from the village, and particularly from religious places.

Links with land and tenure: demise of local water management institutions and sources of water

The impact of the emergence of the PUI is also felt on CPR (Common Property Resource) institutions for water management, such as the *johads* (village ponds). This was observed in all the four villages chosen for study. These impacts were felt most by the periurban poor and landless, as common property resources on which they depended for their livelihoods were diverted to urban activities.

Basai village initially had six johads of which three lay on the land that was acquired by HUDA for the development of residential sectors in Gurgaon, and one lay on a tract of land that was acquired for the development of a public school. The fifth one, located near the fields, was polluted with wastewater on account of discharges from a factory in the vicinity. This was considered no longer fit for use by the livestock. An important group of people thus affected here were the potters who depended on the johads for the desilting and on horses and livestock for carrying the clay to their places of work. With the takeover of both the grazing lands as well as the johads, the bases for their traditional livelihoods had been eroded and they had been forced to move into alternative occupations.

In Sultanpur village, among the *Panchayat* (unit of village local self-governance) land that was proposed to be acquired for the development of the Reliance SEZ was land over which was installed a water supply tank managed and operated by the PHED (Public Health and Engineering Department). This tank was the source of drinking water supply to much of the village.

Besides, the acquisition of land for the construction of a highway inconvenienced periurban residents by affecting their routes and access to water sources. Since the local groundwater is

saline, the residents of Sultanpur obtain water from a distance of about 1.5 km away by crossing a railway track. With the construction of the highway, they had to divert their route to the point of water collection and walk a longer distance.

Changing locus of control over village resources

An important impact of the PUI is that the locus of control over village resources shifts to outside the village, as urban residents take part in the auction of village ponds and lands. Once again, this has implications for the livelihoods of those who depend on them.

In Shahpur Khurd, there are three johads. They primarily cater to the drinking water needs of the livestock. Earlier, the village ponds were managed through collective contributions of labour and capital by the villagers. Now, however, the Johad is auctioned and the proceeds of the johad are retained by the Panchayat for welfare activities in the village. The johad is auctioned to contractors who use it for fishing, and these contractors come predominantly from outside the village – particularly from Delhi. Though this is an important source of financial resources for the village Panchayat, it also means that the locus of control over village resources has shifted outside the village.

A similar process was seen in the village Karnera. There are 5 johads, of which 3 are auctioned for fisheries. After 1952, with the take over by the Panchayat of the johad, the tradition of auctioning the johads started. Before 1952, the villagers used to desilt it. Now, the Panchayat gives the johads on auction. The *pattedar* (contractor) takes the johad on auction for a period of two to three years. This task is taken on contract normally by muslims. There are no muslims in the village and these muslims come from outside the village - predominantly from Delhi. The johads are used for fisheries and for the cultivation of a fruit called *singhara* (water chestnut). The adjacent towns provide a market for fish and singhara.

An important impact of auctioning of the johads is that the potters have lost their rights to a livelihood. Their traditional occupation has been pottery; however, they do not have any access to clay any longer, which they used to get from the johads. The potters do not own agricultural land and now work predominantly as agricultural labourers.

Water use in periurban agriculture

Periurban agriculture is most often not officially recognized as an urban land use, even though it is widely practiced in several areas (WII-IWMI, 2006). Several characteristics of periurban agriculture in the study villages may be noted; perhaps the most significant of these are the variety of irrigation sources, the prevalence of both formal and informal means of water allocation, the crucial role of periurban agriculture in supporting livelihoods and the use of wastewater.

Periurban agriculture has been understood to have an important role in providing employment to poor people in the fringe areas of Delhi (Marshall et al., 2003). Landless people are involved in periurban agriculture as agricultural labourers or through the cultivation of leased in land. Whole families are engaged in intensive but small-scale horticulture. Vegetable cultivation, in particular, is conducted mainly by farmers with low socio-economic status cultivating small or marginal landholdings. This type of vegetable cultivation supports livelihoods primarily through food provision, income generation and employment.

A distinguishing characteristic of periurban agriculture is the diversity in sources of irrigation. In village Basai, for instance, depending upon the location of the agricultural fields, farmers were able to benefit from different sources of irrigation. In the absence of an irrigation canal most farmers irrigated through private tubewells. Apart from these, there were two other sources.

First, there was an underground pipe that had been laid down to bring water from the HUDA water treatment plant to a temple in the village. Farmers whose fields lay along this pipe, irrigated by making a cut through the pipe and diverting water to their fields. Second, farmers whose fields lay along a sewage canal emanating from Gurgaon city were able to irrigate from that source as well. From a perspective of irrigation, therefore, the best placed were those whose lands were geographically scattered such that they could irrigate from different sources.

It is important to note, however, that while periurban residents may receive water for agriculture from a variety of sources, water supply for irrigation in northwest India is likely to be intermittent and uncertain. Partly this is to do with the design characteristics of irrigation systems - that are protective in nature - seeking to divide a water supply thinly over a large area (Narain, 2003; Mollinga, 1998). In northwest India, in the states of Haryana, Punjab and Uttar Pradesh, this is accomplished through a *warabandi* system- a mechanism of water allocation that rations out water supplies through a system wherein canals and distributaries operate by rotation and farmers are expected to take water on a specified time and day of the week. Further, both statutory and non-statutory forms of water allocation co-exist. Water is allocated on the basis of a time for taking water as defined in the warabandi schedule. However, this schedule is not always practiced, as farmers deviate from it on the basis of their own *bhaichara* (social relations). Thus, there is a statutory warabandi schedule – that defines a farmer's water right and determines the pattern of resource allocation; however, farmers engage in an exchange of their time shares based on their mutual understanding and bhaichara. Water rights are defined through state law, but realized through another normative system, that is based on social relationships, pointing to the existence of legal pluralism (Narain, 2003). This was noticed in Shahpur Khurd and Karnera, both of which are served by irrigation canals.

An important source of irrigation for periurban agriculture is urban wastewater. Wastewater is known to have a high potential for reuse in agriculture (WII-IWMI, 2006). It offers an opportunity for increasing food and environmental security by avoiding direct pollution of rivers and surface water, conserving significant proportion of river basin waters and disposing off municipal wastewater in a low-cost, sanitary manner. Though wastewater use in agriculture is an age-old practice, there is understood to be not enough systematic information on it, particularly on issues such as farmers' needs and preferences and health and environmental risks.

Within a periurban context, sewage-irrigated agriculture enables farmers to overcome constraints to agriculture that are posed by poor quality groundwater or the absence of an irrigation canal and thereby, widen the farmers' cropping choices. Among the villages studied, sewage based irrigation was found to be particularly important in Basai. The discharge of sewage from the city of Gurgaon became an important source of irrigation for the cultivation of paddy that would otherwise not have been possible given the poor availability of groundwater and the absence of canal irrigation. The benefits of sewage based agriculture were shared unequally among periurban residents, however, depending predominantly on the location of their fields.

The use of urban wastewater emerges as an important rural-urban linkage in the form of resource transfers from urban to rural areas. The sewage water from Gurgaon is auctioned by HUDA among different villages and the village that wins the auction sees the water distributed among the farmers who take it turn by turn at a predetermined rate (it is approximately Rs 900-1000 per hour).

Conflicts and Social Mobilisation

At a macro level, there is evidence of growing stress on water resources, particularly in Gurgaon. The influx of new settlers in recent years has put tremendous pressure on the fragile rural

infrastructure. Even as residential areas with modern facilities are built, Gurgaon has been plagued by poor infrastructure, especially badly maintained roads, erratic power supply and a growing pressure on its water resources.[3] According to the CGWB (Central Groundwater Board), 70 percent of Gurgaon's water needs are met through groundwater and the water table is dropping at a rate of 1 metre every year. Officially, Gurgaon has been declared a "dark zone" by the CGWB in terms of groundwater overexploitation. However, this has not stopped the government from its current pace of urbanisation marked by the issuing of licenses for the construction of huge residential complexes and malls.

As competing pressures around water increase, evidences of rural-urban conflict are beginning to be seen. In the third week of March 2008, farmers living near Gurgaon breached the Gurgaon canal that is the major supplier of water to the city, forcing the residents of Gurgaon city to buy water from private sources (tankers) at prices as high as Rs.500-700 per 5,000 litres.[4] About 400 water tankers had to be pressed into service to supply tube well water to the people of Gurgaon on March 24 2008; this could meet just about 30 percent of the total demand for water. The water crisis in Gurgaon is seen as an outcome of the short-sightedness of the government in issuing licenses for malls and residential areas without taking cognizance of the water availability.

There have recently emerged some efforts at mobilisation around water. Most of these efforts are led by CBOs (Community based Organisations). For instance, in Gurgaon, RWAs (Resident Welfare Associations) have moved judicial authorities against the issue of licenses to builders and property dealers in the wake of the steadily diminishing water supplies as manifest in the falling groundwater levels.[5] Some efforts are also being made for supply augmentation; NGOs (Non Government Organisations) like SURGE (Society for Urban Regeneration) have been instrumental in constructing water harvesting pits.

Issues for Governance and Public Policy: Overcoming the Rural-Urban Dichotomy in Development

As can be seen above, urbanisation processes are impacting the access of periurban residents to water in a variety of ways. Generalisations are difficult and a much localized approach is needed to examine the various ways in which urbanisation affects periurban residents' access to water of a sufficient quality and quantity, as well as water management practices and institutions.

There has been much attention in the media lately on the subject of land acquisition and the financial compensation of land-owners in the process, both in Gurgaon as well as elsewhere in the country. In fact, protests against land acquisition in Singur in West Bengal have acquired much political and media attention. However, the implications of these processes for access to water have received scant attention. In a situation where rights to water are tied to rights to land, the acquisition of lands for industrial and urban development implies de facto the loss of access to water sources as well. When private agricultural lands are acquired, access to local groundwater sources is lost. Likewise, access to CPRs like village ponds is lost when the lands on which they are located are acquired.

Even as far as the acquired lands are concerned, the compensation has thus far been confined to land-owners while tenants and sharecroppers have not been part of a rehabilitation policy.

[3] Elaborate accounts of these problems can be read in various issues of *Gurgaon Plus*, a weekly supplement to *The Times of India*, one of the country's leading dailies

[4] This was reported in an article *Private tankers take Gurgaon hostage* in The Hindustan Times, March 25, 2008, p.1.

[5] These incidents are often reported in the media.

Several studies show that it is the landless and poor who tend to depend much more on CPRs.[6] Further, tenants and sharecroppers are often not registered. These systems of land tenure persist on the basis of social relations. There would, therefore, be no basis for claiming compensation for them even if it were part of a rehabilitation policy.

While a separation of rights in water from rights to land is imperative, and there has been an ongoing debate in India on the subject, it remains difficult to operationalize. Besides, in a setting where contiguous tracts of land are acquired for such activities as the development of SEZs, a separation of rights in water would have little significance unless periurban residents are compensated for the water to which they lose access. Needless to say, assigning a value of compensation for the access to water that is lost (groundwater beneath private agricultural lands or village ponds that are located on lands that are acquired for other purposes) is going to be methodologically, ideologically and operationally complex.

At a more fundamental level, as noted earlier in this paper, periurban governance challenges arise because of the fragmented approach to urban and rural development. Urban authorities define their mandate narrowly in terms of developing urban areas, not accounting for its rural consequences. The mandate of HUDA, for instance, is defined in terms of the development of urban areas, even when it entails land acquisitions from rural areas. HUDA does not have as part of its mandate how to deal with the (rural) consequences of land acquisition for (urban) development, such as the erosion of rural livelihoods or the loss of access to CPRs.

Further, conspicuous by its absence is a platform for interaction between the village Panchayat and HUDA to debate or negotiate on matters of land acquisition, or its consequences. There is no mechanism for the mediation of the land acquisition process. The village Panchayat has had little role in this, and seems to have been subordinated by HUDA in this context.

The whole process of land acquisition by the state government is a somewhat mechanical activity, comprising the issuance of a notice, the filing of records by the *patwaari* (village level record keeper), and the disbursement of compensation. The interaction of the village Panchayat is with the block level authorities further up the hierarchy in the three-tier Panchayati Raj system and not with the urban bodies like HUDA.

As India continues to urbanize, an important challenge will be to integrate planning for urban and rural development. An important thrust in the report of the Rural Urban Relationship Committee (1966) was to explore inter-institutional problems to deal with rural-urban interactive growth; essentially the committee recommended urban development in the twilight zone of rural-urban interaction. The 74th Amendment to the Constitution of India provides an entry-point and an opportunity for this by suggesting the creation of DPCs (District Planning Committees) and MPCs (Municipal Planning Committees). The mandate of these committees is the effective integration of rural and urban planning and spatial and economic development for the entire district (Brook et al., 2003). The state of Karnataka has seen the emergence of the joint Planning Boards to bridge the gap between urban and rural planning in each district.[7] There is a need for creating such organisations on a larger scale to integrate and address the concerns of the PUI.

Potential of Local Level Approaches

In periurban areas, which are in transition from rural to urban, and have inadequate institutional cover, and are difficult to bring directly within the purview of rural and urban

[6] For a recent analysis of this, see Mishra et al. (2008).

[7] However, in practice, only one such example is found in Bellary District of the state (Brook et al., 2003).

jurisdictions, community-based organisations have enormous potential to improve local environmental conditions, to resolve political conflicts in governance and to scale up environmental management activities (Dahiya, 2003). There are several cases of local level action in addressing the periurban challenges world-wide, and in India, that offer important lessons for scaling up and replicating.

The experience of community-based organisations in Colombo, Sri Lanka

The CMC (Colombo Municipal Council) adopted new approaches to address the problems of periurban areas (Dayaratne and Samarawikrama, 2003). It introduced an intervention in the low-income communities of urban and periurban areas; the intervention comprised the organisation of periurban dwellers into community-based self-help groups called CDCs (Community Development Councils). Supported by the Public Health Department, the programme was aimed at low-income groups, with a focus on such activities as health education, social awareness, self-help methodology and environmental hygiene. Environmental Management was an important thrust area, especially, sanitation that was either not available or inadequate. 300 settlements with a population of about 75,000 residents were organized into CDCs. Community Action Planning was undertaken.

This project enabled most of the 300 communities to obtain financial and technical assistance from the CMC and other agencies to upgrade and scale up communal amenities in the periurban areas, such as communal toilets, stand-pipes for water, covered drains, paving of access roads, as well as women's income generating activities. They also made links with nearby churches and temples to obtain regular religious services that were normally denied to new inhabitants. Since 1987, and after the setting up of the provincial councils the CDCs have extended beyond the urban region to the periurban and rural areas of the western province.

The case of the CMC basically points to the need for and potential of building local level collective institutions. On account of the unique nature of periurban problems, characterized by poor institutional cover, the formation of self-help groups provides a viable entry point to ameliorate problems arising from inadequate access. However, the formation of such self-help groups requires the presence of strong catalysts like NGOs at the local level, or strong local leadership. An important issue is also the sustainability of such organizations and their ability to garner an independent financial resource base. Besides, since periurban areas are often characterized by migration and the resultant erosion of social capital, building such collective institutions can be a difficult task.

Revival of awami tanks in Karachi, Pakistan

Similarly, Municipal water supply in Karachi had become grossly inadequate with regard to users' needs and expectations; this was particularly true of periurban locations, especially low-income settlements that have very limited access to municipal water supplies (Ahmed and Sohail, 2003). A solution was found in the use of *awami* tanks (community-managed public tanks). Communities with the support of public agencies were able to generate cooperative solutions to address their basic needs by reviving the awami tanks. However, the assumption that there would be some day, soon a piped water supply put off extending awami tank operations.

The case of the revival of awami tanks points to the potential of reviving local water sources that are collectively managed; in the four villages studied in this paper, this would point to the potential of and need for reviving johads through recharge measures and strengthening the norms, customs and practices associated with their maintenance. However, in periurban areas, migration and loss of interest in agriculture pose practical constraints to maintaining an interest in the preservation of common property resources. Besides, many of these water sources are

often filled and acquired for residential and other urban uses, as seen in the villages chosen for this study.

Participatory Action Planning in Hubli-Dharwad, India

Research and community-based action plans were formulated in 2000-01 on improving livelihoods and enhancing the natural resource base in six periurban villages of Hubli-Dharwad in Southern India (Halkatti et al., 2003). The implementation of this initiative brought out the strong relevance of partnerships among several actors in addressing the periurban agenda. These interventions were made possible through collaboration among the University of Agricultural Sciences, the BAIF Development Research Foundation, India Development Service, Best Practices Foundation, the University of Wales, Bangor, Community-Based Organizations and public organisations as the Hubli-Dharwad Municipal Corporation, Hubli-Dharwad Urban Development Authority, the Dharwad Zilla Panchayat, the Karnataka State Pollution Control Board and others.

The activities of the Shri Shankara Mahalir Manram were effective in addressing similar concerns in Pammal, a small town on the periphery of Chennai in Southern India (Dahiya, 2003). Both the above initiatives point to the need for platforms for bringing together diverse stakeholder and actors. However, such initiatives work when actors can act through a shared vision, with adequate support from local governments.

Conclusion

As India continues to urbanize and cities expand with an enlarging ecological foot-print, integrating rural and urban planning will be extremely important to mitigate the negative impacts of this. In the absence of a property rights structure for water or institutions for integrated water resource management across urban and rural areas, conflicts over water will continue to intensify. While some of these will be visible, others shall be more tacit, such as the loss of water sources as a result of land acquisition.

As shown in this paper, there is a variety of ways in which current patterns of urbanisation impact periurban residents' access to water. They may lose access to groundwater as water tables fall in response to new demands for industry or recreation or lands overlying aquifers are acquired; the periurban residents' access to water sources may get disturbed through the construction of highways and widening of roads; factories may get relocated to village peripheries and contaminate the local environment and water sources. Besides, traditional sources of water like village ponds may get filled and acquired for residential and other urban purposes. These processes particularly affect landless and minority groups whose dependence on such CPRs tends to be quite high. In the absence of adequate institutional cover, the pre-emption of water sources for urban purposes places them out of the reach of rural population, with adverse implications for their quality of life and human well-being. The absence of a property rights structure for water leads to a situation where water access is insecure; furthermore, since rights to water are tied to rights to land, it follows that land acquisition also diminishes the access of periurban residents to water.

Conventional approaches to urban and rural development will be ineffective in ameliorating the concerns of periurban dwellers in the absence of direct local level action in which NGOs, community-based organisations and periurban residents themselves have a role to play. This requires the creation of platforms that bring together rural and urban governments, planning authorities and periurban residents, even though the actual functioning of these platforms will be shaped by power relationships among the actors. Such recent efforts have been underway in Chennai in South India (Janakarajan, 2009).

The proposal for the creation of District Planning Committees noted in this paper provides a viable entry point for integrated planning, though much would depend on the political will in Indian states to carry this out. The potential of local level approaches as demonstrated in the examples provided in the paper suggests the need to support such local level initiatives wherever they exist.

Generalisations are difficult - much localized approaches to analyze these changes are needed, employing process documentation, participatory and ethnographic research. These should then be used as a basis for devising local level interventions. Managing a fluid resource across fluid boundaries is not going to be easy; but nevertheless, an essential challenge for planners and policymakers in the years to come.

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Water Use Conflict between Agriculture and Fisheries in a Selected Water Resources Development Project in Bangladesh

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Abstract

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. 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 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 for dry season agriculture, fisheries, and aquatic ecosystem. This study also attempted to identify a feasible platform for conflict resolution.

Keywords: Conflict reduction, Beel dewatering, livelihood, FCD project, Structural intervention, Environmental impact

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1. Introduction

In the context of Bangladesh, water resource development activities, namely flood control, drainage and irrigation, and closures of natural canals and large/ small rivers got a boost in the 1960s. A huge number of water development schemes were constructed and still under construction as development interventions overlooking the ecology of the beel. Water requirements for aquatic habitat were totally ignored, while planning, designing, and implementing the schemes. As a result, aquatic habitats were eradicated, removed, shrunken, and / or modified with impunity affecting the open water capture fisheries and livelihood of the fishermen community (Ali, 1997). Flood control drainage and irrigation (FCD/I) projects alter the inundation pattern to create an artificial environment conducive to agricultural production (FAP 6, 1994). Flood control projects have a series of relatively specific impacts on fisheries. The conflicts between irrigation and fisheries begin as the fisheries issue in flood control is usually seen in terms of trade-offs. If the overall benefits to agriculture and other sectors exceed the disbenefits suffered by fisheries and those dependent on them, the project is acceptable to the respective authority. This kind of approach ignores many serious issues regarding distribution and what constitutes a benefit for different groups within the population (FAP 17, 1995).

Several subprojects of the Southwest Area Integrated Water Resources Management Project (SWAIWRMP) have introduced structural interventions for flood control, drainage, and water conservation (ADB, BWDB and WARPO, 2004). The purposes of these interventions is to allow storage of fresh water for dry season irrigation, drain out water to allow cultivation in wetlands, locally called beels, and prevent saline water intrusion during the later part of the dry season (BWDB and WARPO, 2005). Although these interventions have been beneficial to dry season agriculture, fisheries and the aquatic ecosystem have been adversely affected (LGED, 2007). Giving high priority to the agriculture sector and ignoring the livelihood of the marginal fishing community results in conflicts between agriculture and fisheries. This conflict may turn into severe problem in the perspective of Bangladesh as the number of FCD (Flood Control and Drainage) projects are increasing rapidly.

In natural resource management, conflict is often inevitable. The growing demand for finite or renewable natural resources to satisfy the needs of different stakeholders is a common source of conflict. As resource becomes scarce, the competing interests cannot be fully met. Faced with such situations, stakeholders will make choices about how best to act to pursue their own interests. Stakeholder negotiation will inevitably involve conflicts of interest and trade offs (Ramirez, 1999). Although these conflicts are often taken to be bad or negative, they are logical developments in the absence of proper democratic, legal, and administrative mechanisms to handle issues that are at the root of water conflicts (Joy and Pranjape, 2007)

Sectoral perception of water use result in various forms of water conflicts, which reflect different perceptions from the sectoral needs for water or from different concepts of water use priority in the process of social and economic development. This kind of conflict is termed as social conflicts in water management (Ti, 2001). The failure to integrate water resources management into the social and economic development processes will lead to the aggravation of conflicts in water management.

The following characteristics of open access resources (water and fisheries) aggravate the conflicts and make it complicated to manage (World Fish Centre, 2006):

i. Over exploitations, hence not sustainable,
ii. Difficult to manage,
iii. Favours powerful and rich, hence not equitable, and
iv. No incentive for conservation, therefore not sustainable.

Ti (2001) suggest that conflicting situations can be reduced by planning the freshwater resources development, use, management, and protection in an integrated manner, considering both the short and long term needs of the social dimension and the stability and sustainability of the social and economic development processes. It is essential to create conditions for an efficient environment for the economic use of water, including a well defined legal and institutional framework for the utilization and conditions for a fair and equitable sharing of the beneficial use of the water resources.

Franks et al. (2004) studied the situation and conflicts amongst competing uses in Usangu basin, Tanzania, and put forth some suggestions to develop a sustainable management plan with the help of local stakeholders. There is no simple solution for allocating and managing water amongst competing uses. It requires a holistic approach. Water resource management depends on the proper understanding amongst the stakeholders about the problems within the basin and linkages between them. Physical, administrative, and cultural boundaries should be borne in mind while managing water amongst competing uses. It should be noted that water resources management and use are closely related to management of other resources such as land and therefore a holistic approach to resource management within the catchment is needed. There is also a need to support bottom up participative process and to integrate them within a plan for catchment which covers a large area and supports a large resident population.

Stakeholder Analysis is an effective tool to reduce conflict. Kammi Schemeer (2001) studied the usefulness of this tool in policy formation to avoid conflicting situation. Policy makers and managers can use a stakeholder analysis to identify the key actors and to assess their knowledge, interests, positions, alliances and importance related to the policy. This allows policy makers and managers to interact more effectively with key stakeholders and to increase support for a given policy or program. When this analysis is conducted before a policy or programme is implemented, policy makers, and managers can detect and act to prevent potential misunderstandings about opposition to the policy or program. When a stakeholder analysis and other key tools are used to guide the implementation, the policy or programme is more likely to succeed.

Multi-stakeholder negotiation is neither possible nor desirable for powerless groups. Weak, disenfranchised stakeholders stand to lose much from negotiations where power differences are too acute to enable collaboration. Nevertheless, all stakeholders stand to benefit when the negotiation playing field is transparent, so that the decision to venture into a negotiation is based on reliable information (Ramirez, 1999).

Conflict management is urgent for sustainable development, although it is a very difficult task considering the complexity of the interactions among various factors of the water sub-sectors, and stakeholders in the integrated water resource management process (Ti, 2001). This complexity was found at the initial stages of the study through the apparent discontent among the fishing community that their needs, priorities, and alternate livelihood options have not been properly considered in the project formulation process. This study conducted a detailed investigation in these issues as part of the postgraduate programme of IWFM sponsored by the Crossing Boundaries (CB) Project.

2. Methodology

The study was conducted in the Siapagla FCD subproject that consists of Siapagla two-vent regulator on the Siapagla Khal[1] and Barmara one-vent regulator on the Khamar khal in Narail district. Preliminary investigation and literature review showed possible conflicts in water use for dry season irrigated agriculture and fisheries resulting from project interventions. The study

[1] A branch which flows away from the main stream as a tidal creek or an irrigation canal

identified these conflicts through focus group discussions (FGDs). The major groups were farmers, fishermen, and women. Seasonal variability in water requirements for irrigation, fisheries and ecosystem was estimated from an analysis of secondary information on various aspects including cropping pattern, crop water requirement, irrigation and fishing practices, and predominant fish and other aquatic species. This analysis revealed the conflicts in water requirements. Impact of project interventions on irrigated agriculture, fisheries, and ecosystem was assessed from FGDs and structured interviews.

The relations among stakeholders and the power structure for community decision-making was identified through stakeholder diagramming based on information collected through the FGDs mentioned above. This helped in understanding the potential areas and opportunities for conflict resolution. Two stakeholder workshops, one at the Administrative level and another at the local level, were arranged to identify agreeable mitigation measures and to explore the feasibility of using such workshops in future as a platform for conflict resolution.

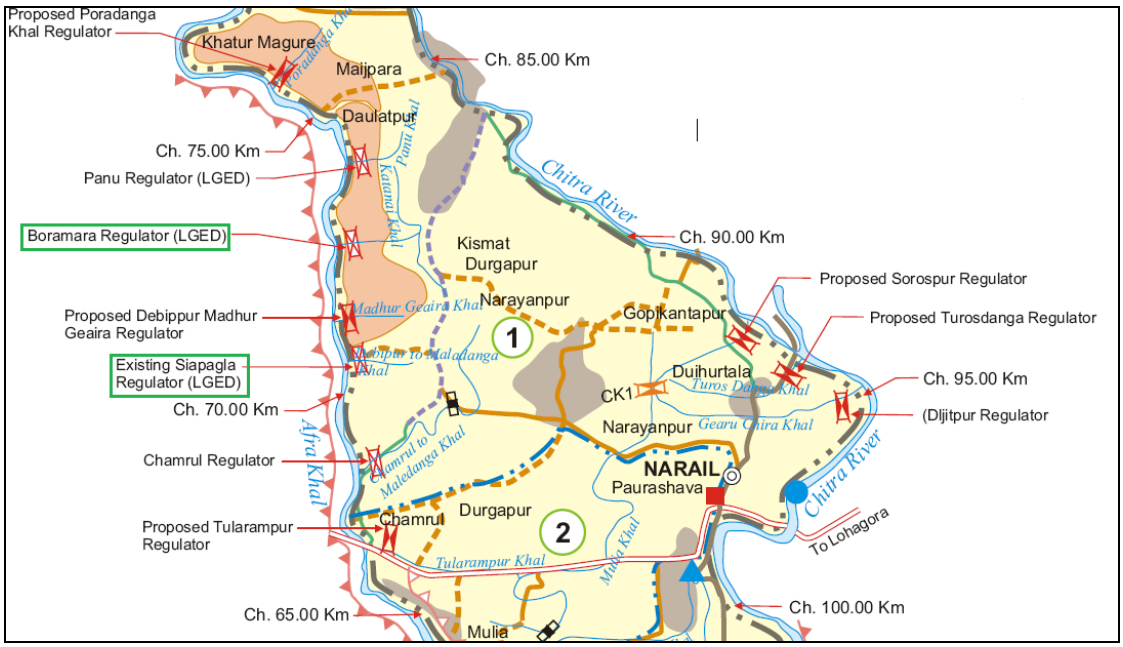

Figure 1: Siapagla FCD subproject area consisting of Siapagla and Baramara regulators (Source: LGED)

3. Conflict Identification

3.1 On the Basis of FGDs and Interviews

Field investigations were carried out to understand the prevailing situations that have created or indicated the conflicts. These situations are summarized as follows:

1. Rapid intensification of agriculture and drastic decline in open water capture fisheries due to the FCD project creates a conflicting situation between farmers and fishers.
2. Most fishermen were not aware about the project at the project-formulation process.
3. There has been severe impact on the livelihood of the fisherman. This results in extreme poverty in the fishing community.
4. The fishing community is not properly compensated.
5. Only solvent people are allowed to catch fish in the khal.
6. The beel areas of Siapagla and khamar khal have lost their aquatic habitat.

7. The condition of the Khamar beel (adjacent to the Khamar khal) is more deplorable than the Kajla beel area around the Siapagla khal. One powerful, rich farmer obstructs the flow of water by constructing a cement-concrete barrier. At high tide, fish can pass the barrier but they cannot return to the river. No fisherman except the owner of that barrier is allowed to catch fish. This creates resentment among the people, especially in the fishing community.
8. Heavy siltation was found particularly in the Siapagla khal. This siltation obstructs the free flow of water and creates drainage congestion, which in the long run has negative impact on fisheries. So, there is an urgent need for khal excavation. Some project beneficiaries and LGED (Local Government Engineering Department) have proposed that excavated soil be deposited on the bank of the khal. But this is strongly opposed by the land owners in those areas.
9. The WMCA (Water Management Cooperative Association) of the subproject is responsible for maintenance of the two regulators. But it was found from field investigations that WMCA is not doing the maintenance properly. One of the sluice gates of the Siapagla regulator has not been working at all for more than a year. As a result, inflow into the khal from the river has been reduced. Heavy silt deposition was found on both sides of the closed gate. This has created adverse situation for fish habitat and migration.
10. The WMCA was supposed to rehabilitate the affected communities by sanctioning loan, giving training, providing a training room for female members, etc. But, in fact, loans are being approved only to those who serve some of their interests. The weaker people, especially the fisher group, did not gain any benefit from the WMCA.

3.2 On the Basis of Analysis of Hydrological Data

3.2.1 Pre- and post-project water levels

Figure 2 shows that the water level in the khal (outside the gate) has been lowered in general in the post project period (1996-2008). The maximum water level in the post project situation is approximately 3.0 m in mid September. The range of water level variation in the Khamar Khal is approximately 1.24 m and in the Siapagla Khal is approximately 0.88 m. The difference between the pre and post project water levels ranges from 0.08 m to 0.28 m in the Khamar Khal and from 0.06 m to 0.22 m in the Siapagla Khal.

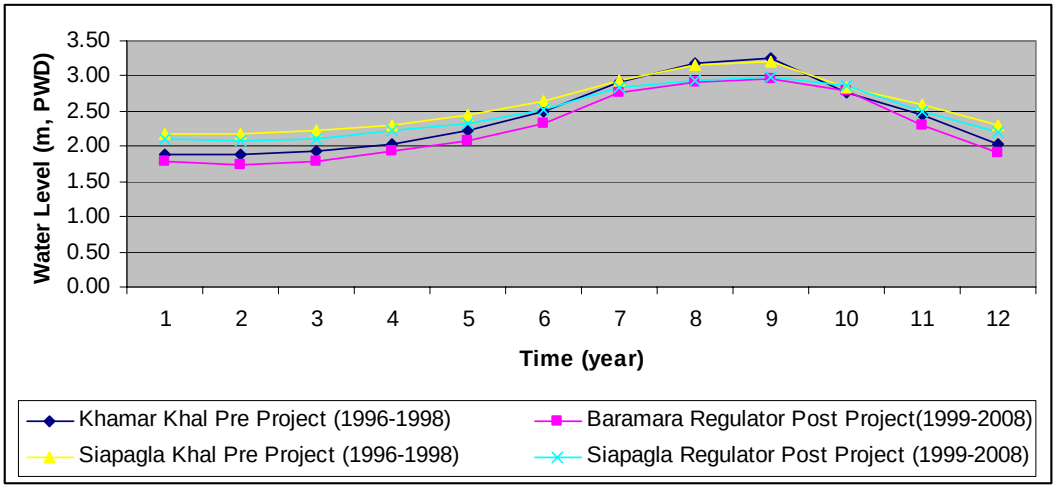

Figure 2: Water level variations (pre- and post-project conditions) in the Khamar khal and Siapagla Khal.

3.2.2 Pre-project water level variations in the khals

Table 1 gives the post-project water levels in the Khamar khal and Siapagla khal (inside the gate), respectively. These water levels were obtained from the gate operators and were verified with the local people. Maximum water levels maintained in the khals by the gate operators are 2.30 m and 2.41 m for the Khamar Khal and Siapagla Khal, respectively. Figures 3 and 4 shows the monthly water level variation and indicate the periods when the sluice gates are open or closed.

Table 1: Post-Project Water Level Variation in the Khamar Khal

Month	Post-Project WL in Khamar Khal (1999-2008)	Post-Project WL in Siapagla Khal (1999-2008)	Explanation
Jan	0.91	2.24	When the sluice gate is open, the water level variation is due to the fluctuation of the Afra river and rainfall. But when the sluice gate is closed, the water level variation depends only on rainfall.
Feb	0.83	2.23	
Mar	0.90	2.24	
Apr	1.20	2.26	
May	1.25	2.27	
Jun	1.30	2.28	
Jul	2.13	2.39	
Aug	2.30	2.41	
Sep	2.37	2.41	
Oct	2.16	2.39	
Nov	1.53	2.31	
Dec	1.05	2.26	

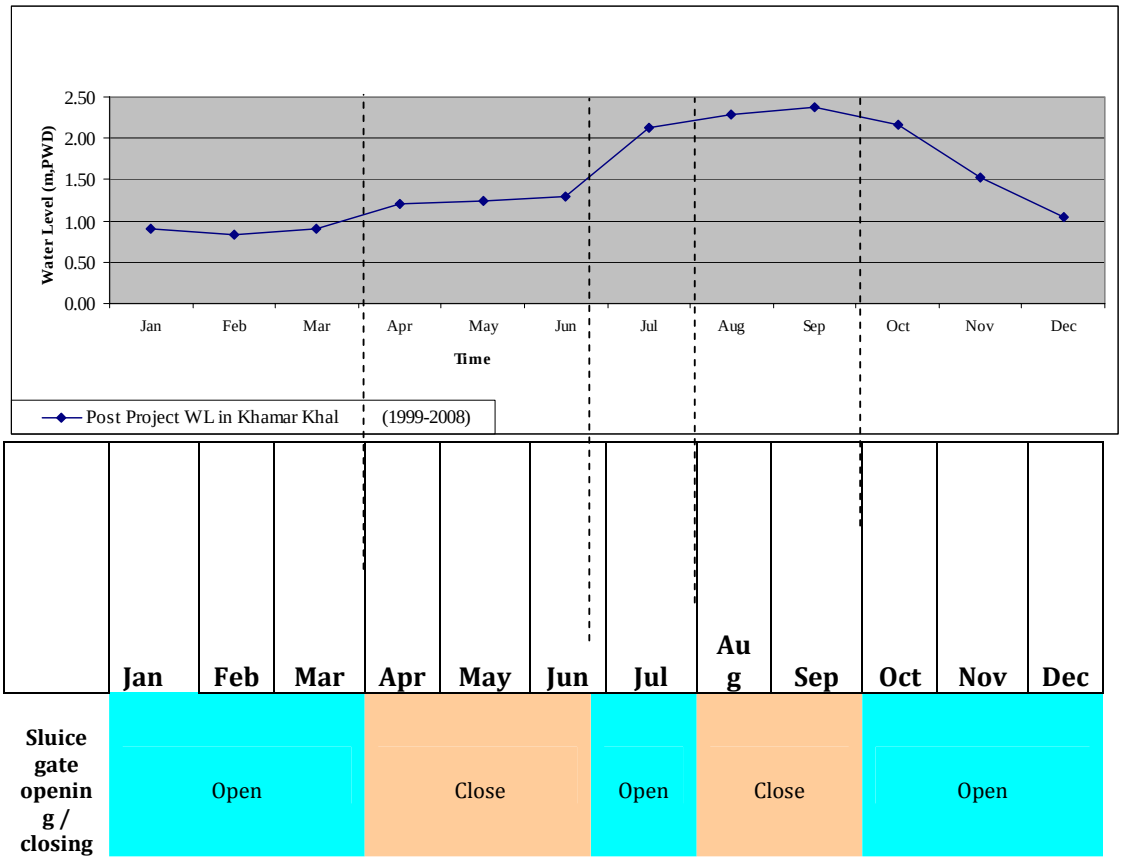

Figure 3: Post-Project Water Level Variation in the Khamar Khal (1999-2008)

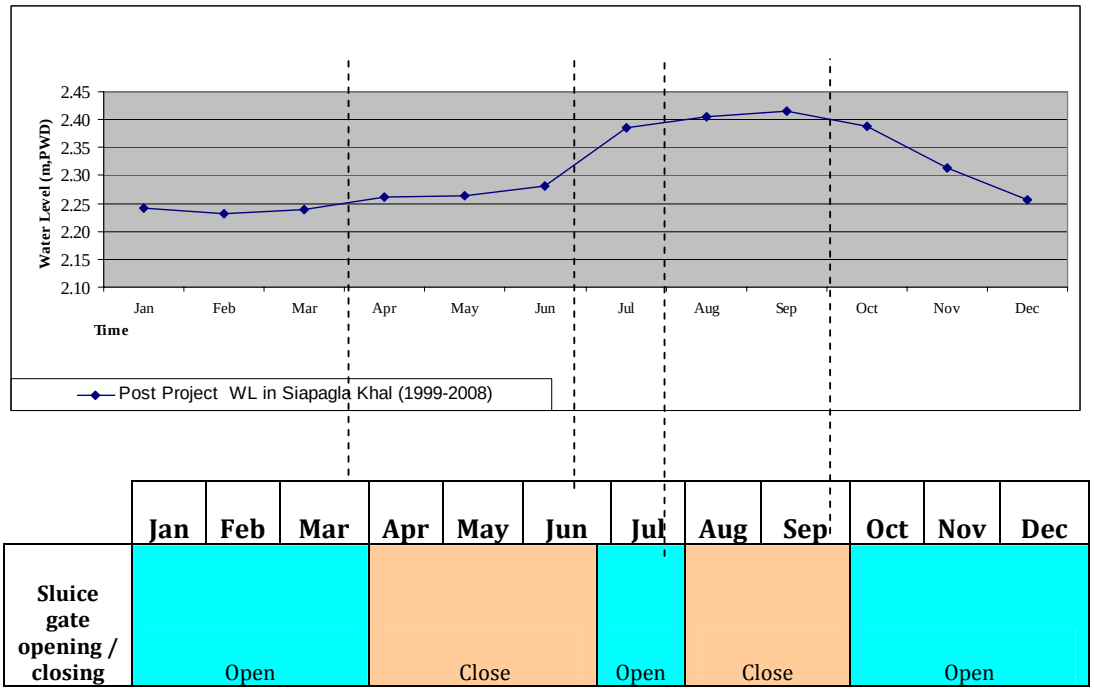

Figure 4: Post-Project Water Level Variation in the Siapagla Khal (1999-2008)

3.2.3 Effects of the sluice gates on fish migration

Both the Siapagla and Baramara regulators reduce fish migration between the river (Afra Khal) and floodplins (Kajla Beel, Peruli Beel, Khamar Beel) in two ways;

1. by reducing the number of entry points on to floodplains and thereby forcing the fishes into fewer channels where they were more susceptible to capture. Field study showed that during neap tide, when the sluice gates are open and water level in the khal is very low, village people (both male and female) were engaged in fishing in the khals. They were even catching fish by straining the muddy soil of the khals.

2. by closing the gates for extended periods during the pre-monsoon and monsoon.

Table 2 describes the fish migration pattern of Carp and Cat fish species by the dark cells. This Table shows the periods when different types of migration are hampered due to closing of the regulator gates. For example, "dispersal of young over floodplain" for the Carp fish takes place during 21 May to 31 October. However, since the gates are closed during April 1- June 20 and August 1- September 30, this type of migration will be affected during April 01-June 20 and August 01- September 30.

Table 2: Seasonal migration of fish species affected by the regulators at different stages of life cycle

Category: Carp Fish

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Spawning migration												
Fingerling migration						Hamper		Hamper				
Dispersal of young over floodplain						Hamper		Hamper				
Return of young to beel and river									Hamper			
Harvesting beel and river												

Category: Cat Fish

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Spawning migration												
Migrate to floodplain				Hamper								
Dispersal and Growth						Hamper		Hamper				
Return of youngs to standing water												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sluice gate status	Open			Close			Open	Close		Open		

3.2.4 Rainfall-runoff analysis

Annual runoff in the study area was estimated from mean monthly rainfall using Khosla's Formula (Subramanya, 2006). Annual runoff depth was found to be 75.58 cm, and the runoff coefficient was estimated to be 0.42, which is in good agreement with the values suggested for agricultural lands (Garg, 2005).

Figure 5 shows a digital elevation model of the study area. The deeper areas indicate the higher storage areas for rainfall-runoff. Figure 6 shows the relationship between a given elevation and cumulative area below that elevation.

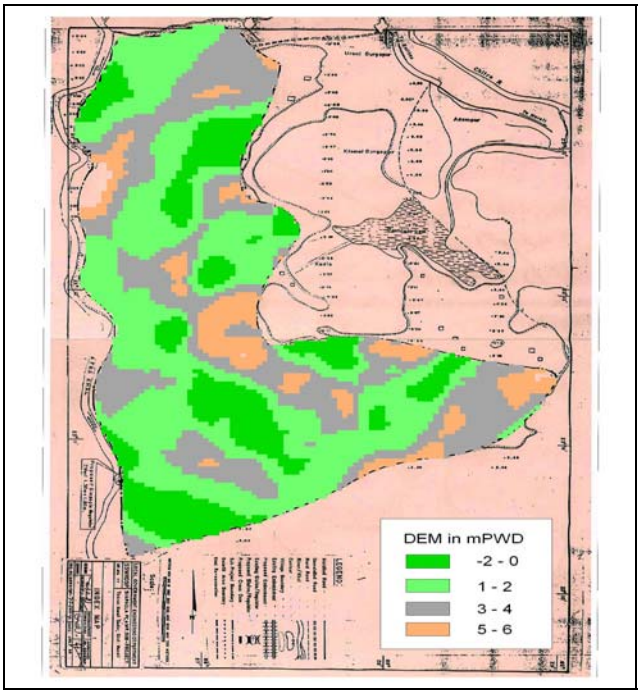

Figure 5: Digital Elevation Model of the study area

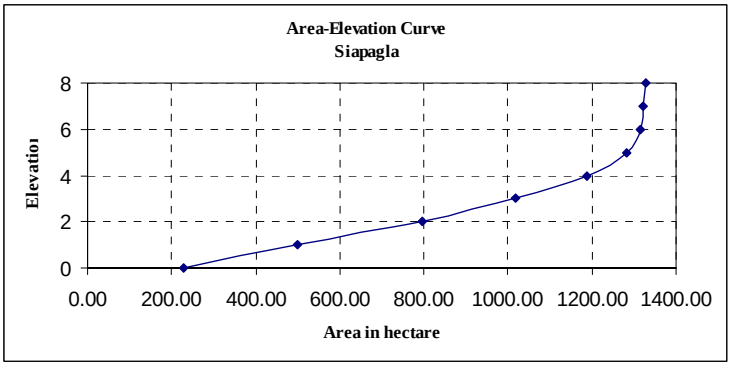

Figure 6: Area-elevation relationship for the study area

3.3 Water Requirement Conflicts

3.3.1 Irrigation water requirement

Different types of crops and vegetables are grown in the study area. The irrigation requirements for these crops and vegetables vary in application amount and time. The Table 3 presents the total water requirement for different crops and vegetables of the study area. From this table it can be concluded that the minimum water requirement in Siapagla is 120 cm.

Table 3: Irrigation water requirement.

Crop			Total Water Requirement (cm)
Rice Crops	Stages	Water Requirement (mm/season)	120
	Land Preparation	200-250	
	Crop Water Requirement	450-550	
	Percolation losses	250-450	
Wheat			30
Maize			35
Lentil			20
Cabbage			26
Cauliflower			22
Potato			28
Radish			18
Carrot			18
Tomato			25
Brinjal			35
Onion			20

(Source: Website BARI, 2008)

3.3.2 Fisheries water requirement

Distributions of fish concentration by depth class proposed by EGIS (1997) are as follows: 44% in depth class 1 (1-15cm); 285 in depth class 2 (16-30 cm), 16% in depth class 3 (31-90 cm); 9% in depth class 4 (91-180 cm); and 3% in depth class 5 (>180 cm). Fish respond to changes in water level with increased movement and concentration shift between depth classes. The

highest fisheries concentration and biomass occur in depth class in 1 and decline throughout other depth classes; the lowest concentration of fish and biomass occur in the deepest portion of the floodplain in depth class 5. However, the number of species and alpha biodiversity are the highest in deep water (depth class 4 and 5) and lowest in shallow water (depth class 1 and 2) (EGIS, 1997).

Fish exhibit a preference for habitat by concentrating within certain habitat. Species of prawn, perch, gorami, barb, gobie, eel, small catfish, and puffer prefer habitat in shallow water (depth class 1 and 2, or 1 to 30cm). Glass fish do not indicate a strong habitat preference; instead they utilize all depth classes. Cyprineid, snakehead, and cyprinidone species show a strong preference for the shallowest depth class (1 -15cm). Exotic species indicate a strong preference for depth class 2 (16-30 cm), while knife fish species prefer depth class 3 and depth class 5. Species in the clupeid carp, large catfish, and mullet guilds exhibit a strong preference for deeper water (depth class 4 and 5, 91 – 180 cm and deeper). Therefore, the minimum water requirement for fish species is 180cm.

Table 4: Post project water level in Siapagla khal.

Month	Post Project WL in Siapagla Khal (1999-2008)
Jan	2.24
Feb	2.23
Mar	2.24
Apr	2.26
May	2.27
Jun	2.28
Jul	2.39
Aug	2.41
Sep	2.41
Oct	2.39
Nov	2.31
Dec	2.26

Table 5: Post project water level in Khamar Khal.

Month	Post Project WL in Khamar Khal (1999-2008)
Jan	0.91
Feb	0.83
Mar	0.90
Apr	1.20
May	1.25
Jun	1.30
Jul	2.13
Aug	2.30
Sep	2.37
Oct	2.16
Nov	1.53
Dec	1.05

The water depth in the Siapagla khal is adequate for fish species but that in the Khamar khal is not adequate, especially in the dry season for the species clupeid carp, large catfish, and mullet guilds as they exhibit a strong preference for deeper water (depth class 4 and 5, 91 – 180 cm and deeper).

It was found from the field survey that 3 LLPs (Low Lift Pumps), 210 nos STWs (Shallow Tubewells -run by diesel) and 18 nos STWs (run by electricity) were active in the subproject area during the dry season. These numbers indicate that the irrigation system in the study area is mainly dominated by groundwater irrigation. The khal water was mainly used for seed bed preparation, jute rotation, etc. Jute rotation pollutes the khal water which negatively impacts the fish species.

So there was almost no conflict between surface water irrigation and fisheries in the khal. The conflict mainly rose due to the beel dewatering in Kajla and Khamar beel for agricultural purposes. The required water depth or fish species, especially for depth class 3, 4 and 5 was not maintained at all.

4. Conflict Resolution

As part of this study a Stakeholder Analysis was performed on the basis of field surveys. Two stakeholder workshops were arranged to assess the suitability of a platform for conflict resolution.

4.1 Stakeholder Analysis

The stakeholder analysis was performed in three stages to accomplish the study objectives. At every stage, it was checked through FGDs and interviews ,which stakeholders are relevant to be involved in the process and whether the stakeholders have the same "rights". The role and involvement of the stakeholder may differ from stage to stage. Each stage of analysis focuses on a specific question that leads to the answer for that stage. The roles and involvements of the stakeholders are clarified while answering these questions.

During the stakeholder analysis the degree of involvement of every stakeholder (per stage) was labelled as (ARB toolkit, 2002)

- Co-operating: the stakeholder that will actually participate in and contribute actively to the process (i.e. active involvement)
- Co-thinking: the stakeholder that gives input with respect to content, it is a source of knowledge like experts (i.e. consultation)
- Co-knowing: the stakeholder which does not play an active role in the process but should be informed of its progress (i.e. information supply)

And the identification approach was redefined by identifying the actor as (ARB toolkit, 2002)

- Decision maker: stakeholders which decide about the project
- Users: Stakeholders which use the result of or are affected by it
- Implementer: the stakeholders that have to implement the result or new policy
- Expert/ supplier: stakeholders which put information, expertise, or means at the disposal of the project.

The analysis results are presented on a stakeholder diagram to help identify the differences, similarities, and relationships among the stakeholders. On the stakeholder diagrams, the stakeholders are arranged in three tiers: Co-operating, Co-thinking, and Co-knowing; and four quadrants: Experts, Decision-makers, Implementers, and Users. To identify the initial stage of conflicts, the roles of the stakeholders in the planning stage was analyzed, which is the main goal of Stage 1. Second stage leads to identification of water use conflict and the third stage attempts to find a feasible platform for conflict resolution. Stakeholder list for Stages 1, 2, and 3 are given in Tables 3, 4, and 5, respectively, on the basis of degree of involvement of the stakeholder at each stage.

At Stage 1, the planning stage, farmers play a decision-making role because of their strong position in the community power structure. Since the fishermen and women are relatively weak, they play merely a co-knowing role during the planning process. At Stage 2, the roles of water users in the sub-project area were analyzed. Figure 8 shows that farmers, fishermen, women, and other local inhabitants are all affected, positively or negatively, because of the project interventions. Water-use conflict is apparent at this stage. Farmers are the only stakeholders who are benefited, whereas many others are adversely affected. Moreover, since WMCA consists of mostly farmers the rights and privileges of the weaker groups are neglected in their decisions. At Stage 3, the conflict resolution process, the farmers, fishermen, women, local inhabitants, WMCA and Fisheries Officers are the main stakeholders. The Union Porishod (local government) may play the most important role at this stage since it has a decision making position.

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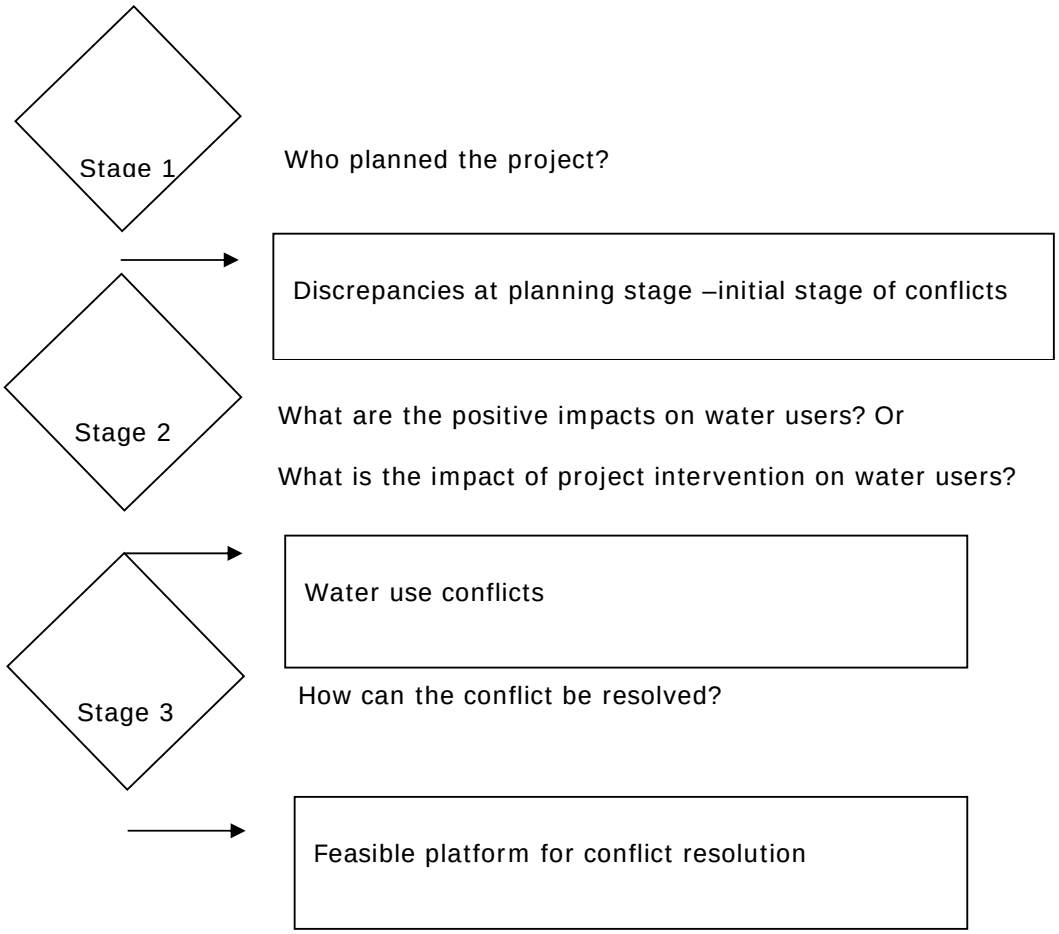

Figure 7: Different stages of water use conflict identification and resolution

Table 3: Stakeholders for Stage 1 (Pre-Project Stage – Who planned the project?):

Group	Actors	Degree of involvement	Role
LGED	Implementer	Co-operating	Actively participate in the project area selection process
Farmers	Decision Maker	Co-operating	Actively participate in the initial project selection process
Fishermen	User	Co-knowing	Affected by the FCD project
Local Inhabitants	User	Co-knowing	Affected by the FCD project
Women	User	Co-knowing	Affected by the FCD project
UP Members / Chairmen	Decision Maker	Co-operating	Participate in decision making process
Agriculture officer (AO)	Expert	Co-thinking	Provide information about the agriculture benefits
Fisheries officer (FO)	Expert	Co-knowing	Just informed about the project
Foreign Consultant (FC)	Expert	Co-operating	Actively participate in design
Donor Agency (ADB)	Implementer	Co-operating	Provide fund to implement the project
NGO	Expert	Co-knowing	Informed about the project
UNO	Decision Maker	Co-thinking	Participate in the final decision making process

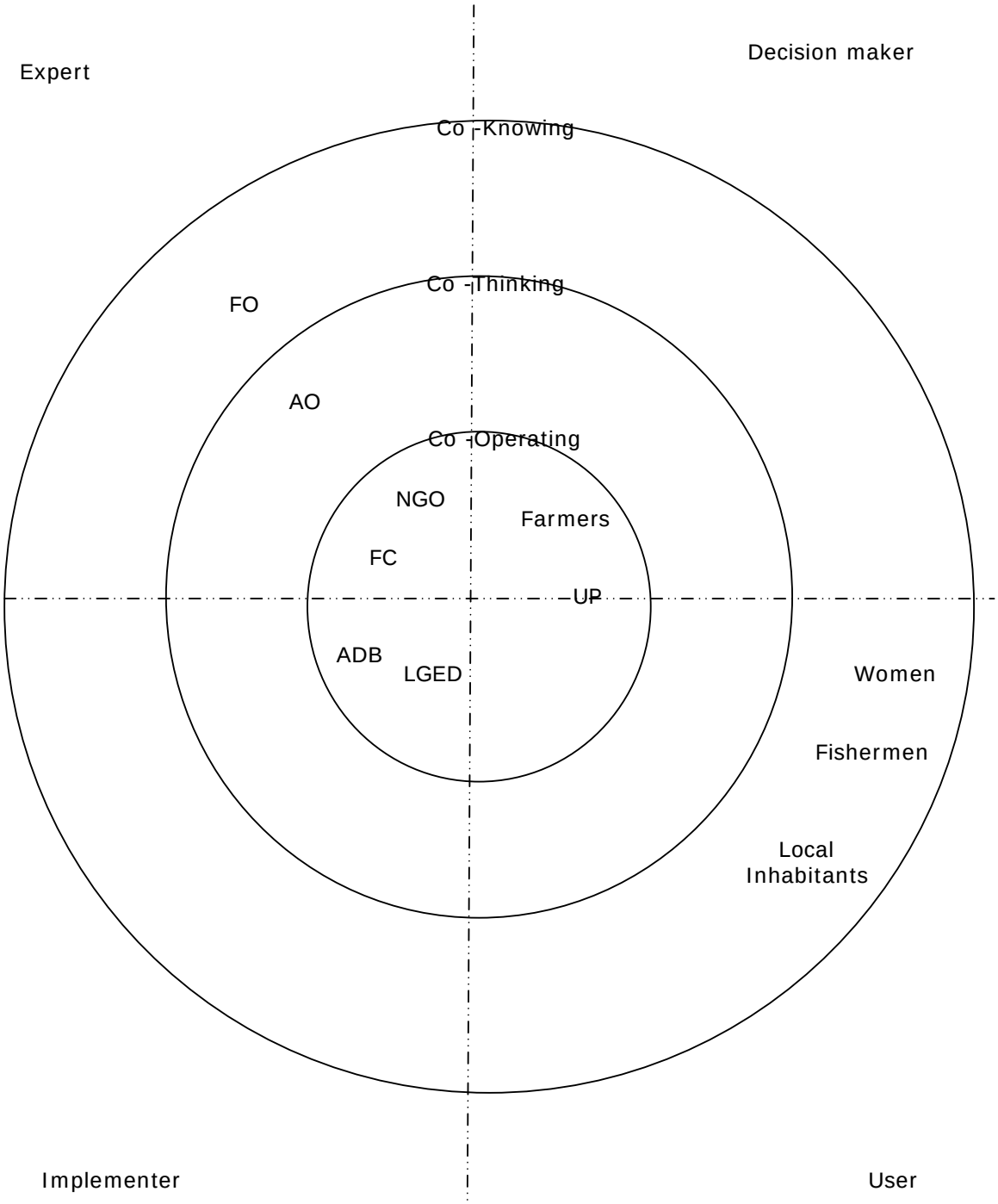

Figure 8: Stakeholder Diagram for Stage 1

Table 4: Stakeholders for Stage 2 (Post-Project Stage - What are the positive impacts on water users or what is the impact of project intervention on water users?)

Group	Actors	Degree of involvement	Role
WMCA	Implementer	Co-operating	Control sluice gate operation; benefited group
Farmers	User	Co-operating	Increase of potential command area, protected from saline water intrusion; benefited group
Fishermen	User	Co-operating	Negative impact on livelihood (The term co-operating indicates active involvement. In this stage the main target is to identify the impact both positive and negative. As the fishermen are directly impacted by the project intervention in a negative way, so their degree of involvement is co-operating.)
Local Inhabitants	User	Co-operating	Positive impact on livelihood
Women	User	Co-operating	Positive & negative impact
UP Members/Chairmen	Decision Maker	Co-operating	Participate in decision making process of gate operation
LGED	Expert	Co-Knowing	Informed about the situation
UNO	Expert	Co-Knowing	Informed about the situation
Agriculture officer (AO)	Expert	Co-thinking	Actively participate with farmers to observe and provide guidance in agriculture process
Fisheries officer (FO)	Expert	Co-knowing	Informed about situation
NGO	Expert	Co-thinking	Provide suggestion to increase positive impact

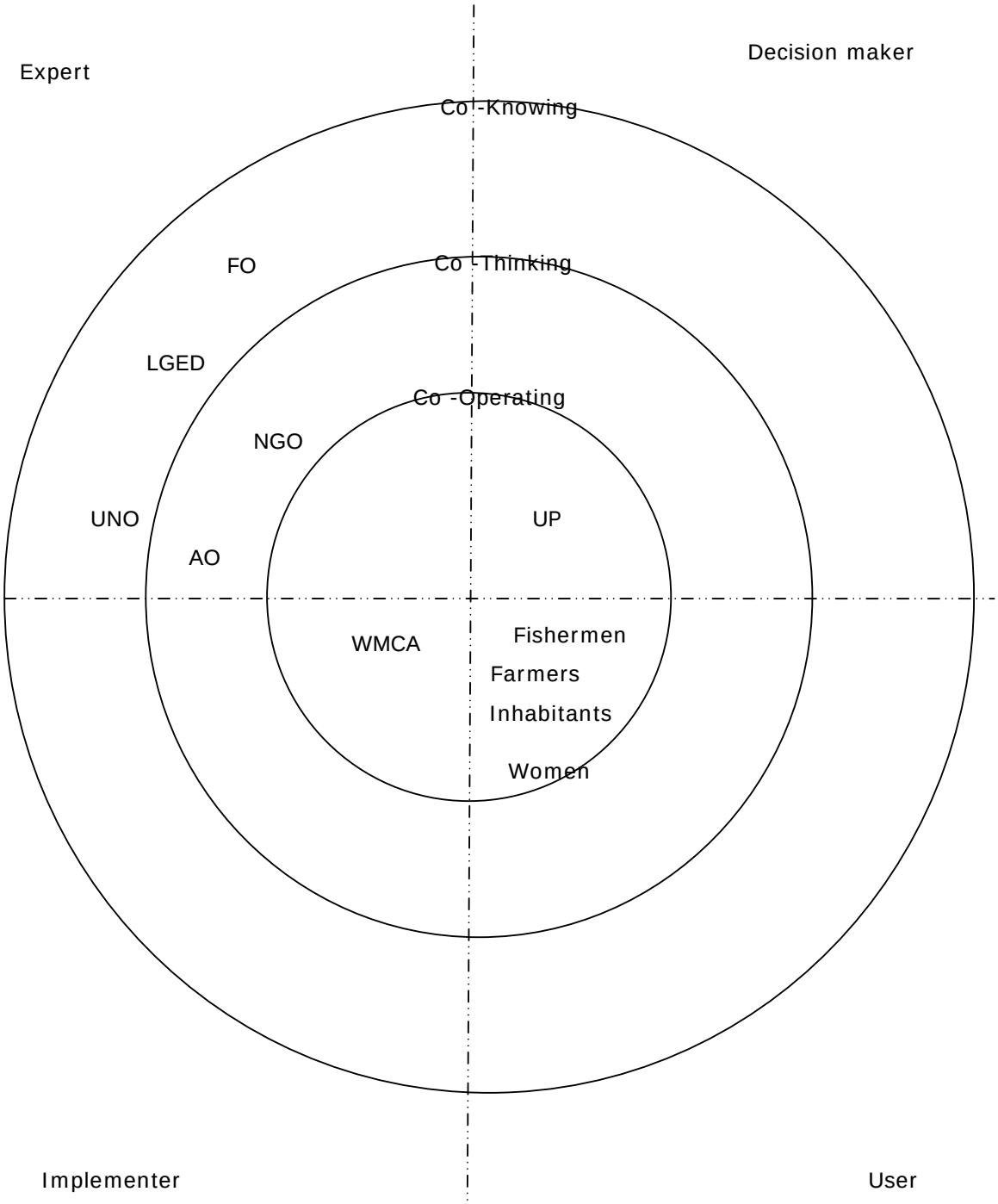

Figure 9: Stakeholder Diagram for Stage 2

Table 5: Stakeholders for Stage 3 (How can the conflict be resolved?)

Group	Actors	Degree of involvement	Role
WMCA	Implementer	Co-operating	Consult with each and every stakeholder; responsible for conflict resolution
Farmers	User	Co-operating	Involved in agriculture practice
Fishermen	User	Co-operating	Informed about situation
Local Inhabitants	User	Co-operating	Informed about situation
UP Members/Chairmen	Decision Maker	Co-thinking	Participate in decision making process of conflict resolution
LGED	Expert	Co-thinking	Ensure a balance trade-off
UNO	Expert	Co-thinking	Ensure a balance trade-off
Agriculture officer (AO)	Expert	Co-knowing	Provide guidance in agriculture process
Agriculture Engineer (AE)	Expert	Co-thinking	Provide guidance for water delivery system, maximum utilization of water use can be ensured
Fisheries Officer (FO)	Expert	Co-operating	Minimize negative impact on fish species
NGO	Expert	Co-thinking	Rehabilitate the negatively impacted group

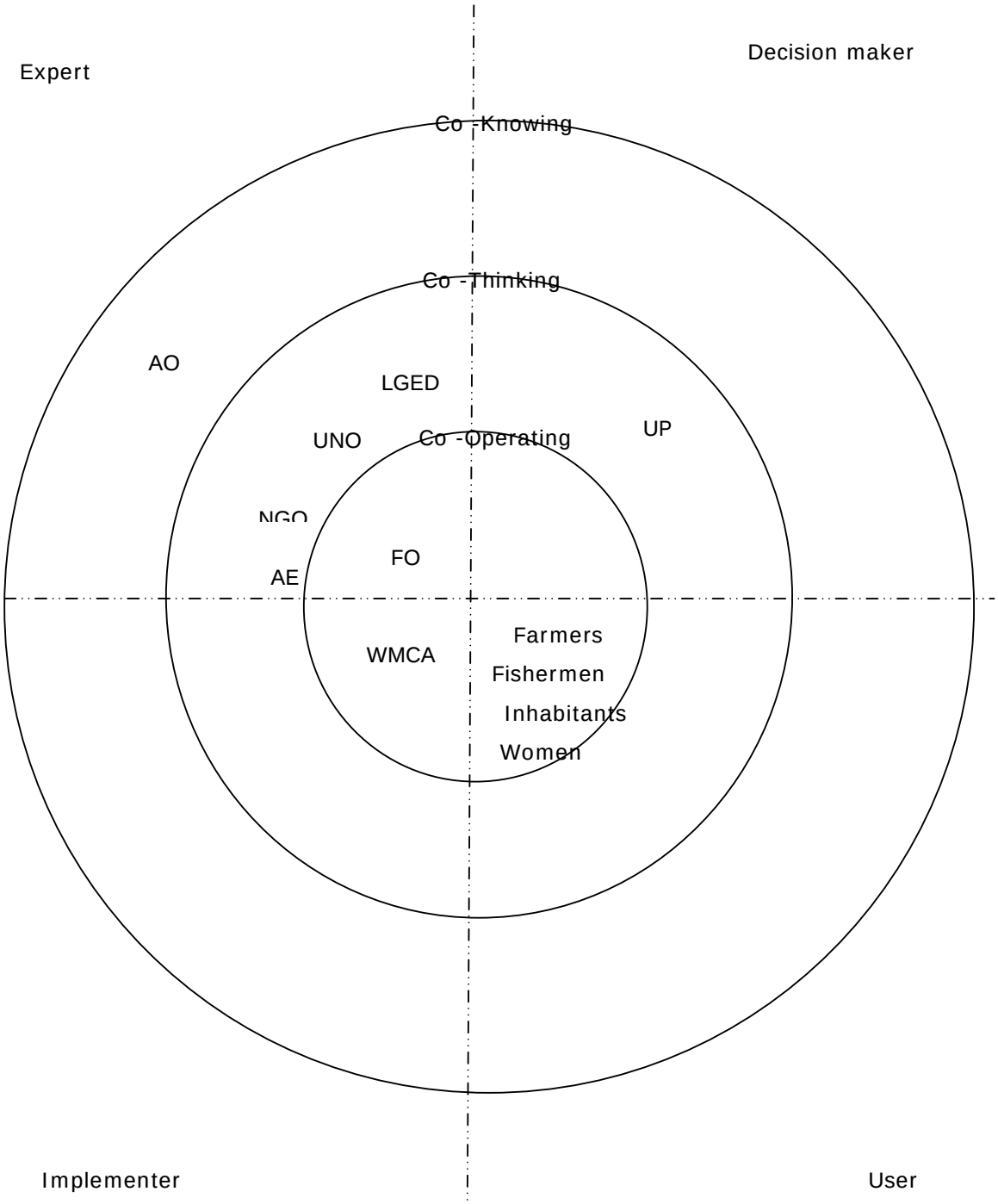

Figure 10: Stakeholder Diagram for Stage 3

4.2 Stakeholder Workshops

After conducting the stakeholder workshops (one at the administrative level and another at the local level) it was felt that these workshops at the local level may not serve as effective tools for conflict management in a situation where an unbalanced power structure prevails. The facilitation of an external powerful entity (e.g. UNO, LGED/ BWDB officials, Fisheries Officer, Agriculture Officer, etc.) is essential for the success of such workshops. However, arranging more stakeholder workshops at the local level may give better results for conflict reduction.

It was observed during the workshops that the weaker groups were very hesitant to express their problems, feelings, and demands in front of the powerful groups. They proposed many possible solutions for conflict reduction during the FGDs and interviews, but remained almost silent during the stakeholder workshops. So, stakeholder workshops at the local level in a community having unbalanced power structure may not be a feasible platform for conflict reduction. In these situations, regulatory or legal approaches may be more effective.

According to the National Water Policy (1997) of Bangladesh the ownership of water resources belongs to the state only and the state has the power to allocate water to ensure equitable distribution, efficient development, use, and to address poverty. Stakeholder involvement at all stages of the project cycle should be ensured by making a complete reorientation of the institutions to make the decisions affective regarding water resources management. So, the practical implication of this policy is an urgent need to manage the water use conflicts.

5. Conclusions

The risk of conflict between beel dewatering and fisheries tends to increase with increasing scarcity of water resources. The diversification of such conflicts indicates that their probability of occurrence is significant. These conflicts may not be always expressed because of suppression of the voice of the weak in the community power structure.

Beel dewatering to increase agricultural land is the main reason behind the current conflict. Besides, exclusion of the fishing community prior to implementation of the project, absence of proper compensation schemes to cope with post-project adverse situation, non-functioning of WMCA indicated by irregular meeting, partiality in loan disbursement, improper maintenance of sluice gates, khal excavation, etc., and unbalanced community power structure (farmer-dominated community) are some sources of conflicts between agriculture and fisheries.

Hydrological analyses show that fish migration pattern is adversely affected due to project interventions. It also indicates a remarkable difference between pre- and post-project water levels at the Siapagla and Khamar Khal. Pattern of regulated flow on to the floodplain was also investigated to illustrate a significant reduction of water area coverage for fish species due to the Siapagla FCD subproject. The digital elevation map (Figure 5) and area-elevation curve (Figure 6) clearly shows that due to the closing operation of the gates of the Siapagla and Baramara regulators, a huge portion of the beels remain dry when the outside water level is relatively high. The annual runoff depth is 0.76 m and it can inundate only about 425 hectares. This indicates an increase of agricultural land.

Pure engineering solutions fail to resolve such social conflicts. Solution to such problems lies in the combination of a socio-technical approach. Stakeholder participation from all levels of the society is a must to address the conflicts, enter into the depth of the problems, and find a suitable platform for conflict resolution. Identification of stakeholders was done on the basis of FGDs and interviews. Stakeholders were prioritized based on the degree of influence and degree of importance. After prioritizing, stakeholder analyses were performed in three stages and

arranged on three-tier, four-quadrant diagrams on the basis of role and involvement of the stakeholders. The stakeholder analyses show that the weaker fisher community was not involved at the planning stage. Farmers, fishermen, women, and other local inhabitants are all affected, positively or negatively, because of the project interventions. Since WMCA consists of mostly farmers, the rights and privileges of the weaker groups are neglected in their decisions. The Union Porishod may play the most important role in the conflict resolution process as it has a decision making position.

Many good solutions may emerge from FGDs and interviews. But in a stakeholder workshop, where multi-stakeholders interact, the weaker group may keep quiet in front of the powerful group. Powerless, marginal fisher community usually does not feel comfortable and reassured to express their feelings and opinions. Stakeholders' involvement is essential in conflict identification and reduction; but the most effective mechanism for conflict management may be the regulatory and legal procedures, especially in a community where unbalanced power structure exists. In the case of Siapagla FCD sub project, further study can help to bring an optimum water level for fisheries and agriculture sectors by taking the interests of all the conflicting groups in a trade off situation.

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Discourses on IWRM

These are the first and second books in the series 'Water in South Asia' being brought out by Sage Publications in collaboration with the South Asia Consortium for Interdisciplinary Water Resources Studies (SaciWATERs), Hyderabad.

The first book, edited by Peter Mollinga, Ajaya Dixit, and Kusum Athukorala, is about the idea or concept of Integrated Water Resources Management (IWRM), and is in two parts. The first part is largely theoretical and conceptual; the second part is about a number of different aspects and themes, with reference to specific contexts or cases, grouped under the heading 'Different Dimensions of Integration'.

The book begins with an illuminating introductory essay by Peter Mollinga. Starting from the Dublin-Rio principles, Mollinga traces the origins and evolution of the concept of IWRM, draws attention to the absence of a firm and precise definition, and identifies the different ideas that are loosely associated with the fuzzy term. He points out that though claims of a global consensus on IWRM are somewhat misleading; the term has indeed gained some currency internationally. As for South Asia, Mollinga describes IWRM as a concept in search of a constituency: it is an external idea that has certainly become familiar in South Asia, but has not yet struck roots there. The fact that IWRM has associations with ideas such as water being an economic good, the principle of full cost recovery, the privatization of water services, and so on,

makes it a contested concept. However, Mollinga argues that the need for a change from the old agriculture-dominated perspective on water to a different and more integrated and inclusive perspective is being recognized and that this perspective is likely to make headway.

The second chapter by J. A. Allan postulates five successive water management paradigms: (i) pre-modern, (ii) industrial modernity (inspired by the Enlightenment, science, capitalism, and the belief that nature could be controlled), (iii) environmental awareness (the Green Movement), (iv) the economic paradigm and (v) the recognition that water allocation and management are political processes. His discussion of the evolving perspectives on sustainability and their special relevance to IWRM (which he amends as IWRAM, bringing in Allocation as a political dimension) is placed in a social / cultural theory framework. It is an insightful analysis and this review cannot do justice to its richness and complexity.

Another extraordinarily interesting and informative paper is one by Timothy Moss on the reorganization of water management in member States following the European Water Framework Directive. It points out that there was a wide range of institutional arrangements for water management in the European countries, all of them operating within political / administrative boundaries, and not many of them taking note of river basins as units. The superimposition on that diversity of the European Water Framework Directive (which, among other things, calls for water-management based on river basins) holds the potential of conflicts between the spatial reorganization of water management that this involves and the existing national arrangements. Moss argues that the spatial 'fit' so achieved may affect the institutional 'inter-play' that is necessary (and to some extent exists in the current administrative arrangements). This is studied in detail with reference to the facts of the German case.

The chapter by Tushaar Shah and others on 'Limits to Leapfrogging' gives an account of the circumstances of the developing world (hydrology, demographics, water sector organization, and stage of development), points out how different these are from those of the developed world, and argues that concepts and models that emerged in response to the conditions in the west cannot readily be transposed to the developing countries. It does recognize that some useful lessons can be learnt from western experience and concludes by briefly indicating the elements of the right approach for the South Asian countries.

Jayanta Bandyopadhyaya argues the case for a radical change from the old paradigm of water management to a new holistic framework, and sets out seven indicators or criteria for the latter. He examines India's National Water Policy 2002 against those indicators and finds that it does not constitute a significant new departure from past ways of thinking. He concludes that there is little indication of the much-needed emergence of a new holistic paradigm of water systems management in India.

D. J. Bandaragoda stresses the importance of water-land linkages, and holds it to be a relatively neglected issue in IWRM. He blames the current sectoral thinking for this. 'Integration' tends to be within the 'water sector', and the emphasis on water leads to a similar polarized emphasis on land. He concludes by emphasizing the imperative of water-land integration in IWRM.

That brings us to Part II of the book. The title 'Different Dimensions of Integration' does not seem to fit this Part very well. The papers contained in this Part discuss important issues, provide much information and analyses, and are generally well-written. They add substantially to the value of the book. However, the connection to the idea of IWRM varies and is quite tenuous in some cases. For instance, if Saktivadivel's solid and authoritative paper had been on 'Water Balance Studies and Hydrological Modelling' without any reference to IWRM, would it have been very different? Perhaps the answer is 'Yes'. That question is left open. Similar questions can be raised about the chapters on Water Allocation between Agriculture and Hydropower (Lalani Imbulana) and Multi-Stakeholder Dialogue (S. Janakarajan). They are

excellent papers, but would they have been significantly different if the book to which they were contributions, made no reference to the term IWRM? The idea of IWRM is perhaps more strongly (but still not integrally) present in the papers on Inter-Intra-Sector Coordination (Ranjith Ratnayake) and on the Thuruvila case (Kusum Athukorala). The last paper by Phadke and Patankar on Asserting the Rights of the Toiling Peasantry is of absorbing interest, but it is exactly what the title says it is: the account of a struggle for rights. It is difficult to see any direct connection between that struggle and the concept of IWRM.

A more important point is that certain aspects of integration, such as inter-disciplinary integration or humanity-nature relationships, are not covered by any illustrative cases. Perhaps such instances were not available in South Asia, but in a general book on the concept of IWRM, illustrations could have been drawn even from elsewhere. Secondly, it might have been useful to take some cases where the idea of IWRM played no part even indirectly, and to consider hypothetically what difference the concept would have made to them if it had been adopted.

However, it is always possible for a reviewer to suggest that the book under review should have been different! Such comments do not detract from the value of the book. This is a book of high quality on an important subject.

Turning to the second book on Droughts edited by Jasveen Jairath and Vishwa Ballabh, one can understand its being part of a series on 'Water in South Asia', but how useful is it to bring it under the rubric of IWRM? Leaving that aside, and looking at it simply as a book on drought, it is clear enough that it is a major contribution to the understanding of drought.

The first chapter by Jairath and Ballabh makes compelling reading and clarifies many things. It analyses the concept of drought, questions the prevalent understanding, distinguishes between drought and water scarcity, and points out that droughts are not necessarily natural phenomena but the result of the ways in which the available water is managed, controlled and shared. The chapter is virtually a class analysis of drought (whether so intended or not). It follows that treating droughts as instances of water scarcity to be responded to technologically with supply-augmentation projects, without remedying existing inequities of access and control, might accentuate those inequities and aggravate the problems of the poor. The authors argue for a reversal of the established approach of proceeding from projections of demand to supply-side responses, and call for a more socially just distribution of the available water endowment. They also deconstruct the complacent idea that the people learn to 'cope' with drought, and point out that survival in conditions of distress cannot be called 'coping'. There is much more in the chapter but this review can only give the reader a rough idea of its contents.

Sanjay Sharma gives a fascinating historical account of the evolving attitude to drought during the colonial period. Reading Seema Kulkarni and Nagamani Rao's paper on Gender and Drought was an educational experience. However, the *pièce de résistance* of this section is undoubtedly the elaborate setting forth of an alternative approach to drought and drought-proofing by Suhas Paranjape and K. J. Joy. In place of the usual firefighting strategies they propose an alternative one based on the enhancement of the local resource base. Drawing upon the late K. R. Datey's work, they advocate a biomass approach to water entitlements and allocations and distinguish a *rights-based* entitlement from an entitlement based on economic opportunities. They postulate a hierarchy of rights with water as life-support coming first, closely followed by the right to water-based livelihoods, the 'rights' of the environment / ecology coming next, and economic rights coming only thereafter. If the local water availability falls short of the requirements (modestly estimated at 6400 m^3 for a household), they envisage supplementation from exogenous sources. Some of these propositions are debatable, but there is no doubt that this is a different and original approach to the problem. Part II contains country overviews covering Sri Lanka, India, Bangladesh and Pakistan. These are very useful and illuminating but cannot be summarised here. That applies also to the valuable Case Studies in Part III.

In conclusion, this reviewer's general assessment is that these two books are solid, scholarly, interesting, informative volumes, and valuable additions to the literature. They set very high standards for the books that are to follow in the series. Having dealt with the books in their own terms, this reviewer may perhaps be allowed the liberty of indicating that he is not an enthusiastic subscriber to the idea of IWRM. To begin with semantics, 'integrated' is the language of engineers when they want to step beyond engineering. 'Resource' is an accountant's or economist's language, preferably to be avoided in talking about water; water and indeed nature in general have not merely an instrumental value but an existential one. 'Management' comes from the world of business: there is a world of difference between corporate management and 'natural resource management', and using the same word in both contexts is fraught with the danger that the thinking appropriate to the former might creep into the latter. Indeed it has. Further, if we talk about 'integrated river-basin management' we run the risk of promoting centralisation. IWRM is also susceptible to the ills of techno-centrism.

The problem is that water was understood to be essentially a matter for engineers not very long ago, and that way of thinking is still fairly strong. To this was added the economic element stressed in the fourth of the Dublin principles, and this became very strong because of the worldwide resurgence of capitalism. It is that combination of engineering and economics that still holds sway. In between came the emerging environmental concerns; these did influence the engineers and economists to some extent, and the word 'integrated' was added. The 'I' in IWRM was thus essentially the addition of the environmental dimension to the engineering-economic approach. To the extent that this represents a widening of mental horizons, it is indeed welcome. IWRM is certainly an advance over earlier thinking. However, it does not go far enough.

What then would be one's alternative formulation? In place of the words 'integrated', 'resource' and 'management' one would prefer 'holistic', 'water', and 'wise use', but that does not make for a catchy slogan like IWRM, which in any case seems well established. Reluctantly accepting that term, one would like to bring the following components within its ambit: holism; prudence and economy in water-use; equity and social justice; avoidance of conflict; ecological sustainability; harmony between groups, between political units, between countries, between generations, between species, and between humanity and nature. Proponents of IWRM would of course say that all this is part of IWRM. Such a claim is difficult to accept. A transformation is needed. The paper that comes closest to such a vision is Jayanta Bandyopadhyaya's chapter in the first book.

Taming the Anarchy: Groundwater Governance in South Asia

Tushaar Shah, Resources for the Future, Washington D.C, 2008. pp 302

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With this book, Taming the Anarchy, Tushaar Shah achieves what many South Asian water scholars thought impossible - a scholarly yet very readable and provocative book that provides not only an original summary of the impacts and impasse of current groundwater management but also upbeat and positive propositions to facilitate rethinking of groundwater governance options. This book compiles a mass of both the authors' own and also many other scholars' work into an accessible text that will be a boon for a wide audience from students and academics to the interested public. However, the book also lays down a challenge to water resources managers and national and international policy makers – especially related to groundwater and canal irrigation management - with stark criticism of past and contemporary policies based on strong empirical evidence. The book introduces a core new phrase into water planning and economic development – that of 'water scavenging' – to explain the secret of the success of pump irrigation undertaken by small farmers in South Asia. This shows the book's intent to provoke reaction and rethinking among the failing institutions of both groundwater management and canal irrigation. It also targets politicians, even up to the level of Chief Ministers, who are the ones responsible for shaping groundwater management. It is thus, an excellent book for South Asia in general, and India in particular, to usher a fresh perspective on where groundwater and irrigation management may go in the 21st century.

The title of the book itself indicates a deliberate aim to depart from the standard line of arguments presented on water policy. Shah's perception of South Asia as a place of 'functioning anarchy' - one that depends not upon the government but on the energy of its people - gives it a real focus on what works in the eyes of these groundwater users and their own political economy of water development. He notes how, for this region, the choice for groundwater governance may not be of one between chaos and stability, as global discourses may label it, but of the humanity we manage in maintaining access for different users. Moreover, Shah wants to reject the images of unmanageable chaos, intolerable disorder, and inhumane anarchy often given as characterizing current groundwater use. To argue these points, Shah delights in documenting both the ingenuity of groundwater users, and the perverse incentives of some formal groundwater institutions. He uses both these analyses to suggest that formalized groundwater alone cannot work in the world of users in today's South Asia. Shah thus concludes with a plea for strategic indirect approaches to groundwater governance - tailored more specifically to socio-ecological regions, thinking about groundwater as part of wider water resources locally, mixing informal and informal institutions as relevant - that he thinks can at least tame or lessen some of this anarchy as it materializes with different faces in different regions. Also that can allow new ideas about governance to evolve and thrive locally to allow for a more 'manageable chaos'. This may better suit the rapidly transforming world of groundwater users in South Asia.

The book revolves around some core arguments, expanded in its chapters. A critical and provocative crux of the arguments is that the heyday of large-scale canal schemes is over. Indeed if they continue or new schemes do materialize, these must be run more with reference to groundwater recharge and understanding of conjunctive use principles. Second, is the case to understand the special characteristics and history of the groundwater boom in South Asia, giving special attention to its socioecology – with reference to different regions as shaped by their hydrogeology and agrarian and political histories. A third argument is that the groundwater development must be understood against scarcity of land and not only water, and the high populations of the many small farmers for whom pump sets offer the chance to scavenge water more reliably and lucratively than permitted by canal irrigation. The fourth argument is to understand the nature of the informal water economy and distributed governance that Shah sees operating in groundwater governance in the region. Shah aims to present farmers' real economic responses and options under different contracts emerging around the relationship around land and water access, water markets, and the water-energy nexus. His case is that we must understand these economic institutions better, if we are to understand what new governance mechanisms may emerge as the regional water economy transforms. They are also central to understanding prospects for further future poverty alleviation of marginal farmers through groundwater development

The book is structured around eight chapters that build these arguments and provide evidence towards the 10 propositions that close the book. The book starts with three chapters that set the scene, with a skilful synthesis of the hydraulic past and the role of irrigation and state formation, the rise of the colossus of pump-based groundwater-irrigation in the region alongside canal irrigation, and a very provocative chapter on the uncertain future of canal irrigation and its problem fields. These chapters weave together a good overview of historical and political studies from a wide authorship. They provide not only useful and sometimes startling data but also bring in core ideas from development theory and planning, that can and have been used to study these fields. South Asian irrigation is discussed also within the wider global context of irrigation development (of other hydraulic societies likes Egypt and Sudan) as well as experiences from US and Australia. Shah is especially adept at bringing in contemporary political economy into the analysis and challenging the reader to think about how and why canal irrigation is experiencing such problems in its management in the last fifty years and why groundwater irrigation is now surpassing the area under large-scale systems.

The next 3 chapters focus more specifically on groundwater development, looking at the welfare impacts of wells, the concerns over diminishing returns from groundwater development, and the relationship of aquifers and institutions. Here, Shah also weaves some newer syntheses and perspectives into the book, even to those who know his work overall. These chapters provide some fascinating reflections on the different socioecologies of groundwater, particularly with reference to India, and again provide some new insights into what kinds of institutions are working or not in these regions. These socio-ecological regions include the Indo-Gangetic plains, arid alluvial aquifers, and the hard-rock and confined aquifers, whose prevailing institutional histories are studied from perspectives of institutional economics rather than conventional sociological perspectives and development approaches., In a highly readable style, Shah looks at institutional responses in relation to atomistic, opportunistic, and gaming strategies He asks the reader to look for collective possibilities and different Coase outcomes reflecting how property rights and understandings of externalities outcomes might reshape possibilities, rather than assume the worst under Prisoner Dilemma outcomes. However, these chapters also bring in a political economy perspective alongside institutional economics, analysing how farmers' movements have interacted or not with state policies to shape groundwater governance outcomes. These chapters bring some new energy into the older debates around the water-energy nexus to see how differences play out in different socio-ecological regions. These chapters have laid the empirical argument for the final two chapters.

The last two chapters ask whether the anarchy can be tamed and whether irrigation in South Asia can thrive in such anarchy. These chapters first present a serious critique of the global discourse on Integrated Water Resource Management (IWRM) and its standard tools. They make the case instead for much better understanding of processes happening and possible in the different socio-ecologies of groundwater in the region. Shah makes a clear case to see South Asia as still in the largely 'informal' stage of water economies, for which the prescriptions of IWRM hold little promise. He makes a clear and strong plea for indirect approaches, far more than integrated ones when building groundwater governance, tailored to and built from what has worked in different groundwater socioecologies. This is how and why the author sees groundwater governance as 'work in progress'.

Nevertheless, there are some gaps that this deliberate orientation leaves bare, which may frustrate some readers. Despite Shah's calls for recognizing indirect governance as more able to bring 'humane anarchy' than formal institutions, many small farmers have lost access to groundwater or face deteriorating terms in accessing water markets, and he could have written more about the struggles here. For the five institutional responses that Shah portrays (page 154) as playing out in different aquifer/socio-ecological regions, the poor are potentially negatively affected in at least three of these with few options also for political mobilization outside energy subsidies. We are given no figures of the likely numbers affected by changes or who might benefit, nor how wider public agency can act to support these dynamics in less perverse ways than subsidies. The new agrarian economies emerging around middle-sized but wealthier farming families also embedded with wider economic and political structures in the villages in these different socio-ecologies remain less examined. Shah has used the quote of Ashis Nandy (page 208) about chaos, anarchy, and disorder with wonderful literary elegance. The chaos may have seemed manageable and the disorder tolerable on the epic scale of India given the benefits many have obtained from groundwater use. However, clearly the anarchy of some groundwater development had, and will continue to have, some quite inhumane impacts on many individual poor farmers. How do we record those impacts and look for adaptive strategies against them in future, to remain sensitive on who gains and who loses?

Alternative perspectives on surface canal irrigation and whether there are any perspectives for its change are not really presented, rather, just demolished. While it is easy to criticize the operation of large-scale systems, it hardly seems possible to replace the livelihood of millions of small farmers still dependent on them from additional groundwater development and exit strategies will not be a choice or public or individual strategy in the short-term. Shah is right to emphasise the need for better attention to conjunctive use as a key design and policy issue, but more discussion on operational changes for water supply could have been provided form other country experiences. Also, leaving analysis of public and funding agencies to comments like 'ostrich-like, business-as-usual approach', however true in the short-term, meant there was no systematic analysis of how agencies can interact in providing water services. This imparted a weakness in the argument and evidence on how South Asian countries will transform institutionally in comparison with other water economies, which Shah discusses in Chapter 7, and how this 'distributed governance' between formal and informal institutions can emerge. Shah has an interesting diagram in Chapter 7 on the stages in the transformation of water economies, but does not analyse what enables these transitions, or how distributed governance helps in bringing them about. For example, what phenomena have shaped the shift between the 'largely informal' stage (as South Asia is seen) and 'formalising water economies' (as countries like Mexico are seen)? The question of whether states can become industrialized nations while still having largely informal water economies dependent on local institutions of informal markets, mutual help, and community management institutions, and what role larger public agencies (including irrigation ministries) play in such transitions, still needs an answer. Thus, one felt the general lack of attention to higher level institutions – something is needed at higher than village or local aquifer level to coordinate resources use and data management but this is hardly touched upon. The State and public agencies in general, whether at national or state level

get little attention beyond the criticism of past initiatives. The examples of positive experiences from beyond the region sometimes seem presented with far less critical analysis of the role of surface irrigation agencies than applied to those from the sub-continent.

There is virtually no discussion of groundwater hydrology, and the issues in getting better information on this into the informal water economy that Shah writes about. Hydrologists and engineers get rather a telling off in this book in that they are seen to view resource use differently from farmers and not design for them. However, this under-represents some efforts to promote participatory assessments and local management of groundwater. Some readers may feel that there is a deeper story to tell here of efforts to promote better planning and governance that may have failed, but where there are also lessons to be learned. More importantly, how do we change this involvement of public agency in their scaling up? Shah does call for a platform for scientists and farmers to work together after showing how they think differently – but does not discuss what can make such platforms sustainable.

Finally, while the book is strongly and perhaps rightly focused on agrarian questions linked to groundwater governance, it largely ignores new environmental demands and the issue of water quality (although the subject is raised briefly). Once again, the reader might question how strategic indirect approaches will tackle the management of deteriorating groundwater quality, or the complex interactions between groundwater and surface water in questions of water pollution in general, or the environmental impacts of widespread groundwater use. These impacts are not mentioned in the book, although 70% of people in South Asian depend on groundwater for drinking purposes.. These environmental issues, of course, have not been the real focus of most 20th century groundwater research in South Asia or of the author. However they are important issues for future management. The book therefore presents a challenge to others to build up an ecological understanding as sound as the societal analysis in this book, so transformations in these socio-ecological groundwater regions give their current groundwater users a future.

The strength of the book lies not only in the accessibility of arguments, especially economic and political economy perspectives, but also the power of these arguments to challenge existing water agencies and planning departments on their approaches. It shows clearly and unequivocally the vulnerability and problems of large-scale services schemes and argues their increasing irrelevance as reliable suppliers of irrigation water unless groundwater is also considered with them. As already mentioned, it introduces the concept of the 'scavenging water' as it can be achieved by farmers with pumps, which might be felt as something of an affront to those who have developed the models of pump selection and groundwater modeling, although they also know these models have not been that much updated or stood the test of time. It provides a very interesting historical overview of Asian irrigation, well linked in with theoretical ideas and locates South Asian groundwater development in a wider context. There is a very good exploration of what is unique about the South Asian irrigation economy (with its millions of small users within a seasonal water regime etc).

The broader lessons that can be applied from South Asia and elsewhere are not really a focus of the book, except insofar as the institutional models can be compared elsewhere. Rather the book aims to build up and demonstrate where action can still come in the future, using wider comparisons from other regions and groundwater development regimes. It also provides a unique set of clear examples for a number of institutional economic analyses applied to groundwater governance. Having all these together in one book, written in a provocative but simple prose, accompanied by good supporting argument and data, gives it great impact and the power to engage and challenge the reader especially those involved with groundwater and large-scale irrigation developments.

Looking towards the future, Shah does not try to forecast what new government institutions might come or exhort particular new models. Instead, he tracks emerging patterns of behaviour by decision-makers and representatives and bases propositions on these - to avoid tokenism; look for institutional innovation as locally developed; and ensure learning as well as action. He pleads for a model of what he calls 'distributed governance' made up from various types of formal and informal rules. This can only come with the breaking of what he describes as the 'path dependency' in the behaviour of agencies and their following of ideas of groundwater governance developed so far. Thus, we should not see the book merely as being provocative and argumentative, or fallible given certain gaps in coverage. Tushaar Shah is, in fact, motivating us to think differently. In seeking to challenge the reader, he is first and foremost playing the role of an advocate for thinking about new groundwater governance. With this book, Tushaar Shah is 'handing on the baton' to a new generation of researchers, agencies and civil society groups to think differently and innovatively. Let us hope we can take up the challenge in the same spirit, and with the same commitment to good research and honesty, with which he has written this book.

Pluralized Water Policy Terrain = Sustainability and Integration

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The term 'policy' is a word sanitized for polite company: it really is about power and the formula for its use. Since power, like procreation, is best exercised in society invisibly, policy discussions are notorious for what is covert and vaguely implied than for what is overtly laid out for public view. As in the case with the other much bandied term 'stakeholder', which assumes that putting the village landlord and the village landless in the same room without acknowledging their power difference magically brings about a 'stakeholder consultation' that legitimizes development decisions, conventional 'policy' analysis does not interrogate existing power structures but assumes a status quo. In much of South Asia undergoing the pangs of change in the guise of modernization, the failure of development initiatives in water and other sectors, or at least hostility to them, can be traced to the drama of power exercise by those who have it, and resistance by those who do not. Such being the case, the questions of interest for water policy making and its deployment are: what are the various forms of power and its exercise; who does the exercising and how; and what does it mean for water management, or more bluntly, water politics?

Approached this way, the key issue around water conflicts is that of the exercise of power among elements within a society. In his classic study of power, Steven Lukes discusses three faces of power that influence public consent to its exercise (Lukes, 2005). The first is coercive with an implied or demonstrated punitive threat, and the second is persuasive through inducements. Lukes discusses at length the third type, which is its exercise in the moral or cognitive dimension that impose internal constraints "wherein those subjected to it are led to acquire beliefs and form desires that result in their consenting or adapting to being dominated, in coercive and non-coercive settings". In a similar ethos, British political philosopher E. H. Carr, in trying to define the new and emerging field of international relations at the start of the Second World War, also talks of three types of power: military power, economic power, and power over opinion (Carr, 1939), the third corresponding with the moral dimension of Lukes.

It is intriguing to note how classical South Asian thinking on the subject of power (*shakti*, as different from the actors (or *patras*) exercising those powers) maps onto the pluralistic scheme of Lukes and Carr (Gyawali, 2000, Thompson and Gyawali, 2007 and Gyawali, 2009). Samkhya philosophy distinguishes between coercive (often military) power exercised by the hierarchic solidarity of the state (*tamasik shakti*), the persuasive (monetary or organizational) power exercised by the individualist solidarity of the market (*rajasik shakti*) and the moral power wielded by the egalitarian ethics community (*sattwik shakti*). It is this third face of power, the ethical dimension – which Lukes talks about and which civic movements behind water conflicts are the vanguards of – that is often behind the power wielded by various ideologies. Many social or environmental activist movements do not wield military or monetary power: theirs is the power of critique exercised through moral outrage.

It would be a major error to think that these powers are exclusive to some particular social solidarity or even an individual actor: Samkhya is emphatic that these are *gunas* (or constituent subtle characteristics) which are found in varying mixes, from a perfect balance in rare cases to the dominance of one or the other trait in most. Similarly, each of the powers is inextricably intertwined with the others and cannot be viewed in reductionist isolation. Indeed, they have been compared to the wax, the wick, and the flame respectively in a lighted candle. The otherwise *tamasik* wax has to melt, rise up through the *rajasik* wick, and burst into self-sustaining *sattwik* flame to provide beneficial light all around. It is the higher *sattwik* purpose of a lit matchstick that drives the *tamasik* inertness with *rajasik* drive to provide for light in a dark room. Alone , the lit matchstick, the wick, or the wax, means nothing and leads to no benevolent end.

Using this concept, we can examine the mix of political powers enjoyed by the different actors as well as to explore how those powers are deployed to enhance the standing of each of them. Translating this concept into modern statecraft terms, the grossest form is *tamasik shakti*, that of brute force, represented by armed police or military might, which in its essence is the very defitnition of the state. More subtle is *rajasik shakti*, that which emanates from organized strength including networked markets and political parties. At the highest plane, capable of harmoniously balancing the two is *sattwik shakti*, the ethical force that humbles even mighty generals commanding large armies. It gets things done without the statesman having to use any *tamasik* threat or *rajasik* inducement. In the absence of statesmen in the society's body politic commanding such ethical weight, this role is filled by civic movements.

New thinking in the social sciences is beginning to move away from the closed hegemony of monistic thinking or/ even the dualism of 'mixed economy' state-bureaucratic centralism with free market liberalism. The most notable on this count has been what is called the theory of plural rationalities (or more widely Cultural Theory(CT)), which goes beyond monism or dualism in public policy (but avoids the infinitude problem that is the bane of post-modernist thinking). Summarizing Thompson (2008), its arguments can be briefly encapsulated as follows: the variability of an individual's involvement in social life can be adequately captured using two dimensions of sociality (or discriminators). The two discriminators – transactions symmetrical or asymmetrical and competition fettered or unfettered – generate four permutations of the ways of organising (see Fig. 1: in older formulations of CT, called *grid-group analysis*, 'transactions' were termed 'grid ascription' in the Y-axis and 'competition' was denoted on the X-axis by the term 'group affiliation', both of which were either strong or weak, high or low, positive or negative).

Group affiliation – with competition fettered and accountable or unfettered and unaccountable – captures the extent to which an individual is incorporated into bounded units. The greater the incorporation, the more is individual choice subject to group determination. Grid ascription – with transactions happening between equals (symmetrical) or ranked unequals (asymmetrical) – denotes the degree to which an individual's life is circumscribed by externally imposed prescriptions. The more binding and extensive the scope of the prescriptions, the less of life that is open to individual negotiation. In one sense, these two parameters are asking the fundamental questions of philosophy in human life: who am I (group affiliation)? And what should I do (grid ascription, or the context of pre-ascribed rules)? Depending upon a positive or a negative response to these two fundamental questions, the two discriminators together generate four basic ways of organizing (also called four social solidarities): *hierarchism* (high group, high grid), *egalitarianism* communards (high group, low grid), *individualism* (low group, low grid) and the *fatalism* of the conscripted (low group, high grid).

Symmetrical transactions and unfettered competition are the hallmark of the unbound and unranked realm of market individualism where risk-taking is the behavioural norm. It is risk-taking of entrepreneurs that brings forth innovations and new technological as well as

management solutions that drive the water and other markets. At the opposite end of the diagonal is the ranked and bounded world of bureaucratic hierarchism where transactions are asymmetrical and competition fettered. Within this management style, risk-managing is the norm with the desired objective being control over the process and outcome. Because much of water management debates have remained confined to these two diagonally polar opposite positions, the history of the last half of the 20th Century has resulted in the "market versus government intervention" pendulum swings that bedevils the sector.

What CT does is bring in the other two (often ignored) proclivities to the policy debate: the management styles of symmetrical transactions and fettered competition, which is the world of activist egalitarianism and civic movements; and that of asymmetrical transactions with unfettered competition that results in the fatalised world of conscripts. In the former, the need for keeping the group boundary intact as well that of risk avoidance often leads to alarmism and risk magnification, while in that of the latter, coping passively with whatever risk fate dishes out is the norm. While the previous two (markets and hierarchies) represented the stable diagonal, these latter two (communards and the fatalist masses) represent the ephemeral diagonal. Indeed, if one examines the nature of civic protests, they arise as a reaction to some perceived danger (whether loss of language, culture, habitat, water rights or other threats), which, if they have not been sensitively addressed by the powers that be, can bring down governments and the boycott of market products.

These groups disappear or lie dormant until catalysed into action by some such provocation from perceived external danger, and hence are seen as less stable a social solidarity than hierarchies and markets. It is also the egalitarian activists who catalyse the fatalist masses, who otherwise are passive and dormant, into some form of reaction. It is for these reasons that the conventional social sciences have mainly considered the first two, the world of bureaucratic socialism or that of free market individualism, but mostly ignored civic movements and the otherwise passive masses that only react (or more correctly are incited to do so by the other three) during elections and revolutions, whether of the market or the comrades.

As argued at the beginning of this essay, *rajasik* power is exercised by market individualism through its richness of networks and contacts. It believes in substantive rationality – "what is in there for me?" – and is moved to action, to take risks, only when the profit motive is strong enough. It is this drive that is the basis of precocious scientific and technical innovation by the market. *Tamasik* power is exercised by bureaucratic hierarchism following a procedural rationality: "Follow the rules and guidelines, and you can do anything within its limits; but infringe established procedures and you will be punished!" Activist civic movements are guided by a critical rationality whose basis is *satwik* power that comes with maintaining the moral upper hand. The many failures of markets or hydrocracies to assure equity and justice in water development projects form the grist to its mill of strident critique. While the fatalists are passive and do not actively cognize and strategize like the other three (if they did, they would no longer be fatalists), they too exercise their brand of power: it is the power to react and withhold consent. Mass boycotts of brand name consumer products or unexpected swings in elections are examples of the revenge of the fatalists exercising their reactive power; but then someone must have had to jolt them out of their fatalist stupor, and these are more often than not the activist egalitarians.

What Fig. 1 depicts is primarily the social construction of water using the CT framework, a similar framing having been done in the case of another natural resource – forestry – and the corruption therein, which in essence is an exercise of power but not in the sanctioned manner (Gyawali, 2004). Given that risk is socially constructed – and CT argues that it is only constructed in four specific ways – the very definition of what the problem is will be different. Thus in the current hyperactive global climate change discourse, the one problem of excessive greenhouse gas emission is seen as the result of too large a population growth by the hierarchs,

too much profligacy by the activist Greens and too restrictive a pricing policy by the market players. And if the three active solidarities of hierarchism, egalitarianism, and individualism differ in their very definition of the problem, one can rest assured that their proffered solutions and the technology choices they will make to achieve those solutions will also be distinctly different.

As an example of the application of the CT framework, Dixit (1997) has shown that the problem of silt in the Kosi river in Bihar too is defined differently: to the hierarchic department of irrigation, silt is a danger to be controlled since river waters are public goods; to the individualistic *zamindaars*, silt is a private good leading to opportunity for profit, whether through desilting contracts or other contracts if the high dam is built on the Kosi; to the activists of the Ganga Mukti Andolan, silt is a common pool good but attempts to control it or profit from it is a diversion from other evils in our midst, which is the high risk posed by high dams or the corruption in canal cleaning contracts; and finally to the fatalistic ryots, silt is one among a host of woes about which we can do nothing in this life.

Each of these ways is reflective of a particular worldview and a specific manner of organizing that consolidates that worldview, especially regarding their 'myths of nature'. For instance, individualism regards nature as infinitely bounteous, that nature is robust and takes care of herself. The only "scarcity" is due to the constraints imposed by governments and civic bodies that prevents the full exercise of human ingenuity to exploit nature and, if one item runs short, to find immediate substitutes. Opposed to this worldview is that of egalitarianism, which sees nature as fragile, tipped to depletion and collapse if left to market exploitation and lack of government concern. Control-oriented hierarchism, in an attempt to balance these two opposing positions, sees nature as robust but within limits, with those limits set through impact assessment rules devised by its in-house expertise. To fatalism, nature is capricious and could go any which way it might like a lottery and one just has to cope with what comes. Thus the four social solidarities define resources as abundant, depleted, scarce or like a lottery. Such a worldview is also a reflection on the distinctive exercise of power by the four social solidarities.

Hence, returning to Fig. 1, we see that, to market individualism which prizes freedom of choice and networking, water is nature's veritable cornucopia, a private good to be bought and sold in the market after ingenious processing, either as glamourized bottled water or tankers or privately owned tube wells. External management is an unnecessary constraint imposed on human ingenuity. On the other hand, to bureaucratic hierarchism, water gets defined as a scarce public good: it is scarcity, not abundance, that has to be managed through regulated government- or municipality-owned water utilities that decide who or which ranks and localities have the right to how much water and when, the entire set of procedures to be determined by their expertise-based establishments and protected by laws and regulations. To activist egalitarianism, water is a depleting common pool good, to be protected from pollution and misuse by markets and mismanaged municipalities, while to fatalism water is a lottery like life itself, a club good from which they are excluded because they do not belong to the club. Each of these co-definitions is all partially true expressions of the social construction of water that captures a part of the social reality: chose only one definition by discarding the rest and you discard the wisdom contained in them as well. And that would be a recipe for a potentially unpleasant policy surprise, which is clearly not a very sustainable situation to be aimed for.

What CT therefore proposes is not to choose one definition – of the market or of bureaucratic centralism or even a mix of the two as in the much-talked of 'public-private partnership'. What it asks is a more pluralized democracy that gives space to all the three active social solidarity voices of bureaucratic hierarchism, market individualism and activist egalitarianism depicted (Gyawali, 2003) as a three-legged policy stool in Fig. 2. It also insists that you cannot merge these perspectives into one: the best you can do is have them constructively engage between

themselves in a democratic terrain because it is the democratic engagement process, not the proceduralism of bureaucracies alone, that provides for integration. It also argues that the potential for strategy switching flexibility is the basis for sustainability, while inflexibility on this count is a recipe for disaster sooner than later.

It is this concept of inclusiveness in the CT framework which led to the suggestion (Gyawali, Allan et al, 2006) that the mantra of Integrated Water Resource Management (IWRM) be replaced with CEIWRAM. The CE stands for 'constructively engaged' policy discourse between votaries of the risk-managing hydrocracies, the risk-taking market innovators, and the risk-sensitising social and environmental activists. Since they each come with a different perspective on the problem and a different set of filters that lets in some and rejects other 'facts' pertaining to the problem, they would adopt a different choice of technologies to solve what they define as the problem. Only with all three social solidarities being given a place at the table can we be ensured that no information has been filtered out, no technological possibility ignored at the outset.

The A in the above formula refers to 'allocation', which is an intensely political process, not just for physical water allocation but also the allocation of budget between sectors as well as time and other resources. This recognition of the various types of water politics in all its *satwik*, *rajasik* and *tamasik* elements is what has so far been missing in the water policy discourse. Such recognition would also require a re-thinking of the very concept of sustainability in water management: to individualism, since nature is perceived as robust and bounteous, *all* development is sustainable, whereas to Green activism that perceives nature as fragile *no* development is sustainable. It is only bureaucratic hierarchism that thinks development is sustainable within the procedural limits of its EIAs. Under conditions of inherent scientific uncertainty, where a socially acceptable truth lies can only be discovered, not *a priori* in a hegemonic fashion but through a constructive engagement between all the social solidarities in a democratically open but essentially contested terrain. This pluralisation is the core message of CT for a 'sustainable' and 'integrated' water policy.

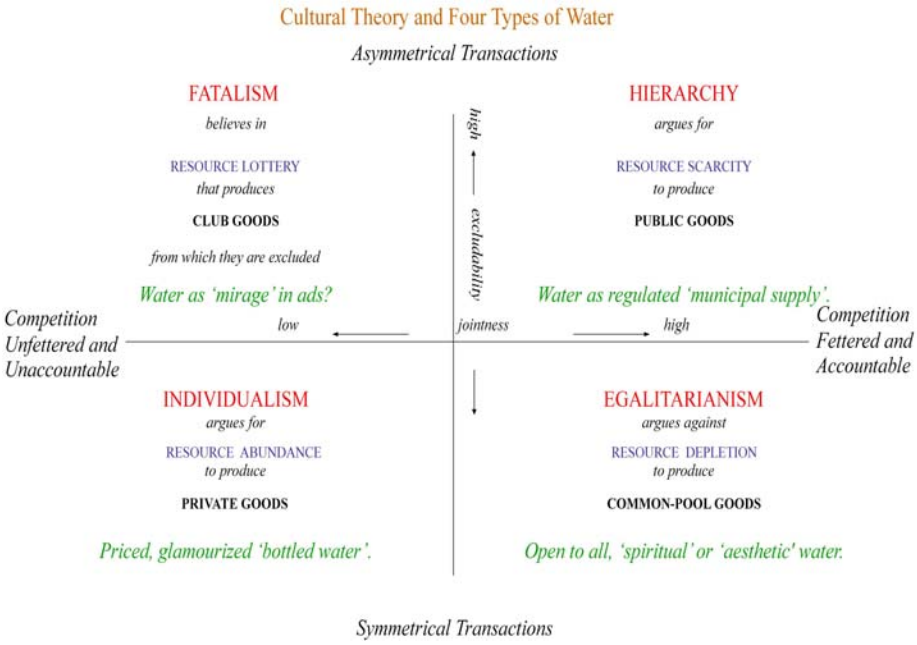

Fig. 1: Social Construction of Water Using Cultural Theory's Two Discriminators

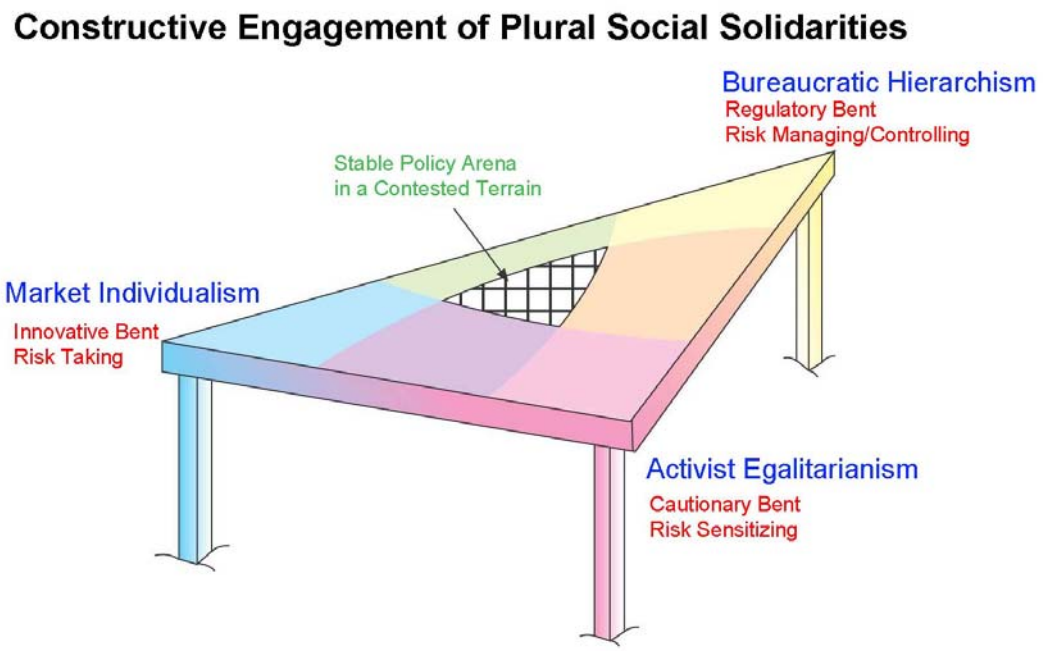

Fig. 2: Risk Proclivities within a Three-Legged Policy Terrain

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