PAKISTAN

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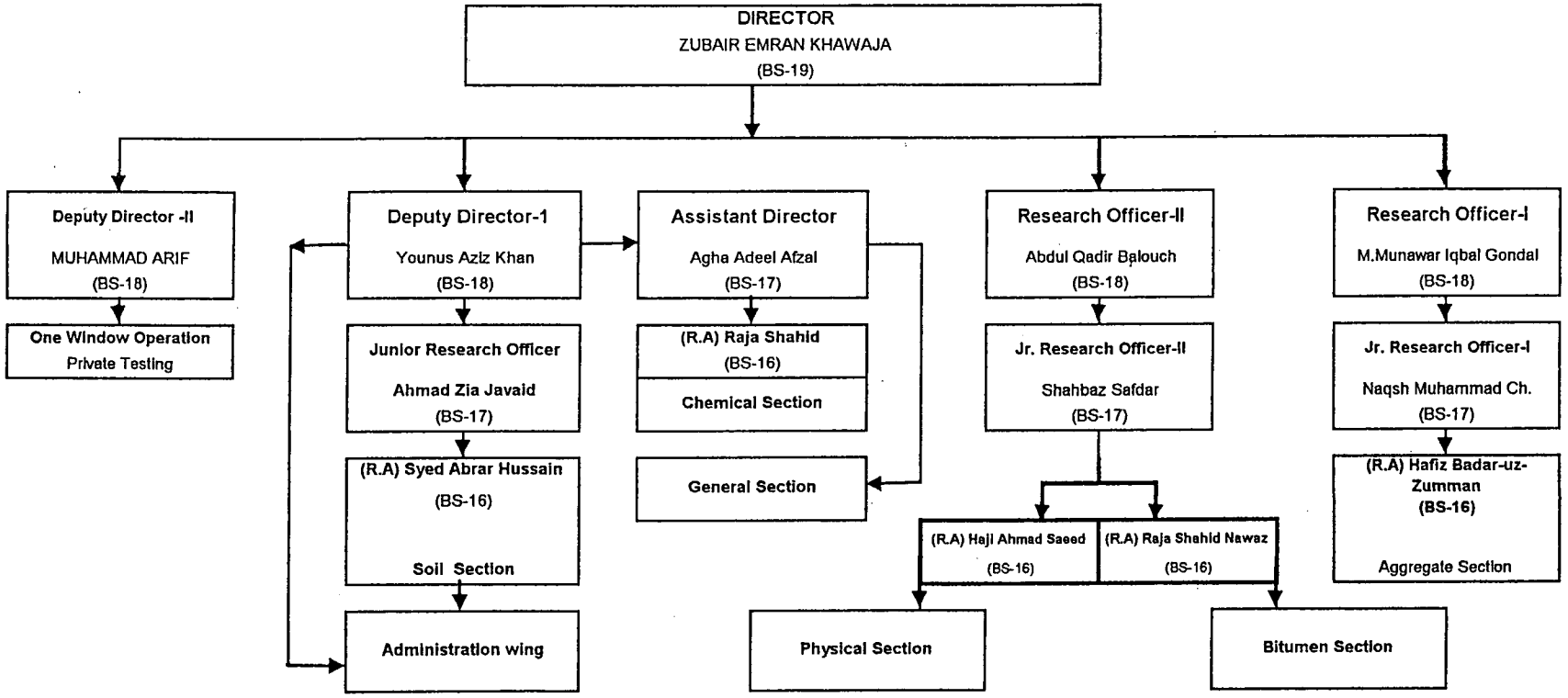
EXECUTIVES' SEMINAR
ON PUBLIC WORKS MANAGEMENT
JAPAN

COUNTRY REPORT
PAKISTAN

ROAD RESEARCH AND MATEIAL TESTING INSTITUTE/PRIVATE SECTOR PROJECTS INVESTMENT CELL. COMMUNICATION & WORKS DEPARTMENT GOVERNMENT OF THE PUNJAB, LAHORE

Zubar Emran SANTIAGO

ORGANOGRAM



TOTAL STRENGTH = 131
WORKING = 115

Subject of Common Interest

"Water Resources and River Management for Sustainable Development"

Pakistan's Economy by and large is agriculture based, and contributes 24.7% of GNP of 2000-2001 and accounts for more than 60% of foreign exchange earnings. About 68% of the rural population depends on agriculture as it employees over 46% of the labor force. Within the agriculture sector, the contribution from crop production is 52% while livestock contributes almost 44% the contribution from fishers and forestry are comparatively small, estimated at 3% and 1% respectively.

The principal objective of economic and financial policies of the Government of Pakistan is the achievement of sustained annual economic growth of around 6%, with agriculture making a significant contribution. Water has played a very significant role in the economic development of Pakistan and is likely to continue as such in future.

Total power generation capacity in Pakistan is of the order of 17,980 MW. This includes hydropower generation capacity of 5,009 MW, thermal power generation capacity of 12,509 MW and nuclear power energy generated. The potential for hydropower generation is of the order of 40,000 MW. Cooling water requirements of the Chashma Nuclear Power Plant and several thermal power plants are also met from the river and canals.

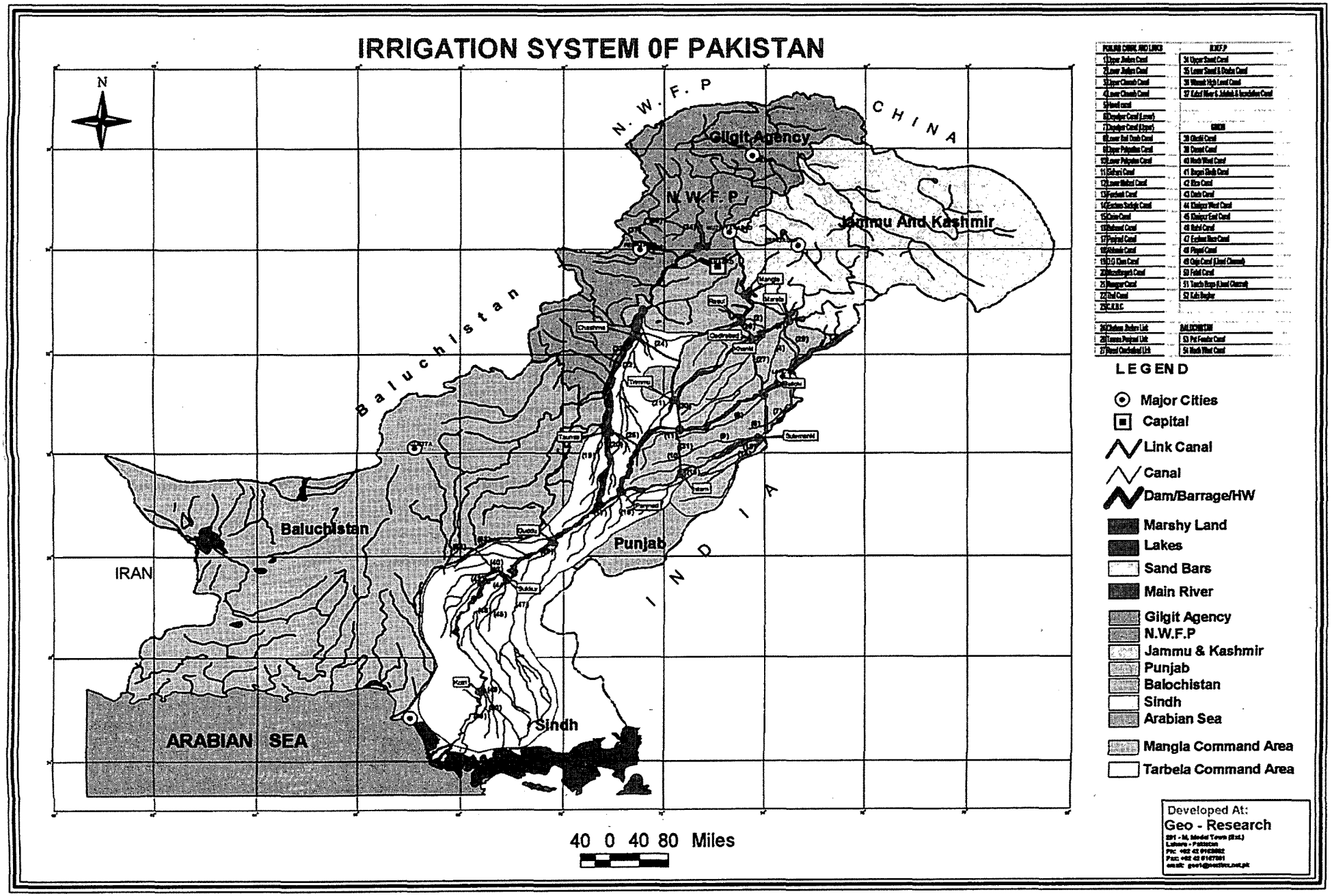
In addition to agriculture and hydropower, inland fisheries contribute reasonably to the national economy. Pakistan produced 665,000 metric tons (mt) of fish and related products in 2000 including 185,000 mt from inland water and 480,000 mt from marine fisheries. Although the share of fineries in the GDP is small, yet its contribution to national income through exports is sustainable. During the same period 84,693 mt were exported with a value of Rs.7.9 billion.

Water Resources: The total surface water available in the Indus Basin is estimated at 147.17 MAF (181.55 BCM). Additionally, in Balochistan the Makran Coastal basin has an average flow of about 3.0 MAF (3.69 BCM) and the Kharan Basin, has an average inflow of 0.79 MAF (0.97 BCM), both of which could be harnessed for use.

There is also groundwater. Recharge is from direct rainfall and infiltration through the alluvium from rivers, the irrigation system and from the irrigated fields. Estimates of groundwater recharge vary significantly but range from 40.5 to 52.7 MAF (50 to 65 BCM) annually. The groundwater supply is almost fully utilized and in some areas, notably in balochistan, groundwater tables are rapidly declining.

The water Apportionment Accord (1991) has allocated 114.35 MAF (141.1 BCM) to the provinces and another 3 MAF (3.7 BCM) for the Civil Canals in NWFP. Over the 11 years since the Accord it has never been possible to divert the full allocated amount despite above average inflows in several years. This is mainly a storage problem, as the most critical shortage occur in early Kharif when inflows are low, irrigation requirements are high and there is insufficient water in the storage reservoirs for release.

Average water abvailablity and hydropower generation from Mangla and Tarbela are declining as their combined live storage capacity reduced due to siltation. It has seen a 20% reduction in capacity to date and this will continue.


IRRIGATION SYSTEM 0F PAKISTAN
N
N.W.F.P
CHINA
Gilgit Agency
N.W.F.P
Jammu And Kashmir
Baluchistan
Baluchistan
IRAN
Punjab
INDIA
Sindh
ARABIAN SEA
40 0 40 80 Miles
LEGEND
Major Cities
Capital
Link Canal
Canal
Dam/Barrage/HW
Marshy Land
Lakes
Sand Bars
Main River
Gilgit Agency
N.W.F.P
Jammu & Kashmir
Punjab
Balochistan
Sindh
Arabian Sea
Mangla Command Area
Tarbela Command Area
Developed At:
Geo - Research

Potential for Additional Storage: There is reasonable potential for additional storage but, at present, lack of consensus among the provinces on the storage issue hampers its development. The storage option will require a strong national commitment, which satisfies the genuine concerns of the provinces and overcomes the objections of the provinces for the greater national good.

Additional storage of 15 MAF (18.5 BCM) by 2025 is required to fulfill the water need of all sub-sectors, especially agriculture under the projected Low Demand Scenario, and to replace lost storage in the existing reservoirs. This is in addition to 6 MAF to be developed through efficiency increases in irrigation.

Recognizing the importance of water and power development in the national economy, the Pakistan Government through Water and Power Development Authority (WAPDA) has launched a water resource and hydropower development Mega-plan known as 'Vision-2025', which aims at the development of about 21 MAF (26 BCM) of new storage capacity between 2005 and 2025.

There are several possible storage sites, with a total volume of 22.5 MAF, as shown in Table 1.

Dam Site	Storage Capacity (MAF)	Power Capacity (MW)	Status	Design & Construction Period (year)	Cost (m$US (2000)
Gomal Zam Dam	1.14	17.4	OG	4	167
Mirani Dam	0.30	-	OG	4	118
Satpara Dam	0.02	0.20	OG	3	10
Munda Dam	0.68	740	FS	9	750
Kalabagh	6.10	3600	FS, DD, TD	8	5000
Sehwan Barrage	0.65	-	FS	7	610
Kurram Tangi Dam	1.20	1.20	FS	7	200
Raising Mangla Dam	3.10	180	FS	5	883
Basha Dam	5.70	3360	PF	12	6000
Sanjwal & Akhori	3.60	TBD	C	12	600
Total	**22.49**	**9498.8**	**N/A**	**N/A**	**14338**

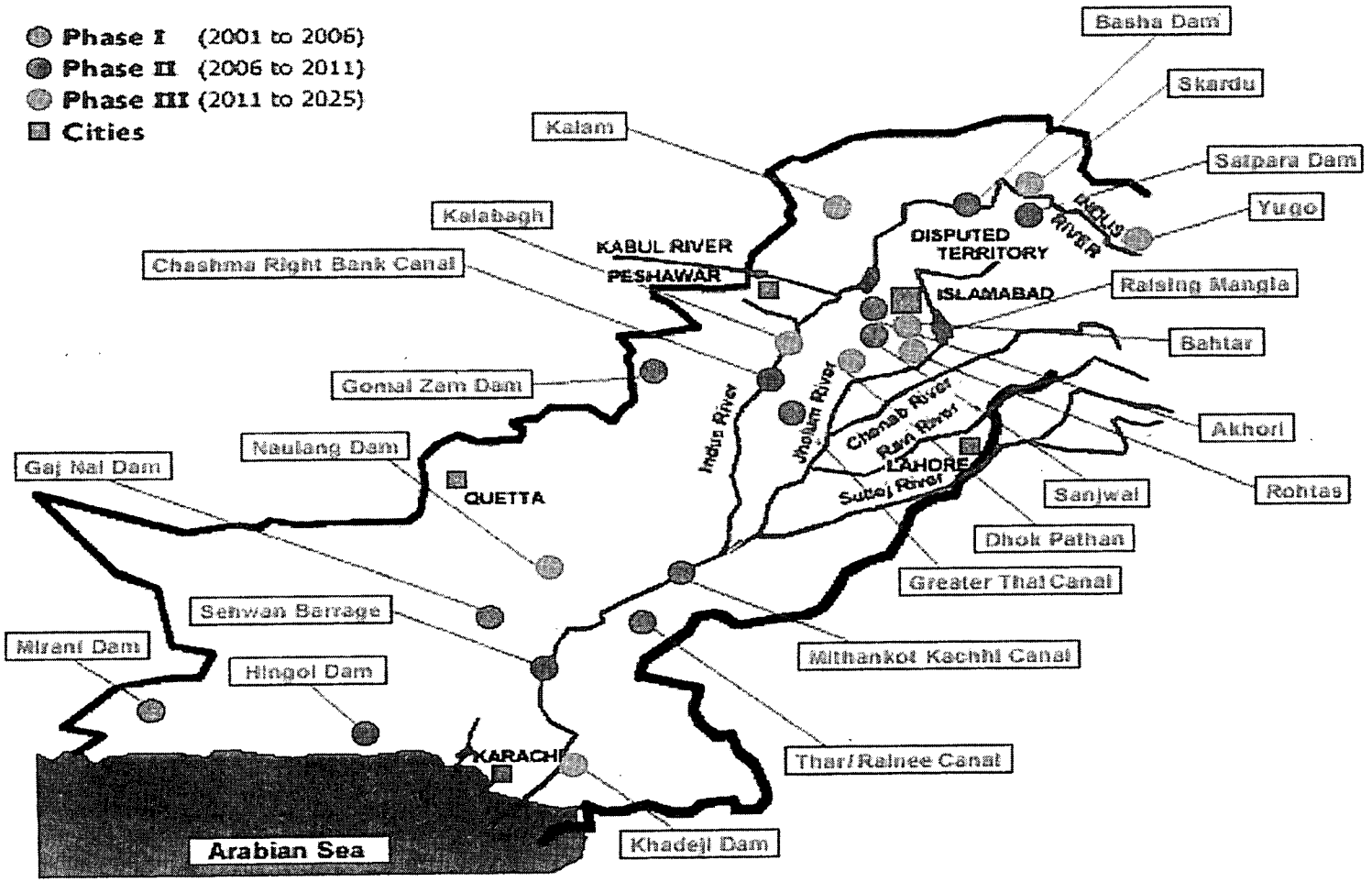
Table 1: Potential Storge Sites Presently Being Considered

Status:

OG	Construction started/likely to be stated shortly
FS	Feasibility Study ready
DD,TD	Detailed design and Tender Documents ready
PF	Pre-feasibility study ready. FS, DD& TD to be prepared
C	Concept exists, PF, FS, DD & TD to be prepared
TBD	To be determined
Costs	for most dams the costs are from the WAPDA Visions 2025 For Munda and Sewhan, costs were determined in this Study.

PAKISTAN WATER AND POWER DEVELOPMENT AUTHORITY
VISION 2025

Location Map of Water Sector Projects



Proposed Strategy for Water Resources: Population growth is the single most important driving force affecting the water sector, with the increasing demands, which it will place on irrigated agriculture production and non-agricultural water services. Pakistan's current population of 141 million people will grow to 221 million by 2025, with the resultant increased demands for water food and power.

Pakistan is now at the limit of its water resources. The long-term sustainable average annual surface water inflow is 144 MAF and there is limited potential for increasing the resources. There will be increasing competition among the various water sub-sectors as demands for non-agricultural uses increase and demands agricultural production increase. The main objective for the water resources sector is to provide sufficient water to meet the needs of the various sub sectors through several interventions, which include.

i). Water for the future will come from a combination of conservation and storage. Conservation will mainly come from the agriculture/irrigation sector through various interventions.

ii). Additional storage of 15 MAF is needed. The primary constraint in developing additional storage is the current lack of consensus between the provinces on the acceptability of such projects and the lack of national level commitment.

iii). A planning body must be instituted, which assesses overall water resources and has the authority to overcome the lack of cooperation between the provinces.

iv). A full Storage Master Plan should be undertaken with the objective of determining the best storage and, water management options. Included in this must be the assessment of the actual environmental water needs downstream of Kotri.

v). Implement a Public Awareness Programme to inform the public about the water resources isues and their responsibilities in conservation and other concerns.

vi). Develop a Management Information System (MIS) for all water information at athe national level, carried out in cooperation with the provinces and federally administered areas.

vii). Develop and implements a comprehensive Water Quality Improvement Programme to improve both surface water and groundwater quality.

Urban Water Supply and Sanitation

Water Supply: Public water supply in Pakistan represent a small component of total water use, currently estimated at around 3.16 MAF (3.9 BCM) per annum of 3% of total water use. Its relative importance to the population is, however recognized in current policies and plans and its need for priority acknowledged. For the urban sector alone, the estimate is 2.76 MAF (3.4 BCM) per annum.

In terms of proportion of the population with access to piped water supplies in cities, the estimate is 55% to 90% for the large cities with a weighted average around 71%. For smaller towns the average is nearer 50%. The overall average urban coverage for piped water supply is around 60%.

The reported quality of water entering the distribution systems is generally satisfactory. Conventional treatment is provided where the raw water comes from surface sources or where ground water quality is poor. Water quality deteriorates within the distributed system as a result of depressurization of the main. Under these conditions, chlorination cannot be effective in preventing bacterial contamination.

Sanitation: Present coverage of access to sewer connections for Karachi, Lahore and Faisalabad averages 56%. For the remainder of the urban population, the coverage is between 40% to 45%. Access to piped sewerage by the whole urban population may, therefore, be in the range 45-50.

The present total sewage treatment capacity is estimated at 339 Ml/d which represents less than 1% of total domestic sewage generated in urban areas. Some of this capacity is unused due to lack of sewerage infrastructure. Most of the sewage treatment plants in Pakistan are not in working order.

RIVER MANAGEMENT:

Incidence of Flooding: Rivers forming Indus basin in Pakistan has had a long history or repeated localized and widespread flooding that has caused loss of life, substantial damage to property and infrastructure and loss of agricultural crops and lands. Despite the construction of reservoirs and major investments in flood protection, there is still a considerable flood hazard. The barrages that occupy a key place in the irrigation economy are at risk when exposed to large floods, as some of the barrages do not have adequate capacity for the passage of major discharges. Also, there are some old structures such as bridges, which cannot pass high magnitude floods, thus raising the flood levels upstream and exacerbating damage. These constraints sometimes require breaching of flood protection bunds that cause flooding in downstream areas.

Much of Pakistan is a flood prone region, with steep upper catchments and the potential for high intensity rainfall. The flood problem has been exacerbated by the progressive denudation of river catchments and the general deterioration of river channels from significantly reduced flows during non-flood seasons because of increased diversion from the rivers. Major floods have occurred in 1950, 1956, 1957, 1973, 1976, 1978, 1988, 1992 and 1995. In 2001, though the country was passing a severe drought cycle, local flooding in the Leh Nullah caused extensive damage to life and properly in Rawalpindi. It is estimated that between 1995 and 2001 direct losses from floods have been of the order of US $ 10 billion and over 6,000 lives were lost.

Despite the construction of reservoirs and major investments in flood protection, there is still a considerable flood hazard. The capacities of the dams that attenuate flooding and regulate river flows are being reduced by situation. Uncompleted or poorly planned and constructed flood protection works are at risk, as well as the lands they are intended to serve.

Flooding mainly impacts on three areas of the country:

- The main riverine areas, adjacent to the Indus and its tributaries (the Jhelum, Chenab, Ravi, Sutlej, and Kabul), where annual floods are used for irrigation purposes and which are heavily populated and suffer catastrophic damage due to high intensity floods.;
- High torrent affected areas where intense local rainfall on steep, largely denuded mountainsides can cause major flash floods. Such floods cause immense damage

communications and urban infrastructures. Large and sudden deposits of sediment from hill torrents near the confluence with main river, adversely affecting flooding and erosion conditions.;

- Areas of poor drainage where water ponds in agricultural and urban areas as a result of heavy summer (monsoon) rainfall.

Flood Protection Works

Flood protection works in Pakistan usually take the form of:

- River training works and flood protection works for barrages and bridges that usually take the form of guide bunds and spurs;
- Breaching bunds which are utilized when the flood peak exceed the capacity of barrages;
- Bunds usually with spurs to constrain the river and prevent overall onto adjacent lands; and,
- Revetments on riverbanks to protect towns and villages.

The flood problem and the strategy for flood protection vary across Pakistan. Flood protection embankments are constructed where there is a problem of flooding, whereas spurs are constructed to arrest the problem of land erosion. The existing flood management facilities in Pakistan include about 3700 miles (5920 Km) length of embankment and nearly 800 spurs.

Flood Protection Plans and Projects

i) assess the flood problem;
ii) prepare an integrated and suitably phased flood control plan comprising short and long term measures; and
iii) recommend arrangements for efficient maintenance of flood control and protection works.

The Food Commission prepared a plan for flood protection in 1970. This central Commission was later replaced by two provincial commission; i) Punjab Province Flood Commission; and ii) Indus River Commission in Sind. Following the devastation during heavy floods in 1973 and 1976 the Federal Flood Commission (FFC) was constituted by the Government of Pakistan in 1976 with the main function of;

- preparing a National Flood Protection Plan for the country;
- approving flood protection schemes prepared by the provincial/federal agencies
- ensuring proper monitoring of flood works; and
- improving the performance of flood warning system.

A comprehensive National Flood Management Plan was prepared in 1978, which contained a phased implementation plan. Phase I under this Plan was implanted during the period 1978-88. During this period 350 flood protection schemes were implemented at a cost of Rs. 1.73 billion.

The Flood Management Plan was updated and the National Flood Protection Plan-II (NDPP-II) was implemented during the period 1988-98 where in 170 schemes were completed at a cost of Rs. 2.542 billion. During the same period several foreign funded

projects. Both for flood damage restoration and flood protection, where also implemented which included:

- 1988 Flood/Rain Damage Restoration Project where 2065 schemes were completed at a cost of Rs. 2.3 billion including US$ 200 million provided by ADB.
- Flood Protection Sector Project-I (FPSP-I) – 257 schemes were implemented at a cost of Rs. 4.86 billion including US $ 131 million provided by ADB.
- 1992-94 Flood/Rain Damages Restoration Project – 1980 schemes were completed at a cost of Rs. 6.67 billion including US $ 193 provided by IDA, EU, KFW and ADB.

Several facilities and services were procured under FPSP-I to improve the flood forecasting and warning capability. As a floow-up, FPSP-II is currently being implemented with the assistance of ADB in order to complete the remaining activities to strengthen the Flood Forecasting and Warning System, undertake left over sub-projects and develop certain new flood protectin schemes. The FPSPII has encountered major delay of about 55%. AS of end 2001, physical progress is 3% cumulative contracts awards 14%, and cumulative disbursement only one %. The Chief Executive of Pakistan constituted a Special Committee (namely the Flood Protection Committee) on 19 June 2001 to review the flood sector, and specifically FPSP-II. The review of FPSP-II was carried out over a four month period. The Committee completed its findings and recommendations in November 2001. The total cost of the project is proposed to be reduced from Rs. 8 billion to Rs. 4.342 billion for the reformulated Project which is designated as Phase I components of FPSP-II. The remaining sum of Rs. 3931.235 million is proposed as Unallocated Sum for Phase II of FPSP-II. After approval of the reformulation proposals by ADB the Project is likely to recommence.

FCC has also completed several feasibility studies through consultants to address the problem of flood damage caused by hill torrents in various parts of the country. The proposals from these studies are in the process of approval at the federal government level for arranging financing.

For each of the %-ages indicate whether stable, increasing or decreasing	Severe Impact	Moderate Impact	Slight impact	No impact
Area of rural floodplains in which flooding adversely affects people and/or agricultural activities.	20%	50%	20%	10%
Area of urbanized floodplains in which flooding adversely affects people, properly and/or industry.	15%	35%	30%	20%
Area of settled floodplains that has integrated structural and nonstructural flood mitigation				30%
Area of settled floodplains that has effective nonstructural flood mitigation				Negligible