Growing contribution of groundwater in South Asia’s agricultural economy remains both underestimated and understudied. However, in recent years there is an increasing awareness about the important role that groundwater has played in fostering food sufficiency in much of this poverty stricken belt of the world. At the same time, there is a realization that much of this precious resource stands the chance of rapid and irreversible exploitation in many parts of South Asia. The issue is: how long can this good run continue without any mechanism for governing this colossus? What kind of governing structures and mechanisms might help? Refined understanding of the (non)existing governance structure in groundwater and further research into fine tuning this understanding in order to try and bring about a modicum of order in the functioning of this booming but anarchic economy is of great urgency. In this quest for better governance, need to understand the spatial variation within South Asia itself is of great importance and indeed was the justification of the country surveys conducted by IWMI in 2002.

The findings, based on an extensive region wide groundwater survey will thus, bring out the salient features of groundwater economy and socio-ecology of South Asia. This survey has helped reinforce several facts regarding groundwater irrigation in South Asia and at the same time has helped challenge some myths surrounding it.

Perhaps the most important finding of the survey is the rapid growth of groundwater economy in the last three decades, with peak in 1990s. Thus, 1990s can very well be designated as the decade of “pump explosion”. This survey corroborates the findings of Agricultural Censuses of India in that the ownership of groundwater assets were less skewed than the ownership of land, making groundwater an ideal mechanism for poverty alleviation in the water abundant areas. That groundwater economy is primarily self financed came as a revelation to many who maintained that huge government subsidies, either direct or indirect, has played an important role in spreading groundwater irrigation. Perhaps, what this indicates is that, government subsidies might not have reached the targeted...
segments and indeed, there is enough evidence for the same. However, there are regional differences in this regard. Evidence from Nepal suggests that government subsidies have played an important role in popularizing groundwater irrigation, while evidence from Bangladesh suggests that government subsidies had hardly any role to play. Another important aspect explored in this survey was the regional variations in distribution of electric and diesel based water extraction mechanisms (WEMs). That there exists a wise “energy divide” in South Asia was clearly brought out. This so called energy divide is quite ironic in nature. Thus, the poverty stricken and water abundant areas in Eastern India, Nepal, and Bangladesh, where groundwater can unleash unprecedented agrarian boom are saddled with low capacity and high operating cost diesel pumps, while regions with depleting groundwater tables have a predominance of electric WEMs, paying negligible power tariff. In this context, “energy irrigation nexus” emerged as an important aspect of the groundwater economy and perhaps the only handle that the government has in managing this huge economy. Water markets in South Asia has been a topic of great interest to scholars and the views expressed as charted seemingly two contradictory paths. On the one hand, water markets have been hailed as important vehicle for poverty alleviation and on the other hand, it has been condemned as instrument for accumulation of surpluses by rich water lords. Our survey, therefore, quite justifiably concentrated on this aspect of the groundwater economy. The results revealed a change in the regional spread and intensity of the groundwater markets. Eastern India, Nepal and Bangladesh have developed very vibrant groundwater markets over the last decade or so, while, the much documented water markets in the Western and Peninsular India are on a decline. This basically reflects the amount of groundwater availability across regions, and given the widespread overexploitation in the hard rock regions, it is not surprising that scale and intensity of groundwater markets have declined. In fact, in such hard rock regions of South Asia, groundwater has in fact contributed to further immiserization of the rural poor. This is in sharp contrast with the opportunities that groundwater offers in the water abundant parts of the Ganga-Meghna-Brahmaputra basin.

Our findings underscore the need for refined and nuanced analysis of groundwater socio-ecology in South Asia taking into account both the spatial and temporal aspects of change. It recommends adoption of groundwater policies suitable to the regional realities of Asia.

III. PROTECTING FOOD AND LIVELIHOODS SECURITY THROUGH CONJUNCTIVE WATER MANAGEMENT: THE CHALLENGE OF GROUNDWATER GOVERNANCE IN PAKISTAN
PUNJAB

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Increasing demand and deteriorating water quality has put enormous pressure on the agriculture sector to use its available water resources more efficiently and to improve the productivity of water. These pressures are a result of the increasing demand for food and ever declining opportunities for the extension of irrigation to other areas due to scarcity of land and water resources and high costs of development. Increasing the productivity of water and the sustainability of existing water resources is central to fight poverty, to reduce competition for water and to ensure that there is enough water for nature.

In semi-arid regions, scarcity of fresh water resources has forced farmers to extract groundwater to supplement their crop demands. Groundwater is now the largest source of irrigation (50-60%) in South and Southeast Asia and North China, and its use for cities is also rising rapidly. The extent of groundwater development in Pakistan can be gauged by the fact that in 1960 there were less than 1000 irrigation pumps. Today it has over 0.5 million and groundwater contributes upto 50% of the total water available at the farm gate. The exploitation of usable groundwater provided an opportunity for the farmers of these areas to supplement their irrigation requirements and to cope with the vagaries of the surface supplies. This has transformed a situation of low and uncertain crop yields to more secure and predictable regime of crop production.

Studies have shown that crop yields have increased almost by 150 to 200 percent due to the use of groundwater to supplement rotational canal water supplies. As a result, groundwater has become the heart of booming local economies, and the mainstay of agriculture, food security and rural livelihoods. But the current rates of groundwater use in most of these regions are unsustainable. Rapidly falling water tables and increasing salt contents in the pumped groundwater imply that more expensive and poor quality groundwater will have to be used for irrigation in future. This impairs the Pakistan's capacity to feed its growing population.

Water logging and salinity in the Indus basin still remains one of the key bottlenecks in managing land and water productivity to the optimal levels, despite of immense efforts. Secondary salinization associated with the shallow groundwater tables and use of poor quality groundwater for irrigation has further compounded the salinity problems. Therefore, salt-affected soils have become an important ecological entity in the Indus basin of Pakistan. It is estimated that nearly 6 million hectares are already afflicted with this menace, of which about half are located in irrigated areas. About 40% of this area