

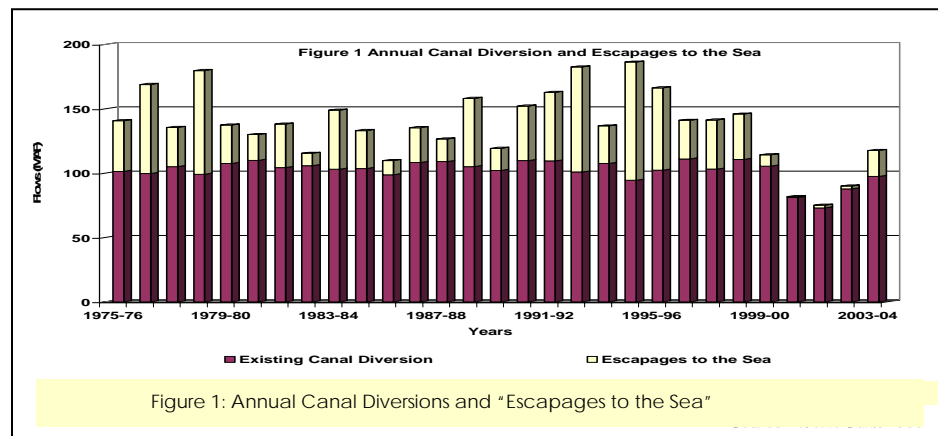
Better Management of Indus Basin Waters

Strategic Issues and Challenges

The Resource Gap

- **Pakistan is moving from being a water stressed country to a water scarce country**—Pakistan is already one of the most water-stressed countries in the world a situation, which is going to degrade into outright water scarcity due to high population growth.

- **Pakistan is fast approaching the limit of its water resources.** (Fig, 1) Only a small quantity of water is left to mobilizing but Pakistan can get much more value from the existing flows.



Building new dams is just one part of a set of necessary activities to increase income from water. These include improving the transparency and efficiency of administration of the Water Accord, and making a set of institutional reforms and investments at provincial, canal command and farm levels to ensure better use of water.

- **Groundwater is being over-exploited in many areas, and its quality is deteriorating.** The use of groundwater by private farmers has brought enormous economic and environmental benefits. Groundwater accounts for almost half of all irrigation requirements. There is clear evidence that groundwater is being over-exploited yet thousands of additional wells are being put into service every year. Depletion is now a fact in all canal commands. Furthermore, there are serious and growing problems with groundwater quality, a reality that is likely to get worse because there are 20 million tones of salt accumulating in the system every year.

The Maintenance Gap

- **Much of the water infrastructure is in poor repair.** Due to a combination of age and the "Build/Neglect/Rebuild" philosophy of public works, much of the infrastructure is crumbling. This is true even for some of the major barrages which serve millions of hectares and where failure would be catastrophic. There is no modern Asset Management Plan for any of the major infrastructure.
- **The system is not financially sustainable.** Users of canal water pay a very small part of the bill, which is basically paid by the taxpayer who provide much less than required for rehabilitation and maintenance of the assets and for operations. The result is that most infrastructure is in poor repair. The bulk of funding is used to pay the heavily overstaffed bureaucracies, whose productivity is low. This reality gives rise to a vicious circle, in which users are not willing to pay for poor and unaccountable services, which means that insufficient funds are available for operations and maintenance, which results in the decline of service quality and whereupon users are even less willing to pay.

The Trust Gap

Poor governance and low trust. *Monopoly + Discretion - Accountability = Corruption.* The result is inequitable distribution of water, poor technical performance and a pervasive mistrust and conflict, from the provincial offtake to the farmers fields. The water bureaucracy has yet to make the vital mental transition (depicted in Figure 2) from that of builder of assets to that of a good manager of assets.

The Productivity Gap

Water productivity is low. Large parts of Pakistan have good soils, abundant sunshine and excellent farmers. And yet crop yields, both per hectare and per cubic meter of water, are much lower than international benchmarks, and much lower even than in neighboring areas of India (Figure 3). The quality of water service plays an important role in this: yields from reliable, self-provided groundwater are twice those of unreliable and inflexible canal supplies.

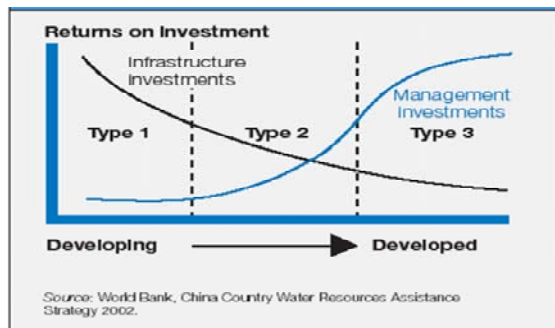


Figure 2: Rates of return on investment on infrastructure and management of water resources

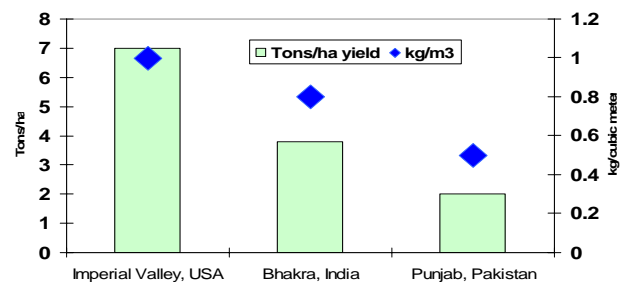


Figure 3: Wheat yields per unit of land and water

Source: Ahmad 2005

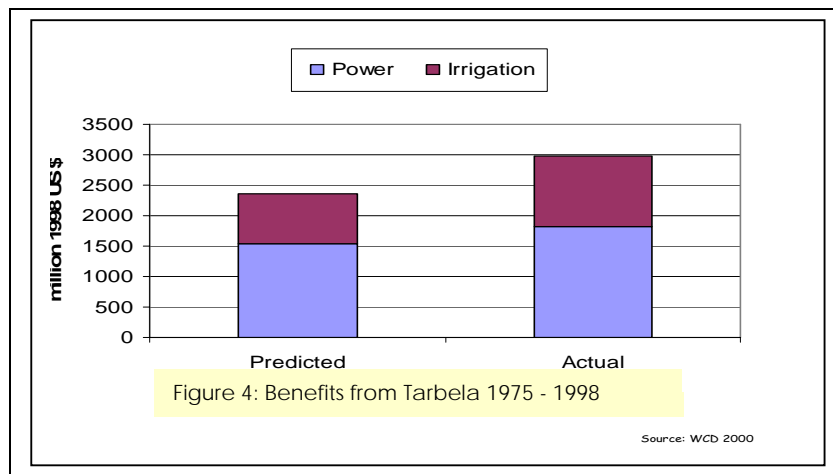
Pakistan's Water Management Strengths and Opportunities

The Water Accord

A well-established tradition and system of water entitlements exists. Pakistan's rights to water from the Indus Basin system are unambiguously defined in the Indus Waters Treaty. The 1991 Water Accord is a major achievement, which establishes clear entitlements for each province and implicitly for each canal command to surface waters. There are also well-established rules for further distributing surface water to the distributary and outlet levels. Below the outlets, the *warabandi* defines the right of each farmer for whatever water is in the delivery channel when it is his turn. Pakistan can now focus on: putting in place a similar entitlement system to cover any new water that might be mobilized; formalizing entitlements for environmental flows (including to the delta); and moving towards a similar definition of entitlements for groundwater; and, above all, administering this system in a more transparent, participatory manner.

Potential Payoff

- **There is much scope for increasing water productivity.** The flip side of current low water productivity is that Pakistan can get much more product – crop, jobs and income – per drop of water. It is quite possible to substantially increase production with existing supplies of water.
- **High returns from previous major water infrastructure.** Pakistan benefited immensely from the major water infrastructure built in the Indus Basin. As shown in Figure 4, the benefits from Tarbela substantially exceeded those which were predicted at the time of construction.



Future Investments

Asset Management and Development

Pakistan has a large endowment (with an estimated replacement value of US\$60 to 70 billion) of water infrastructure, most owned and managed by the provinces, and much now quite old. The condition of this stock of infrastructure is a major cause of concern. In some instances – such as Taunsa and Sukkur barrages – the precarious state of major structures puts the well-being of tens of millions of people at risk. In other instances, the effect is more insidious, with the poor condition of canals and pipes and treatment plants meaning that infrastructure does not produce the services it should, and people have to adapt to unreliable and sub-standard services.

For these reasons both Federal and Provincial authorities need to develop a culture and practice of asset rehabilitation and management. This should include emphasis on development of Asset Management Plans, which will include an inventory of existing assets, an evaluation of their condition and the requirements for one-time and regular rehabilitation, and for maintenance.

Since most of the water in Pakistan is already allocated, attention should be focused on sustaining the infrastructure that has been built, and improving the productivity of water. Simultaneously, Pakistan will need to continue to invest in drainage and salt management, and to formulate national and provincial drainage and salt management strategies.

Water Resources Management

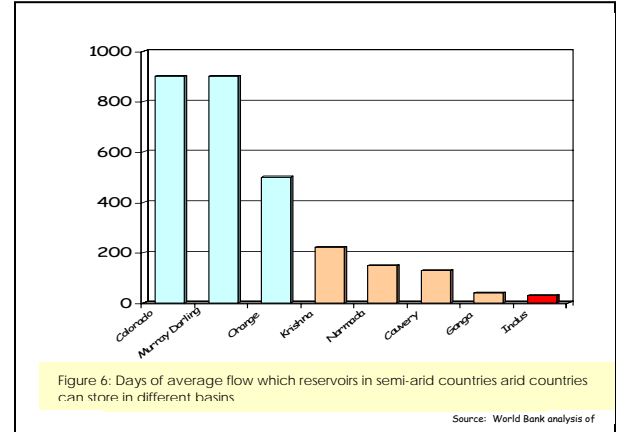
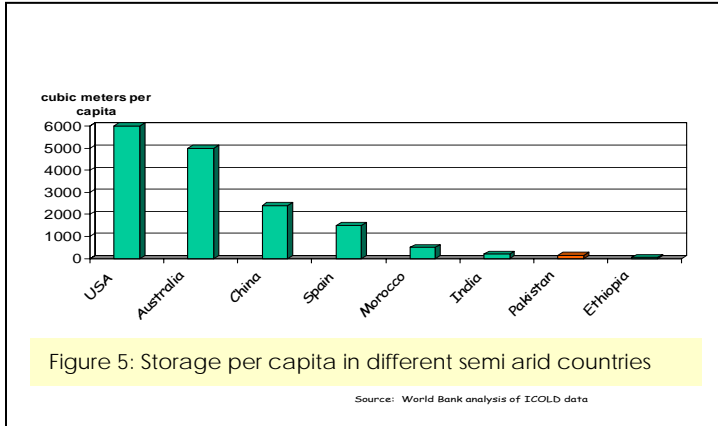
The development and management of the water resources of the Indus Basin is a huge challenge, requiring very high levels of administrative, engineering and scientific capability. There is broad agreement that over recent decades the capacity for modern water resources management at both the Federal and Provincial levels has not grown rapidly enough to meet the emerging challenges. Accordingly, government will need to give high priority to supporting the development of capacity at the provincial and federal levels. For surface water supplies a major emphasis will be building on Pakistan's platform of defined water entitlements, making the administration of these more transparent and accountable, from the inter-provincial to the user levels. For groundwater, capacity for knowledge generation, and a policy for, (and its implementation) groundwater management will be critical.

On-farm Productivity

The investment portfolio will need to go beyond delivery of water services, and involve investments in on-farm services (land leveling, watercourse lining – for which a major program is already under implementation-, introduction of new technologies) which are essential for agricultural diversification and for improving the amount of crop, income and jobs produced per drop of water.

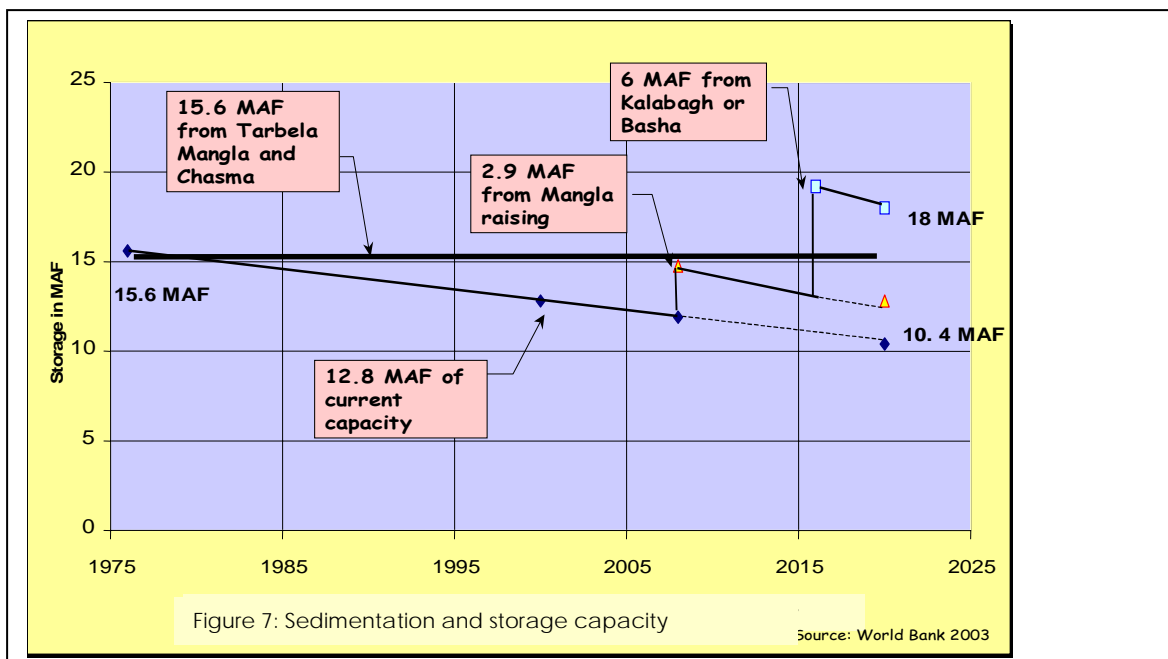
Investing in Water Reservoirs

Pakistan has very little water storage capacity. The Figure 5 shows that whereas the United States and Australia have over 5000 cubic meters of storage capacity per inhabitant, and China has 2,200 cubic meters, Pakistan has only 150 cubic meters of storage capacity per capita. And Figure 6 shows figures for some major arid basins in the world. The dams of the Colorado and Murray-Darling Rivers can hold 900 days of river runoff. South Africa can store 500 days in its Orange River, and India between 120 and 220 days in its major peninsular rivers (Figure 6). By contrast, Pakistan can barely store 30 days of water in the Indus basin.



When the Indus Basin Works were being planned, it was clear that the construction of Tarbela and Mangla were not a “final solution”, for two reasons. First, because it was known that the high silt loads from the young Himalayas meant that effective storage capacity would decline over time (Figure 7) and that it was necessary to build further storage to replace this loss. And second that at such low levels of storage there were – see the storage-yield curve in Figure 8 – substantial benefits from increasing the overall amount of storage in the system. The Water Strategy calculates that Pakistan needs to raise storage capacity by 18 MAF (6 MAF for replacement of storage lost to siltation and 12 MAF of new storage) by 2025 in order to meet the projected requirements of 134 MAF.

Large dams do not only increase the assurance of water supply, but they can also generate large amounts of electricity. Currently, about 30% of Pakistan’s energy is generated from hydropower. Even though irrigation requirements are its priority, Tarbela’s power benefits account for 60% of the overall economic benefits from the dam. And (Figure 9) power benefits would be an even higher proportion of total benefits from either Kalabagh or Basha.



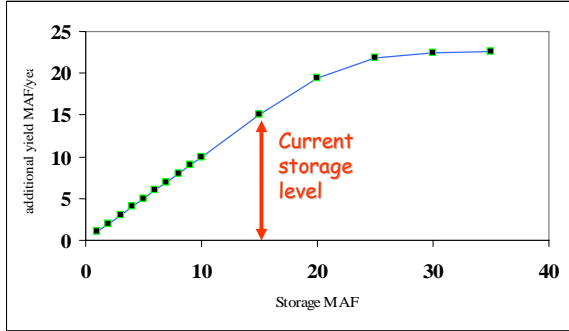


Figure 8: Storage-additional yield curve for the Indus

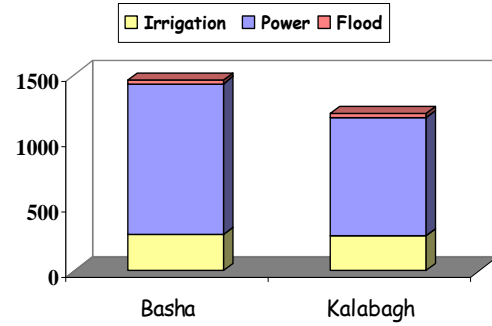


Figure 9: Benefits from the Basha and Kalabagh

As shown in Figure 10, Pakistan has used only about 10% of its estimated 40,000 MW of economically viable hydropower potential., a proportion much lower than, say, India and China (around 30%) and much lower still than rich countries (around 75%). Recognizing the value of power which is not subject to market volatility, which generates substantial local economic multipliers (the mostly-local construction content of hydropower is about 80% versus about 20% for thermal power), and which provides high-value peaking power (which is likely to be worth about four times the value of a unit of base load), Pakistan is planning for hydropower to provide about half of new generation in the medium term.

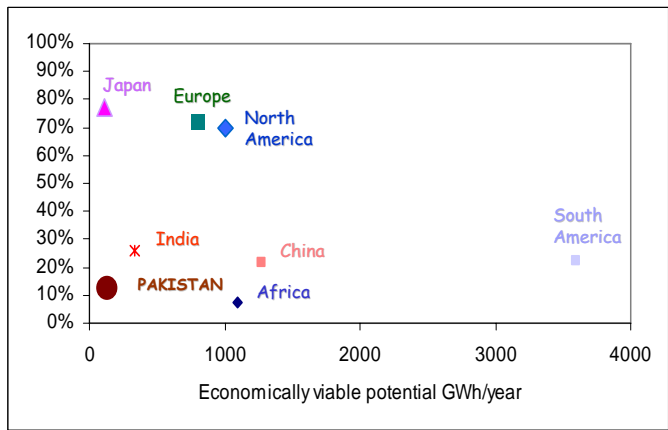


Figure 10: The development of economically-feasible hydropower potential in Pakistan in international context

Source: World Bank 2003

Deciding on which dam should be built involves comparisons from many angles – economic, financial, technical, safety, environmental and social – and multi-dimensional tradeoffs. Figure 11 compares some partial indicators (using a log-log plot) of environmental and social impact of existing and possible future large dams in Pakistan with other major multipurpose dams in the world, using very rudimentary indicators. This suggests that for Kalabagh the environmental and social problems are smaller than for most other large multipurpose dams; for Basha the problems are very much smaller. While such comparisons provide a first-order check, there are many other elements to be factored in before coming to any conclusion on the relative merits of specific dam sites.

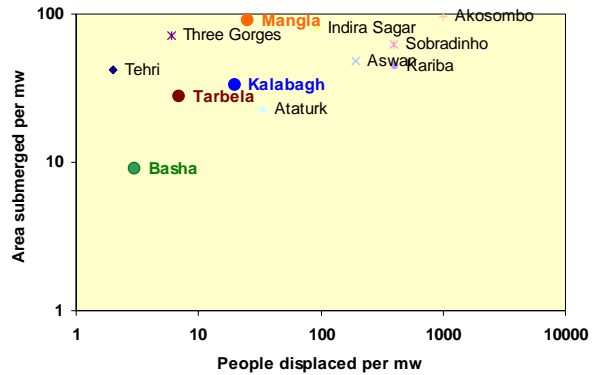


Figure 11: Partial environmental and social indicators for some multipurpose dams

At the time of planning of the Indus Basin works, it was recommended that planning for the next major dam on the Indus commence after the construction of Tarbela and Mangla was complete. It has taken thirty years to decide to start a new dam. The most frequent ostensible reason is that it is already-privileged Punjab which will be the major beneficiary. As part of the 1991 Accord, the shares of any increase in water available as a result of new storage are clearly allocated. As shown in Figure 12, this part of the Accord has a strong re-distributional component, with the smaller provinces (Balochistan and Frontier) getting much larger shares of the “new water” than they have of existing allocations. The shares of both Sindh and Punjab would be less than their shares of “existing water”, with Punjab a little less better off than Sindh.. It is ironic then that the perception is that new storage would disproportionately benefit Punjab, when the opposite is true.

The Federal Government needs to give priority to the development of the infrastructure in Balochistan and NWFP Provinces to enable them to utilize their allocated shares in the apportionment accord from the existing storages and storages to be created in future including shares out of flood flows. The Government must also provide objective and understandable information. More fundamentally, the Federal Government needs to do everything possible to improve the transparency and trust in the implementation of

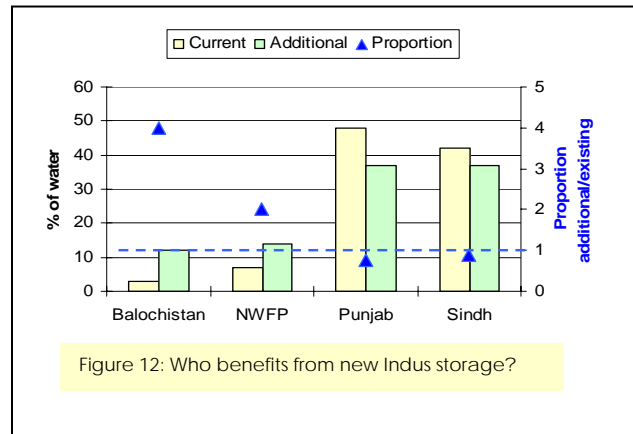


Figure 12: Who benefits from new Indus storage?

the current allocations under the Accord. The Federal Government would be well advised to **appoint a neutral auditor** who would have the resources to measure all abstractions from the system and to report these in a public and transparent way. The Federal Government also needs to conclude, as it plans to do, the long-in-abeyance dispute about releases to the delta. It is important, too, to actively address the other legitimate issues relating to new storage – who will pay? Who will get the contracts? Who will be employed during construction? Probably most important of all is who will get the hydropower royalties – will it remain the anachronistic practice which specifies that “whoever has the powerhouse gets all of the royalties”, or will it evolve into a more logical approach whereby royalties are divided depending on location of dam, powerhouse, area submerged and population to be resettled?

Finally, with each of the many delays in the past, the economic and social costs for any of the major options have risen substantially because of increases in property values and population growth in the areas of the proposed dams. Further delay is not in the interests of the country.

The Financing

Fitting major investments in irrigation is a major challenge. The Financial Responsibility Law puts a maximum on the amount of public debt the government can borrow. Pakistan’s economy is booming but the governments’ abilities to mobilize tax revenue to pay for public goods remains low compared to other countries. There are many priorities for development in addition to water resource development. Within the water sector, perhaps the first priorities are enhancing the operation and maintenance budgets of existing infrastructures and the immediate needs for rehabilitation of the major barrages. Expenditure on earthquake recovery adds a bit to the fiscal burden despite significant pledges of donor assistance. Pakistan’s recent *Medium-Term Development Framework 2005-2010* did provide Rs.160 billion for a major multipurpose dam and other hydro-electric investments in the power sector. This could be enough to start the Basha dam, which will take several years of studies and approach infrastructure before it can start building on the site. Over the longer run, Pakistan’s ability to afford and finance Basha plus two other major dams on the Indus will depend on the maintenance of economic growth of 6%-8%; opening up of more fiscal space for public investment through substantial rises in tax yields well above the current 10% of GDP as well as economy of expenditure in other areas; and a sustained improvement in creditworthiness through good macroeconomic management to keep the macro variables (budget deficit, inflation, balance of payments, money and credit) in balance.

Box 1: The Water Accord of 1991

There was an agreement that the issue relating to apportionment of the waters of the Indus River System should be settled as quickly as possible. In the light of the accepted water distributional principles, the following apportionment (in MAF) was agreed to:

	Kharif	Rabi	Total
Punjab	37.07	18.87	55.94
Sindh*	33.94	14.82	48.76
NWFP	3.48	2.30	5.78
Balochistan	2.85	1.02	3.87
Civil Canals** (NWFP)	1.80	1.20	3.00
Grand Total	79.14	38.21	117.35

* Including already sanctioned Urban and Industrial uses for Metropolitan Karachi.

** Ungauged civil canals above rim stations.

Under Section 14 (b), the record of actual average system uses for the period 1977-82 would form the guideline for developing future regulation pattern. These ten daily uses would be adjusted pro-rata to correspond to the indicated seasonal allocations of the different canal systems and would form the basis for sharing shortages and surpluses on all Pakistan basis.

Balance river supplies, including flood supplies and future storages, shall be distributed as 37% each to Punjab and Sindh, 12% to Balochistan and 14% to NWFP.

The need for certain minimum escape to sea below Kotri to check sea intrusion was recognized. Sindh held the views that the optimum level was 10 MAF which was discussed at length, while other studies indicated lower/higher figures. It was, therefore, decided that further studies would be undertaken to establish the minimal escape needs downstream Kotri.

All efforts would be made to avoid wastages. Any surplus used by province would not establish a right to such uses.

Box 3: The Indus River System Authority (1992)

The Water Accord necessitated the creation of an Indus River System Authority (IRSA) for its implementation. The Authority was established in December 1992. It consists of 5 members, one each to be nominated by each Province and the Federal Government from amongst engineers in irrigation or related fields. The first Chairman was the member nominated by the Government of Balochistan to be followed by the nominees of the Government of NWFP, Punjab, Sindh and Federal Government and thereafter in the same order. The term of office of the Chairman is one year. The functions of the Authority are as follows:

- Lay down the basis for the regulation and distribution of surface waters amongst the provinces according to the allocations and policies spelt out in the Water Accord;
- Review and specify river and reservoir operation patterns and periodically review the system of each operation;
- Coordinate and regulate the activities of WAPDA in exchange of data between the provinces in connection with the gauging and recording of surface water flows;
- Determine priorities with reference to sub-clause © of clause 14 of the Water Accord for river and reservoir operations for irrigation and hydropower requirements;
- Compile and review canal withdrawal indents as received from the provinces on 5daily or, as the case may be, on 10-daily basis and issue consolidated operational directives to WAPDA for making such releases from reservoirs as the Authority may consider appropriate or consistent with the Water Accord;
- Settle any question that may arise between two or more provinces in respect of distribution of river and reservoir waters; and
- Consider and make recommendations on the availability of water against the allocated shares of provinces within three months of receipt of fully substantiated water accounts for all new projects for the assistance of the Executive Committee of National Economic Council (ECNEC).