Contributing Paper

Options Assessment and the Planning System in the IBIS, Pakistan

Khalid Hussain
Development Visions, Pakistan

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Options Assessment IV.2

Options assessment and the planning system in the IBIS

(The Devil is In the Details)

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Prepared for the WCD by:
Khalid Hussain
Development VISIONS, Lahore-Pakistan.
<Daima@brain.net.pk>

World Commission on Dams Secretariat
P.O. Box 16002, Vlaeberg, Cape Town 8018, South Africa
Phone: 27 21 426 4000 Fax: 27 21 426 0036.
Website: http://www.dams.org E-mail: **info@dams.org**

“So let man consider
of what he was
created; he was
created of gushing
water issuing between
the loins and the
breast-bones.”

Qur’an. *The Night-Star*, 86:5–7

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C O N T E N T S

Options assessment and the planning system in the IBIS

PROLOGUE

There is no dearth of options when it comes to irrigation in Pakistan. The very Geography throws up many as the country stretches from the Arabian coast to the northern glacial valleys. The land-water relationship continues to change with the changes in the rate of evapotranspiration. So do the options available for irrigation.

Dominant official conception, however, subscribes only to a surface perception of irrigation, as it has been fixated upon the Indus Basin Irrigation System (IBIS) spread over the flat plains of the Indus Valley. Such a perception imposes many limits upon irrigation options for consideration at the country level within which the IBIS forms only a part. Simultaneously, areas of the country outside the IBIS are simply ignored in irrigation planning and management. This naturally discredits all other options that traditional systems of irrigation in these areas may offer.

This conception is rooted in the evolution of the world's largest contiguous irrigation network[1]. The IBIS is the result of large surface irrigation schemes promoted by the British up to 1947 when their Indian colony was divided into India and Pakistan

Dams are a natural extension to the surface water conception, planning and management of the IBIS. Dams and irrigation are, thus, interlocked in a conceptual grid: water channels carry the water to the farm gate; weirs on secondary canals and minors feed the water channels; barrages divert river water into the main canals that feed the secondary canals; and dams store water for releases into the rivers[2]. Centralized institutional arrangements for planning and management[3] of irrigation in Pakistan reinforce this conception.

It is this conception of irrigation that gives rise to calls for building of newer dams to store more water for irrigation in Pakistan as the per capita availability of water plummets every year. Viable options available even within parts of the IBIS are ignored in the resulting clamor.

This conception is also responsible for a fixation on traditional hardware solutions to irrigation water scarcity problems in the basin. Managers and planners –an overwhelming majority being engineers by profession—are comfortable only with hardware design and execution. Software solutions, including institutional reforms, do not sit well with them[4].

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[1] Ahmad, Nazir Dr., September 1993. *Water Resources of Pakistan*. Lahore: Shahzad Nazir Publishers.
[2] World Bank Report No: 11884-Pak, *Pakistan Irrigation and Drainage: Issues and Options.*, March 1994.
[3] *Water Sector Investment Planning Study*, 1988: Consortium of Consultants. Islamabad.
[4] WAPDA, World Bank, 1995. *Feasibility Study: Second Irrigation and Drainage, Sukh Beas/Lower Bari Doab Canal Project.* Lahore: National Engineering Services Pakistan (Pvt.) Limited, Agrar-Und Hydrotechnik GMBH and National Development Consultants.

However, before proceeding further, let us acknowledge that a number of assumptions underpin this paper. The primary one being that irrigation may have its downside but it is inherently better to be able to direct water for planned agricultural application rather than to stay within the climatic straight jacket that impedes production from the mostly semi-arid lands of Pakistan. The following table substantiates this.

Table showing Rapeseed and Mustard hectarage, production and yield under irrigated and rainfed conditions in Balochistan[5].

Year	Irrigated		Rainfed	
	HECTARES	YIELD Kg/Ha	HECTARES	YIELD Kg/Ha
1974-75	21226	319.7	2023	90.5
1975-76	7813	356.3	3378	180.6
1976-77	8419	398.3	25535	313.1
1977-78	7740	304.5	10838	310.3
1978-79	7098	491.7	24731	350.6
1979-80	5315	506.1	18071	363.6
1980-81	5315	506.1	20525	368.8
1981-82	12686	550.2	5668	425.0
1982-83	13416	603.8	5949	438.7
1983-84	17980	607.3	5650	444.2
1984-85	18114	617.3	6080	448.2
1985-86	18138	625.6	6198	449.0

The name of the game of irrigation is, thus, to continue doing that with minimal ecological and social disruption. It is also assumed that readers have a sound background in irrigation and agriculture so basics and extensive data citation can be skipped. We use a few available options as our Ariadne's thread to identify shortcomings in the decision-making system for irrigation in the Indus Basin[6].

Available options for policy uptake can be divided into two major groups: those available within the IBIS and those in areas not commanded by the IBIS. We explore two major options within the IBIS: conjunctive use of surface and ground water and

[5] Adopted from Government of Balochistan, Agricultural Statistics of Balochistan, Directorate General of Agriculture Department, Balochistan, Statistics Wing, Quetta, Pakistan.
[6] See Annex-B and Annex-C for an organizational overview.

technology reviews to cut O&M costs. We also look at the institutional reforms underway in the IBIS to understand the context better.

Options available in areas not commanded by the IBIS include the many traditional irrigation systems managed by the communities without substantial government intervention. Punjab has about 59% of the irrigated land, Sindh 37% and the North-West Frontier Province (NWFP) and Balochistan about 2% each[7].

The two groups are briefly elaborated below to guide subsequent discussion. We begin with a brief enumeration of options available outside the IBIS since the Indus plain will dominate rest of the paper being the dominant arena where the game of irrigation is being played out between many players. (Or, stakeholders in the current irrigation vernacular.)

OUT OF SIGHT

In Balochistan, approximately 655,000 acres are irrigated by small-scale perennial irrigation systems, which have been mainly developed, operated and maintained by the farmers themselves. The main water sources for these minor irrigation systems are *karezes*, springs, wells, infiltration galleries and diversion structures. These systems range in size from a few acres to several thousand hectares of irrigated land[8]. Most small irrigation systems with a well as the main water source are individually owned and operated, whereas minor schemes with other water sources normally belong to a community of shareholders. The number of shareholders ranges between a few families living in one small village to several hundred belonging to several villages[9].

Some agriculturists, indeed, consider Balochistan the undeveloped wild west of Pakistan. The Dasht plain in the south of Balochistan near Turbat has many small seasonal rivers that can be harnessed for ground water recharge and irrigate more lands[10].

Kareze

Kareze irrigation has been tremendously successful and meets all criteria of sustainability even today in the Baluchistan province. Kareze is an ingenious way of harvesting ground water and guiding it to crops in the fields by harnessing gravity. The social organization underpinning every successful system holds a tremendous potential viz. policy options.

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[7] Government of Pakistan, 1998. *Economic Survey 1997-98.* Islamabad: Government of Pakistan, Finance Division, Economic Adviser's Wing.

[8] Bhatti, Khawar Ali; Randhawa, Abdul Ghan, et al, 1998, *Master Feasibility Studies for Flood Management o Hill Torrents of Pakistan.* Islamabad: NESPAK and the Federal Flood Commission of Pakistan.

[9] Verheijen, Olaf, 1998. *Community Irrigation systems in the Province of Balochistan.* Lahore: Halcrow-Euroconsult-Nespak-Techno Consult-International Irrigation Institute.

[10] Personal notes from a meeting with Dr. Zafar Altaf, former Federal Secretary for Agriculture and former Chairman Pakistan Agriculture Research Council, Islamabad, Pakistan.

Presently Karezes are in decline, partly because they are not adequately maintained and partly because the groundwater levels are being drawn down by pumping from open wells and tube wells. In 1988/89, the area irrigated through *Karezes* was 11% of the total irrigated area in the province[11]. This system –sustainable in the past 4000 years since its recorded history—has now been undermined by a collapse of social controls in the traditional Baloch society. The traditional arrangements of managing the system throw up substantial options for revitalizing the system.

Tube wells has started a free for all in the area with the most water going to the most resourceful and has put an end to all considerations of equity. This is also endangering the long-term sustainability of agriculture in Balochistan[12].

Quetta valley is a classical example that will soon run out of water. Water tables are falling at over one meter every year pushing water deeper and out of the reach of the less resourceful who cannot afford to bore tube wells. Besides the billions in revenue that it earns from profitable orchids of apples, grapes and other fruits, such an eventuality entails undesirable political upheaval and deleterious social impacts for the local population[13].

Small retention dams in suitable places can replenish the lost groundwater in the valley and add to the irrigated land available. Some rule making with cultural sensitivities can check the free for all that is ruining the beautiful and rich valley.

Rod Kohi/Bandat

Hill torrents in Pakistan provide a substantial source of water for irrigation with a potential of approximately 10 maf. An estimated six million acres (which is about 15 per cent of the current area under irrigation) can be developed and brought under cultivation[14].

Hill torrents draining upland areas generally have little base flow and rise rapidly after rainfall on the catchment. Rapid runoff coupled with steep stream gradients, results in high peak flows. Serious flooding results when these streams reach the lowlands where the hydraulic gradient is much flatter. Wherever possible the runoff is harnessed for flood irrigation by weirs or temporary diversion structures. Such systems have a high risk and success depends greatly upon the magnitude and frequency of the rainfall on the catchments.

Rod Kohi system of irrigation uses earthen embankments, called *bund* or *ganda*, to divert flow from hill torrents. When the upstream diversion have received adequate

[11] WAPDA, 1989. *An Economic Evaluation of Kareze and Tube well Irrigation Systems in Balochistan.* Lahore: Irrigation Systems outside the Indus Basin, Irrigation Systems Management Research Project.
[12] Kalwij, Ineke Margot et al., 1999. *Water Resources Management Research Issues in the Highlands of Balochistan.* Lahore: Workshop Proceedings, International Water Management Institute.
[13] Notes from personal Interviews with many geologists, hydrologists, agriculturists and conservationists from Balochistan on the ground water mining in Quetta valley.
[14] Chief Engineering Advisor, 1997. *Accelerated Water Management Programme.* Islamabad: Office of the Chief Engineering Advisor/Chairman, Federal Flood Commission, Pakistan.

water, the *bund* is breached and the next farmer receives the water. This system can however, regularly cause considerable damage to downstream infrastructure, principally due to shifts in the channel system. The system is practiced in DI Khan, Bannu, Karak and Kohat districts of NWFP, the D G Khan district in Punjab and in parts of Balochistan where it is known as *bandat* irrigation[15].

There is a great potential for improving the *rod Kohi* and *Bandat systems*. If properly managed, more areas could be irrigated with a greater degree of certainty resulting in greater production, enhanced recharge to groundwater and less potential damage to downstream infrastructure.

Medium/Small Dams

A large number of streams flow down the *barani* (rain fed) areas of Punjab and NWFP in the Jhelum and Indus catchments and in Balochistan. In many places these streams have cut gorges through ridges that appear suitable for construction of suitable reservoir sites as the land that would be inundated may be quite extensive and agriculturally productive[16].

There are growing international and national debates on the desirability of dams to store water that cast aspersions on small dams as well. One is compelled to state that the technology of dam building is a neutral one. It rests upon the need and judgement of a given community, area or state to determine whether or not they want to build one. Indeed every site has a unique set of geological, technical, economic, social and political variables that need to be addressed through the decision-making processes.

Hill Irrigation

In northern parts of NWFP, such as Chitral, Swat, Dir and Hazara districts, irrigation is practiced by means of contour channels off-taking from the locally available water sources, often steep side streams or springs entering the main valley. Although individually quite small, these irrigation schemes cover about 66,000 acres collectively. Most of these schemes are owned and operated directly by the beneficiaries through traditional social organizations.

The area under production can be greatly increased by an investment in small-scale hydel generation to support spread of sprinkler irrigation.

***Sailaba* (Falling flood) Irrigation**

Extensive tracts of land along the rivers subject to inundation are termed riverine areas, and that part of the riverine area subjected to annual flooding is called *sailaba*.

[15] Bhatti, Khawar Ali; Randhawa, Abdul Ghan, et al, 1998, *Master Feasibility Studies for Flood Management o Hill Torrents of Pakistan.* Islamabad: NESPAK and the Federal Flood Commission of Pakistan.

[16] Starkloff, Ralf et al., 1999. *Social Organization for Improved System Management and Sustainable Agriculture in Small Dams.* Lahore: International Water Management Institute.

Sailaba cultivation utilizes the residual moisture in the root zone after the flood subsides together with sub-irrigation due to capillary rise of groundwater and any rains.

A review of the inundation requirements for optimal production from the *Sailaba* areas should be able to justify a change in the schedule of releases from storage reservoirs. Presently, the areas are starved for regular inundation since the dam releases are geared to the requirements of the IBIS alone.

In Pakistan, *sailaba* cultivation is carried out on about 3,038,401 acres.

THE PROVINCIAL DISTRIBUTION OF SAILABA AREA[17]

Province	**ha**	**acres**	**Percentage**
Punjab	178,362.0	440,400.0	14.5
Sindh	693,115.0	1,711,395.0	56.3
NWFP	28,595.0	70,606.0	2.3
Balochistan	330,480.0	816,000.0	26.9
Total	**1,230,552.0**	**3,038,401.0**	**100**

Tanks, check dams, percolation ponds, terracing, mulching and other water harvesting techniques can add substantial amounts of land to irrigated agriculture in the Suleman piedmonts in Punjab, Sindh and Balochistan that are presently mostly rain fed. Similarly, rain-fed areas in northern Punjab, parts of NWFP can also benefit from such interventions.

OPTIONS WITHIN THE IBIS

Groundwater Reservoirs in the *doabs*

The network of earthen channels that comprises the IBIS can support a maximum cropping intensity of only 75 per cent with full supplies in the *doabs* (land between two rivers) famous for their fertility. The system of "*warabandi*[18]" (canal water rotations among shareholders on a water outlet that govern water supply in the IBIS), set by the original system designers, actually stretched the available water supplies to distribute the scarcity equitably among all recipients. However, government statistics report average cropping intensities of over 120 per cent for the whole IBIS[19]. The system is clearly over-productive from the design viewpoint.

The extra production comes through an unprecedented harnessing of ground water by the farmers. It is in the last 40 years that extensive public development of Pakistan's groundwater resources has taken place. Increased cropping intensities, government

[17] Ibid. as 3 above.
[18] Bandaragoda, D.J. and S.U. Rehman, 1995. *Warabandi in Pakistan's canal irrigation systems: widening gap between theory and practice*. Lahore: Country Paper No. 7, International Irrigation Management Institute.
[19] Kuper, Marcel, 1998. *Irrigation Management Strategies for Improved Salinity and Sodicity Control.* Ph.D. thesis. Netherlands: Wageningen Agricultural University.

subsidies and the demonstration effects of public tube wells have prompted farmers to install an estimated 500,000 tube wells that now provide up to 40 million acre feet (maf) of the water available at the farm gate[20]. This water accounts for the extra-productivity gains obtaining from the area.

The fact that the Indus Basin is a conjunctive use environment is not a new phenomenon. At the turn of the century, an estimated number of 350,000 hand and dug wells existed in the Punjab (including what is now Indian Punjab) and the North-West Frontier Province, contributing about 40 per cent of the total surface irrigation supplies[21]. Ironically it was the development of large-scale canal irrigation in the beginning of this century that made these irrigation wells superfluous.

However, the impressive success of ground water harnessing also has its downside. Ground water tables are declining in large parts of the Punjab, which makes the issue of waterlogging in relation to salinity control less urgent. As water tables sink, salts increase in the discharge of the TWs. This is threatening to degrade soils through a sodification process as a result of irrigation with poor quality water[22]. Excessive pumping by private tube wells in areas with good groundwater quality is leading to aquifer mining[23].

This threat has received little response from the decision-makers[24]. A large part of these problems, however, stems from ignoring the irrigation options that this phenomenon has thrown up.

Salinity is part of the profile of the land[25]. The *doabs* were the flood plains of the five rivers that gave Punjab its name. (Punj=five, Aab=water). These floods pushed the salts in the soil deeper into the aquifer and deposited massive amounts of fresh water in the underground formations. An emulation of the natural recharge under flood conditions can not only help mitigate the threats from salinity but will also create massive reservoirs of water available right under the farmers' feet in the *doabs*. [26]

Present day flood control measures adopted by the water managers, however, are focused on stopping the river waters from spreading over the Doabs. Billions are spent to tame the rivers through construction of embankments[27]. It is however, a futile exercise as data from India shows that flood loss increases in direct proportion to the mileage of the embankments forcing rivers to stay in their beds. These practices also rob the land of a coat of fertile silt every flooding season, deny recharge to the aquifers and increase the

[20] NESPAK/SGI, 1991. *Contribution of private tube wells in the development of water potential.* Islamabad: Ministry of Planning and Development, Government of Pakistan.
[21] Indian irrigation commission, 1903. *Report of the Indian irrigation Commission, Part-II.* Calcutta, India: Office of the Superintendent of Government Printing.
[22] Kijne, J.W. and M. Kuper. 1995. *Salinity and sodicity in Pakistan's Punjab: a threat to sustainability of irrigated agriculture?* Water Resources Development, Vol. 11.
[23] Ibid. as 20 above.
[24] Ibid. as 19 above.
[25] Ahmad, Nazir, Dr., 1987. *Irrigated Agriculture of Pakistan.* Lahore: Shahzad Nazir Publishers.
[26] Ahmad, Nazir, Dr., 1998. *Groundwater Resources of Pakistan.* Lahore: Shahzad Nazir Publishers.
[27] Ibid. as 14 above.

salt content in the soil profile[28]. It is estimated that salinity causes a 20 per cent reduction in crop production in the IBIS[29].

Pakistan will never have sufficient surface water storage. Present facilities (Tarbela, Mangla and Chashma) are less than 20 per cent of the mean annual flow in the Indus River system. Groundwater storage in the Punjab, however, is many times greater than the annual volume of Indus River System[30].

At this time, no organization is responsible for managing this huge groundwater reservoir. It takes decades for salinity to intrude into fresh water aquifers but once this has occurred, it will be even longer to reclaim them. There is an urgent need to embark upon groundwater regulation and management[31]. The combined management of irrigation and drainage facilities implies managing the water table so it is located at sufficient depth to minimize the groundwater capillary rise into the root zones of crops.

Technology Choices

Pakistan has made substantial investments since the 1960s to drain its waterlogged lands. However, waterlogging still affects large tracts of land, with more than 22 per cent of the total Gross Command Area of the Indus basin Irrigation System underlain with groundwater only 1.5 meters from the surface[32].

Pakistan started investing massively in vertical drainage since the first Salinity Control and Rehabilitation Project in Pindi Bhattian where 21 tube wells of up to 3.5 cusecs discharge were sunk in 1954[33]. These were financed through a foreign grant.

The country and its water managers and decision-makers have never looked back since. Not only were new SCARPs constructed all over the country but newer ones are still coming up. This is despite a state policy through which it is divesting itself of the older schemes[34]. The most recent example is that of the Left Bank Out Fall Drainage Project that has sunk over 600 turbine tube wells to feed into a spinal drain that is planned to empty its discharge into the Arabian Sea[35].

SCARPs have proven to be a mixed blessing. They are in a way responsible for kick starting the process of private tube well development that has sustained growth in the

[28] McCully, Patrick, 1996. *Silenced Rivers: THE ECOLOGY AND POLITICS OF LARGE DAMS.* London, New York: Zed Books.
[29] World Bank, 1994. *Pakistan irrigation and Drainage: Issues and Options.* Report No. 11884-Pak. Agricultural and Operation Division, South Asia Region.
[30] Skogerboe, Gaylord V., and Don Jayatissa Bandaragoda, 1998. *Towards Environmentally Sustainable Agriculture in the Indus Basin Irrigation System: Managing Irrigation for Environmentally Sustainable Agriculture in Pakistan.* Lahore: International Irrigation Management Institute.
[31] Ibid.
[32] IWASRI, 1998. *Annual Report 1997*. Lahore: International Waterlogging and Salinity Research Institute.
[33] Ahmad, Nazir Dr., 1998. *Drainage of Irrigated Lands of Pakistan.* Lahore: Shahzad Nazir Publishers.
[34] World Bank, 1996. *Impact Evaluation Report: Pakistan SCARP Transition Pilot Project.* Operational Evaluation Department, The World Bank, Washington D.C.
[35] Reeves, J.W., 1995. *LBOD Stage-I Project: Operational Opportunities and Maintenance Needs.* Tando Jam: Drainage Research Institute.

agriculture sector over the past 30 years since surface water resources had been stagnant. They have to a large extent succeeded in reclaiming vast tracts of lands from waterlogging and making vertical drainage the most successful drainage option if not most cost effective. SCARPs also made substantial amounts of extra water supplies available in areas underlain by fresh groundwater. But they also added to the salinity problems in areas with highly saline effluent. Above all, they have proven too expensive to be sustainable even over the short term.

The reasons for this can be traced to the fact that they were bored deeper (150-300 feet) where salinity is concentrated in the aquifer since they had to produce large discharges. This meant their energy needs were also large for the powerful turbine pumps. So they also needed to be connected to the National Grid. Their power to draw massive amounts of water also meant they were too sophisticated to be produced in Pakistan. The imported devices to run the turbines were also too delicate to withstand rough handling by the lowly paid semi-literate staff operating them. This made the turbines and the spares for necessary repairs expensive as well. So it was all bank rolled by foreign donors.

However, by the late 80s the costs to run the SCARPs had sky rocketed. Punjab was spending over 55 per cent of its total O&M budget for irrigation on SCARPs alone by 1992. This suffocated rest of the system leading to chronic delays in maintenance owing to a lack of resources. The situation led to the adoption of the SCARP Transition policy by the decision-makers[36]. Strangely, new schemes are also being approved to lay down more SCARPs. Over 22 such schemes were earmarked for completion in Punjab alone during 1990-2000[37].

Nobody has noticed any problems with the technology choices made for SCARPs by the water managers in Pakistan. Neither has it prompted anybody to question the wisdom of contracting tied aid for water management in Pakistan. It is common knowledge that every general manager who retired from a SCARP and went into farming after retirement chose the locally produced one cusecs tube well for his lands.

The reason is simple a turbine tube well costs over 1.8 million rupees to give a discharge of three cusecs where as the locally manufactured units cost only 120 thousand for the same discharge. Also, these units are installed and serviced cheaply and their energy requirements are not overwhelming. Their contribution to the local economy is also substantial as the over 500,000 farmers tube wells are in almost all the cases, locally manufactured. Since these pumps suck water from shallower depths, their discharges are also less saline for fresh canal waters seeping down from the IBIS positively affect the upper reaches of the ground water by pushing the salts deeper into the formation[38].

[36] See Annexes B & C for an organizational overview of the decision-making system in the IBIS.
[37] Ibid. as 3 above.
[38] Ibid. as 33 above.

CATCHING UP

Canal-building activity leading to the construction of IBIS commenced in India in 1817[39]. The British concept of planning and management in India had little room and capacity for inclusion of the peasant communities, which is the current vogue. Irrigation investments in India were no exception and many of the underlying assumptions that the British made while developing their canal system went unquestioned and unchallenged until the actual operation of the canals.

Initial objectives of irrigation related policies included the relief of population pressure existing in the congested districts of Central Punjab, pacification of the disbanded Sikh army and to produce cotton to meet demand from Manchester textile mills where supplies had dwindled after the independence of USA. However, the main objectives rapidly became the mitigation of famines, especially after the severe famine that affected large parts of India in 1878, by spreading water resources thinly and equitably over large areas of land[40].

The establishment of a comprehensive hydraulic network and its related administration also strengthened political control of the British over large areas and populations. They also caused problems. The British were already implementing measures to control waterlogging in 1895[41].

Since Independence in 1947, Pakistan has continued with the institutional arrangement it inherited from the British. Most interventions to improve system performance since have focussed on increasing surface water supplies to boost agricultural production. Major investments were made to replace the supplies "lost" to India under the 1959 Indus Waters Treaty through construction of link canals to bring supplies from the Western to the Eastern part of the country, and constructing dams to increase storage capacity[42]. However, there has been little addition to irrigated area during this period.

The policy and planning machinery of the public sector in Pakistan is highly centralized[43]. Similarly, the water sector is characterized by centralized decision-making in terms of all major decisions regarding the fixing of water rates, collection and assessment system, operation and maintenance, the identification and execution of new development schemes etc.

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[39] Ian Stone. *Canal Irrigation in British India. Perspectives on technological change in a peasant economy.* 1984. Cambridge University Press.
[40] Farmer, B.H., 1974. *Agricultural Colonization in India since Independence.* London: Oxford University Press.
[41] Ibid. as 19 above.
[42] Asianics, 1999. *Scoping Report: REVIEW OF THE PERFORMANCE AND DEVELOPMENT EFFECTIVENESS OF TARBELA DAM IN THE CONTEXT OF THE INDUS BASIN.* Islamabad: World Commission on Dams and Asianics Agro-Development International.
[43] Banuri, Tariq, 1991. *Democratic Decentralization.* Islamabad: Mimeograph.

The concept of farmer's participation in irrigation management was introduced in the IBIS through the On-Farm Water Management (OFWM) in 1976 under a US AID supported project. The project has since been replicated all over the country with full-scale implementation beginning in 1981. The Canal and Drainage Act (1873), the principal legislation for irrigation in the Punjab province and the Sindh Irrigation Act (1879) had no scope for water users organisations[44]. For this purpose the then Chief Martial Law Administrator[45] issued an ordinance promulgating the required changes in 1981. Since then organizations are registered with the On-Farm Water Management Department within the provincial ministries of agriculture and have adopted written rules of operation.

Interventions under the project comprise watercourse lining and installation/construction of cemented watercourse junctions (*Nakkas*), precision land leveling and institutional development of farmers groups and concerned government agencies. About 17,000[46] Water Users Associations (WUAs) have been organized. However, studies have pointed out that these remained effective only during the watercourse improvement work and ceased to function afterwards[47].

A well-documented body of exhaustive research[48] coming out of the OFWM paved the way to future institutional reforms that are currently underway in the IBIS. Let's digress a little to understand the compulsion for and the nature of current policy and its context This will be helpful to illustrate discussion on issues and principles for a sustainable future.

OUT OF THE FRYING PAN

The process of reforms in the irrigation sector is picking up speed all over the world. More than 25 countries are now in the process of turning irrigation systems over to farmers groups or other private organizations. This institutional shift goes by different names in different countries –self-management in Niger, participatory management in India, privatization in Bangladesh, turnover in Indonesia and Philippines, and management transfer in Mexico and Turkey—but in all cases it represents a devolution of authority and responsibility from governments to irrigators[49].

[44] Muhammad, Dil Dr., 1998. *Legal Framework for Irrigation Management in Punjab and Sindh Provinces, Pakistan.* Lahore: International Irrigation Management Institute.
[45] Leader of the successful 1977 coup General Zia-ul-Haq.
[46] Badar-ur-Din, M., 1989. *Water Sector Investment Planning Study: Review of Post RAP Activities in Water Sector.* Lahore: International Irrigation Management Institute.
[47] Government of Pakistan, Ministry of Water and Power, 1994. *Institutional Reforms to Accelerate Irrigated Agriculture.* Special Studies Vol. II. Lahore: John Hopkins Mellor Associates Inc. and M/s NESPAK (Pvt.) Limited and S.G. Inc. (Pvt.) Limited.
[48] Produced and Published by WAPDA, World Bank, Asian Development Bank, UNDP, Colorado State University, IIMI and USAID among others.
[49] Postel, Sandra, 1999: *Pillar of Sand: Can the Irrigation Miracle Last?* New York: Norton/Worldwatch Books.

A look at the water policy changes around the world in recent years also shows that policies have moved from the national to the international arena. International bodies like the organization for Economic Cooperation and Development[50], the International Bank for Reconstruction and Development[51], and the Food and Agriculture Organization[52] has stressed the need to move in that direction. The move is based on the realization of the economic values of water.

Depending upon the viewpoint this change either indicate "a wider concern about issues and appropriate options[53]" or an "onslaught of the process of globalization on the remaining commons of the globe"[54].

Despite the fact that essentially similar changes are underway in so many countries the world over, most of the work of crafting new irrigation software has yet to be done. There is a global effort to design what are being called "workable public, private, and community-based arrangements". "Whether these new arrangements improve irrigated agriculture's performance and sustainability remains to be seen. The search is still on for the rules of the game that can make irrigation more efficient, equitable and ecologically sound for future generations"[55].

As in many other developing countries, policy makers in Pakistan have also accepted a series of neo-liberal reforms in the economy. Included among these are financial sector reforms such as interest rate liberalization. It has been demonstrated that the impact has been regressive[56]. The typical asymmetrical distortions in economic and political spheres of a country under adjustment on IMF prescription mean the state finds itself in a financial straight jacket.

No wonder the state of Pakistan has found itself unable to meet the O&M costs of the IBIS. The system has deteriorated. A part of the financial constraints impacting the system may also be traced to the withdrawal of donors traditionally involved in the irrigation sector[57]. The increasing burden of foreign and domestic debt servicing has further limited the state's ability to finance[58].

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[50] Organization of Economic Cooperation and Development (OECD), 1989. *Water Resources Management: Integrated polices.* Organization of Economic Cooperation, Paris, France.
[51] World Bank, 1993. *Water Resources Management: a World Bank policy paper.* World Bank, Washington D.C.
[52] FAO. 1994. *Reforming water resources policy –A guide to methods, processes and practices.* FAO Irrigation and Drainage paper No. 52, Food and Agriculture Organization, Rome.
[53] Strosser P. 1997. *Analyzing alternative policy instruments for the irrigation sector: an assessment of the potential for water market development in the Chishtian Sub-division, Pakistan.* Ph.D. Thesis, Wageningen Agricultural University, The Netherlands.
[54] Barlow, Maude 1999. Blue Gold: *The Global Water Crisis and the Commodification of the World's Water Supply.* International Forum on Globalization (IFG), Canada.
[55] Ibid. as 49 above.
[56] Khan, Shahrukh Rafi, 1993. *Assessing the Impact of Financial Sector Reform on Pakistan's Economy.* Islamabad: Sustainable Development Policy Institute.
[57] The end of the US-AID period in 1991 as result of the passage of Pressler Amendment by the US Congress.
[58] *Economic Survey 1998-99*. Islamabad: Government of Pakistan, Finance Division, Economic Advisor's Wing.

The overall gap between requirements and expenditure on the Punjab irrigation system was more than 24 percent in financial year 1991-92. Simultaneously the gap between O&M expenditure and recoveries through water charges reached 44 per cent in the same fiscal[59]. This gap increases to 57 per cent if recoveries are compared with O&M requirements instead of expenditure[60]. It amounted to 3062.7 million in rupee terms during fiscal 1991-92[61].

This meant the maintenance and operation of irrigation system suffered because of inadequate allocation of funds in the provincial budgets. The low level of funding is only partly related to the gap between water charges collected from farmers and the costs incurred on the system's O&M[62]. The O&M costs are further influenced by the extremely high operation and maintenance costs of public tube wells in the various Salinity Control and Rehabilitation Projects (SCARPs). The poor financial situation of provincial exchequers largely explains the situation[63]. The pressure for reallocation is not simply a result of demand exceeding supply. Much of the pressure is financial[64].

However, the World Bank identified the sources of threats to sustainability of the IBIS as the state's treatment of water as a public good, lack of well defined individual property rights, and the illegality of the sales of surface water constraining operation of informal irrigation water markets. The Bank also cited the Governments failure to make adequate budgetary provision for operation and inappropriate institutional framework[65].

So it suggested as set of institutional reforms in 1994 based upon a participatory approach to irrigation. The original World Bank recommendations would have Pakistan commercialize or at least 'autonomize' the supply of irrigation water to farmers through a market mechanism[66]. The Bank believes that farmers be given "property rights" to their water and allowed to sell/buy it and the whole thing is managed through a market mechanism. The Bank maintained that legalized water markets based on individual water property rights make the opportunity cost of water transparent, leading to greater efficiency in use. It maintains that individual rights to water property will ensure equity in distribution alleviating the problems of tail enders[67]. The World Bank envisaged the new system to be put in place in four phases spread over 15 to 19 years.

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[59] Mohtadullah, Khalid, and M. Afzal, 1999. *Critical Issues in Water Sector Planning: A Case Study of Pakistan.* Paper presented in 8th Afro-Asian Regional Conference of International Commission on Irrigation and Drainage, Bangkok.
[60] World Bank, 1994. *A Strategy for Sustainable Agricultural Growth.* Report No. 13092 Pak, Agricultural and Operation Division, South Asia Region.
[61] Shah, M.H., and A.H. Qaiser, 1994. *Policy Perspective for Making Irrigation Systems Sustainable.* Islamabad: Planning and Development Division.
[62] Hussain, Maliha, 1999. *A View from the Grass Roots in Pakistan.* Paper presented in the "Water for Food and Rural Development. Programmatic and strategic visions from South Asia", New Delhi.
[63] John Mellor Associates, Inc. 1994. *Institutional reforms to accelerate the development of irrigated agriculture.* Special Studies, Volume I & II, Islamabad, Pakistan.
[64] Gould, G.A. 1989. *Transfer of water rights.* Natural Resources Journal, Vol. 29: 457-477.
[65] Ibid. as 2 above.
[66] Ibid.
[67] See annex-A for the organizational structure proposed by World Bank.

The adoption of these reforms was viciously resisted. The state, however, totally ignored the resistance by local irrigation mangers manifesting a ridiculous concentration of decision making at the top levels of government. But so strong was the resistance that Benazir Bhutto, former Prime Minister of Pakistan, found the Punjab Assembly in revolt[68] when her party was under pressure from IMF, World Bank, Asian Development Bank and our bilateral donors to adopt the package of reforms.

The reforms were held up for a few months. Stiff conditionalities by the multilateral and bilateral donors making disbursement of contracted loans contingent upon fulfillment brought the government to its knees[69]. Frustrated in their efforts to enact, the then President of Pakistan Farooq Leghari promulgated the Provincial Irrigation and Drainage Authorities Ordinance to usher in the reforms.

The resistance to reforms, however, impeded and delayed implementation. A number of writers, irrigation professionals and large farmers saw it as a continuation of the colonial and post-colonial traditions of enslaving weaker economies[70]. They also pointed out that irrigation management in the IBIS was not a simple matter of economic pursuit but had political and ecological implications.

Efforts at rapprochement with the politically powerful large farmers by the government resulted in Pakistan obliging her donors by ushering in a set of reforms that stopped short of commercializing operations and management as suggested by the original blue print from Washington. However, she was still obliged to do so through a presidential decree issued willingly by President Farooq Leghari who is himself a known champion of these reforms in Pakistan.

During mid-1997 –shortly after Former Prime Minister Nawaz Sharif won the largest ever parliamentary majority in Pakistan's history of electioneering—each of the four provincial assemblies in Pakistan passed a Provincial irrigation and Drainage Authority (PIDA) Act. These Acts envisage transforming each of the Provincial Irrigation Departments to a semi-autonomous PIDA modeled after WAPDA. The resulting institutional structure is, however, not much different from what the World Bank had suggested for the first phase of the long-term policy shift.

The role of farmers' organization (FOs) is considered critical to the success of these reforms in most literature on reforms, which is largely produced or supported by the Bank. In the short term, they would act as a counter balance to PUs. In the long term, they may even come to own the PUs. However, the reforms see no role for farmers in identifying new development schemes or a review of technology choices that drive costs

[68] From interview with many Provincial Assembly Members when the crisis was brewing in early 1996 but mainly from Mr. Sultan Ali Barq, a progressive farmer who helped coordinate the efforts to defeat legislation for institutional reforms.

[69] Personal notes from interviews with senior irrigation managers, administrative staff at the then Presidency and the Prime Minister's secretariat.

[70] Gadi, Mushtaq, 1999. *Recolonizing Indus Basin Irrigation System.* Islamabad: Sungi Development Foundation.

up in the existing ones. They only allow "Functional Participation[71]" to reduce some financial pressure from the provincial exchequers but stop short of allowing them to try and change the overall system of management which remains the same above the distributory level.

Although there has been a political decision to proceed with the reforms, it is surprising to realize that very little is known regarding the details of the proposed changes and of their implementation or their expected impact on our villages and the people who live their. There is also little information on their impact on agricultural production and sustainability of the resource base[72]. Indeed, there has been no rule making by concerned quarters to streamline the process[73].

The provinces are currently running pilots on one canal command area each. However, a canal command should not be called a pilot but a prototype experiment in social organization. Most canal commands comprise large areas of no less than 750,000 acres meaning that a large number of farmers and their dependents may eventually pay for an ill-designed project or unsuitable options.

The above genealogy of the current policy changes in Pakistan is enough to illustrate the non-participatory nature of its adoption. Such a top down approach can hardly find solutions.

THE WAY AHEAD

To proceed further I will borrow Tariq Banuri's[74] articulation that one cannot look at peoples' actions in most situations without taking account of the social, moral and political contexts in which these actions take place. This is also true of those institutional experts who may have contributed to a host of problems in spite of their noble motives. One argues that in order to understand the nature of crisis faced by the IBIS we have to look at the impact of the entire institutional environment of which irrigation is only a part.

Many factors have contributed to the current crisis in Pakistan. The most obvious are the persistence of poverty betwixt increasing affluence, a high rate of unemployment despite expanding production, and, in general of the failure of the state in ameliorating the condition of people in the country. A second reason for disenchantment with past arrangements also stems from their association with ecological disasters. The consequences have been deleterious.

Pakistan's policy planners have accepted uncritically the notion that progress is identical to a progressive emulation of the social, political and economic institutions

[71] For an explanation of the term see Pretty, Jules N. et al, 1995. *Participatory Learning and Action.* London: International Institute of Environment and Development.
[72] Ibid. as 53 above.
[73] Ibid. as 44 above.
[74] Banuri, Tariq. 1987. *Modernization and Its Discontents: A perspective from the Sociology of Knowledge.* Helsinki: World Institute for Development Economics Research of the United Nations University.

evolved in the western countries[75]. There is a widespread consensus that the governance system has collapsed in Pakistan[76]. At the political level, the role and function of the nation-state has come under a great degree of stress. It has been practically impossible for most of the time in the checkered history of Pakistan to maintain even a semblance of democracy for any significant length of time. Ethnic and linguistic differences have exacerbated the pressure on the state. So has a dramatic increase in rural out-migration and urban population, far faster than the increase in the governments' ability to manage the cities[77].

The resulting lived reality of all the people that participate in the IBIS is a nightmare come true. There has been a progressive decline in the emoluments paid to all government employees in tandem with escalating costs of living since Pakistan signed the first Structural Adjustment Facility with IMF in 1978. The resulting increase in widespread corruption is evident in a society where the police commits crime[78], the courts punish the innocent and let the guilty go free[79], the managers mismanage[80] and the state is unable to provide affordable healthcare and education[81].

The institutional collapse is indicative of a challenge to the very concept of the centralized, impersonal and bureaucratically organized nation-state resulting out of the disenfranchising potential of the modern nation-state[82]. One must say as an aside that this, however, should not mean a license for further concentration of decision-making at the global level.

The alternative vision has to be based on a theory of change fundamentally different from that, which forms the basis of theories of modernization[83]. The latter generally invoke the existence of a crisis situation in the region of interest to argue that immediate action is necessary for the amelioration of the problem. The justification of immediate action then creates the legitimacy of large scale and centralized intervention, which has as a by-product the loss of sovereignty in built.

Repeated experiences all over the world has shown that alien forms of knowledge can be accepted by people in a situation of crisis, or as a temporary measure, but not in 'normal' times as a permanent feature of social existence. For example it is now common

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[75] This section relies heavily on the work of Dr. Tariq Banuri (74 above) whose articulations are used to communicate the crisis in the IBIS.
[76] Good Governance Group, 1998. *Performance Indicators in Public Sector Organizations.* Islamabad: Government of Pakistan, Planning and Development Division.
[77] Good Governance Group, 1998. *Workshop Report: Administrative Issues of Managing Large Cities.* Islamabad: Government of Pakistan, Planning and Development Division.
[78] Good Governance Group, 1998. *Workshop Report: Police Reforms.* Islamabad: Government of Pakistan, Planning and development division.
[79] Good Governance Group, 1998. *Workshop Report: Criminal Justice System at District Level.* Islamabad: Government of Pakistan, Planning and Development Division.
[80] World Bank, 1998. *A Framework for Civil Service Reform in Pakistan*. Islamabad: Poverty Reduction and Economic Management, South Asia Region, The World Bank.
[81] Good Governance Group, 1998. *Workshop Report: Re-Engineering Government.* Islamabad: Government of Pakistan, Planning and Development Division.
[82] Ibid. as 43 above.
[83] For an excellent review of the crisis in modernization theory see 74 above.

observation that it is easy to build systems (e.g. factories, transport systems, irrigation networks etc.) in the so-called developing world but very difficult to maintain them. The first can be accepted as a temporary feature, but the second requires a radical shift in orientation, which is difficult to bring about. The only solution is to cast the problem in the indigenous metaphor, whether of ritual or science. The idea behind this line of argument is that systems should be looked at in terms of their susceptibility to popular control, rather than to technical efficiency or some such[84].

It may be pertinent to add that a vision of this type is only a means of organizing ideas and for indicating the possibility of available options. The actual detail may change from place to place in accordance with the specific cultural characteristics peculiar to that place[85].

So what does such an alternative entail in the longer run? The popular resistance to processes favoring centralization of authority, power, and knowledge indicate that a vision of the future must explicitly be one of a decentralized polity[86], economy, and society. Such decentralization would mean an increase in the powers and functions of 'local' governments, whether at the level of a village, a group of villages, small towns or of possible sub-divisions of large cities. 'Increase in powers' refers to the ability to raise revenues, to spend them on development, redistribution, or on the maintenance of social peace. Such a system would also necessitate the establishment of institutions that can coordinate the actions of decentralization units[87].

Legal decentralization would imply the transfer of legislative and executive powers to the decentralized units[88]. Economic decentralization refers to the development of production systems that can facilitate direct participation in economic decision-making by people in the production process. This is related to the notion that the knowledge as well as action should be responsive to the environmental (social as well as physical) boundaries of the participants world[89].

Changes within the planning system for irrigation proper should compliment the decentralized context. The present set of institutional reforms underway in the IBIS fails to address this issue as it defines participation in a very narrow sense. Moreover, it limits the debate on the causes and hence solutions to the narrowly technical field of irrigation proper that refuses to go beyond its set parameters.

The actual reorganization of the decision-making system for IBIS may take any of the available shapes as long as it follows a Water Policy that should be articulated upon a consensus by all concerned. The social, economic and political goals that the policy

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[84] Ibid.
[85] Good Governance Group, 1998. *Workshop Report: Integrity in Governance in Asia.* Islamabad: Government of Pakistan, Planning and Development Division.
[86] Banuri, Tariq, 1993. *Improving the Provision of Justice in Pakistan.* Islamabad: Sustainable Development Policy Institute.
[87] Ibid. as 43 above.
[88] Ibid.
[89] Banuri, Tariq, 1993. *To Him That Hath: Social Dimensions of Economic Restructuring in ESCAP Countries.* Islamabad: Sustainable Development Policy Institute.

pursues should be spelled out. The state of Pakistan has no such policy to manage its water resources. Such a policy should be based upon principles of decentralization and participation. It should *inter alia* incorporate the following generic principles:

- Staff should be paid adequate wages reflecting the economic reality on ground and not the financial situation of the state exchequer.

- Local research institutions for irrigation should be strengthened to carry out research into the social, economic and political impacts of irrigation schemes.

- Local inputs should be maximized in all new and existing schemes.

- All existing schemes should be reviewed to weed out expensive choices of design and technology with a view to maximize local jobs and reduce costs.

- The approval process for projects should include a review of other choices available for a given intervention. This should be ensured and strengthened through separate budgetary provisions for options available.

- All new development schemes should be screened through a system of public hearings to ensure active participation of people in the design and technology choices made before they are considered for approval.

- Local financing of new schemes should be preferred over external funding.

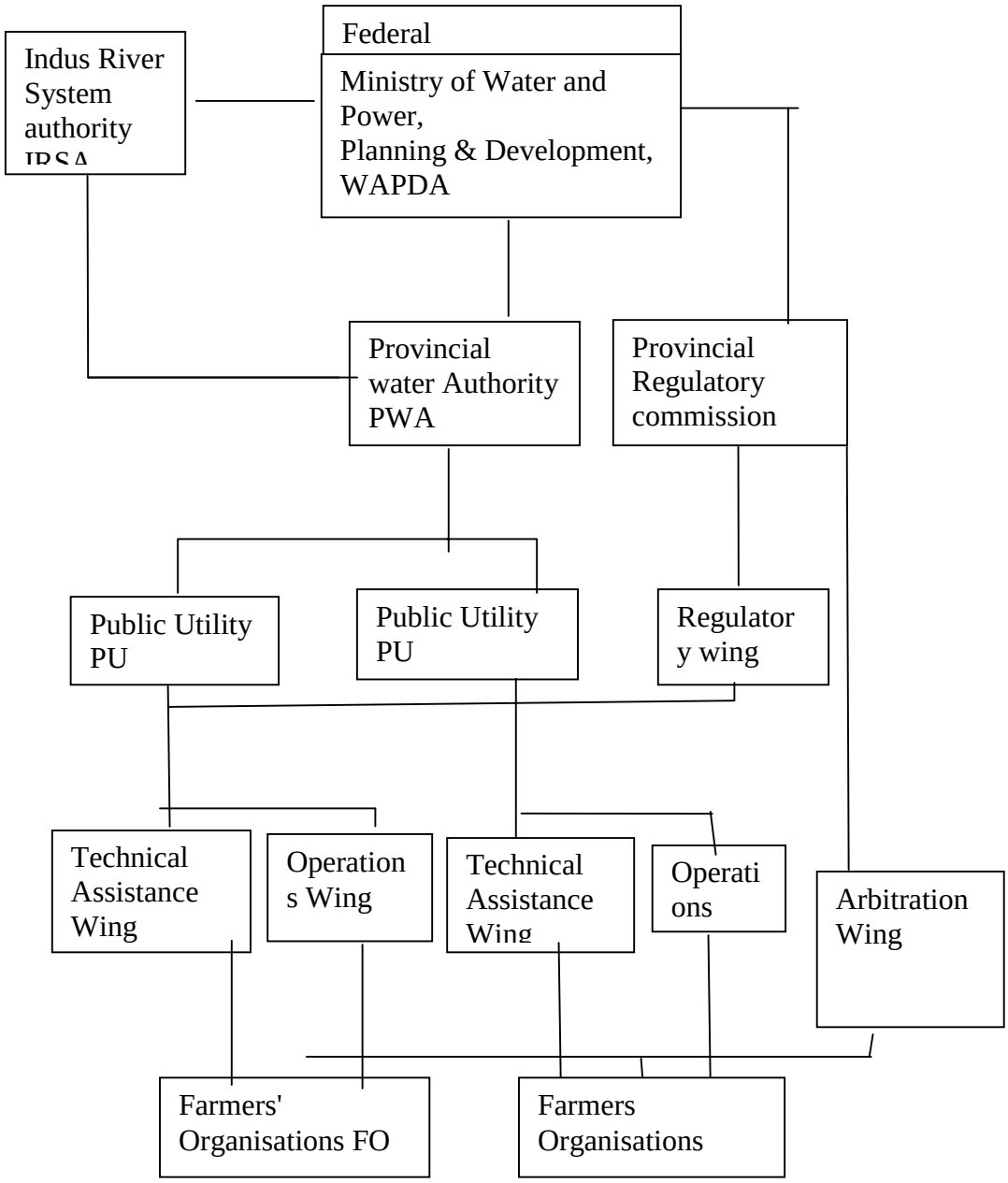
- All new schemes involving external financing should be debated and cleared by the National Assembly.

- System revenues should cover full costs of services.

ENDS.

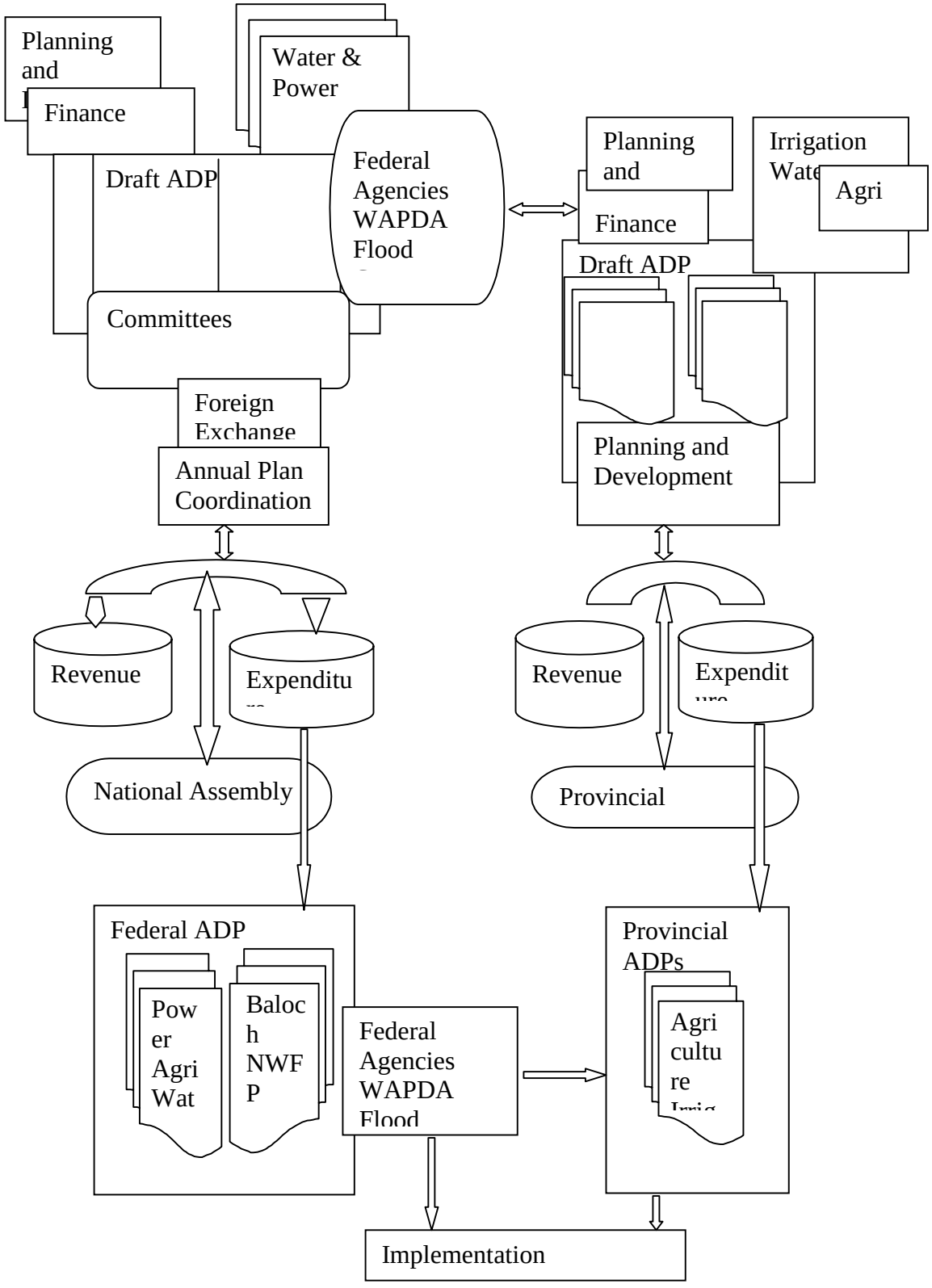
ANNEX-A

PROPOSED INSTITUTIONAL STRUCTURE BY WORLD BANK



ANNEX-B

ANNUAL INVESTMENT PROCESS



ANNEX-C

PROJECT PLANNING/APPROVAL PROCESS IN THE WATER SECTOR