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The Ministry of Water and Power, Government of Pakistan, Office of the Chief Engineering Advisor/Chairman Federal Flood Commission led the development of the Water Sector Strategy under the guidance of Mr. Riaz Ahmad Khan. Mr. Asjad Imtiaz Ali, Project Director, also chaired the Federal Working Group.

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The Water Resources Strategy Study was funded through the Asian Development Bank (ADB) Technical Assistance programme and the Ministry of Water and Power gratefully acknowledges their assistance.

The documents which make up the Pakistan Water Sector Strategy are:

Volume 1, Executive Summary, which is the summary of the Water Resources Strategy Study, under which the Water Sector Profile, Strategy and MTIP were developed;

Volume 2, National Water Sector Strategy, which is a concise presentation of the Water Sector Strategy;

Volume 3, Medium Term Investment Plan, which details the projects and costs for the MTIP, in support of the Water Sector Strategy;

Volume 4, Detailed Strategy Formulation, which presents the supporting information and considerations for the formulation of the Strategy;

Volume 5, National Water Sector Profile, which presents detailed background information on the water sector in Pakistan.

The Water Sector Strategy document presented herein brings out the proposed road map to meet the objectives of the National Water Policy for a sustainable and environmentally and economically sound water sector in Pakistan.

This has, however, yet to pass through the formal channels of approval, with possible fine tuning. The adopted country Strategy for the Water Sector will follow this approval.

EXECUTIVE SUMMARY

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S.1

Study Background

This document is the Executive Summary and is part of the final submission for the Water Resources Strategy Study, which began in July 2001. Funded by the Asian Development Bank (ADB) under the ADB Technical Assistance (TA) Number 3130-PAK, the Study was executed by the Ministry of Water and Power, Government of Pakistan, through the office of the Chief Engineering Adviser/ Chairman Federal Flood Commission.

The Consultant consortium which carried out the study was led by Halcrow Group Ltd. of the UK, in association with ARCADIS Euroconsult (AEC) of the Netherlands, Halcrow Pakistan (PVT) Ltd., Euroconsult Pakistan (PVT) Ltd., and Asianics, Pakistan.

S.2

The Process of the Study

Given the importance of the outcome of the Study to the future of the Water Sector in Pakistan, a collaborative approach was followed from the outset, when five Working Groups were established, one at the Federal Level and one each for the four Provinces. The Federally Administered areas of FATA, Northern Areas and the State of Azad, Jammu and Kashmir (AJK) were included in the Federal Working Group. The collaborative approach ensured that the resulting Water Sector Strategy and Medium Term Investment Plan (MTIP) were developed by the main agencies which would be ultimately responsible for implementing them.

The Government has been engaging in developing the water sector through several initiatives, including the Ten Year Perspective Plan (Planning Commission, 2001), Vision 2025 (Water and Power Development Authority, 2001) and the National Water Policy (Ministry of Water and Power, Draft, 2002). Now the Pakistan Water Sector Strategy Study provides a road map for the future development of the Sector.

S.3

Objectives and Scope of the Study

The main objective of the Study is to provide an updated, comprehensive strategy and a framework for the water sector within which competing demands for water and scarce financial resources can be assessed and service delivery improved. The Study was to develop an updated, comprehensive Water Sector Strategy (with a planning

horizon of 2025) to provide guidance on investment planning in, and management of, the water sector. It was also to provide a Medium Term Investment Plan (MTIP) (with a planning horizon of 2011) with specific investment proposals.

The Strategy and MTIP are to be responsive to the overall national development programmes, principles of economic efficiency and environmental improvement, and policy decisions on institutional reforms.

The Study covered water resource planning, development and management as well as water service delivery. It included all sub-sectors of water, defined as: Water Resources Development, Urban Water Supply and Sanitation, Rural Water Supply and Sanitation, Industrial Water Supply and Pollution Control, Irrigation and Drainage, Hydropower, the Environment and Flood Protection.

Each sub-sector has been assessed as to its current situation, future requirements, objectives for the sub-sector (to 2025), constraints to meeting those objectives, a proposed strategy for the sub-sector, a detailed investment plan with projects aimed at achieving the objectives of the Strategy, with a cost estimate to meet those objectives.

The outcome of the Study is comprised of three main documents which are referred to in total as the Pakistan Water Sector Strategy. These are:

- (a) The National Water Sector Profile, which summarises and details all aspects of the Water Sector as it is today. As such, it will become a reference document for future water sector work.
- (b) The National Water Sector Strategy, which identifies the key issues and objectives for the water sector and outlines proposals for planning, development and management of water resources and their use in all water sub-sectors.
- (c) The Medium Term Investment Plan, which identifies the key projects which should be undertaken up to 2011 which will make the initial contribution to achieve the objectives of the Strategy.

S.4

Chronology of the Study

The Study began on 23 July 2001. The Inception Report was submitted on 20 August 2001 and was followed up by the Inception Workshop on 28 August 2001 which included participants from across the water sector. The workshop introduced the Study and its objectives but its main outcome was to develop a draft of the selection criteria for projects to be included in the MTIP.

The first task was to complete the Water Sector Profile, which provides a detailed description of the current state of the water sector as the basis for developing strategy and investment proposals and proposals. The Draft was completed on 8 November 2001.

Following the delay caused by the events of September 11 2001, the first National Workshop was held on 9 February 2002. The primary outcome of this workshop was to complete an agreed selection criteria for the MTIP. During this period up to the preliminary draft, several meetings were held with the individual Working Groups, both in Islamabad and in each Province.

Because of the extensive nature of the Strategy and MTIP it was felt that the Working Groups and other stakeholders needed more time to digest it than originally laid out in the ToR. A Preliminary Draft Strategy and MTIP was then agreed which would draw out major issues for improvement before the more official presentation of a draft final report. The Preliminary Draft Strategy and MTIP was submitted on April 15 2002.

The Second National Workshop was held on 16 May 2002 to discuss the Preliminary Draft Strategy and MTIP. This was a very productive workshop resulting in many good ideas and changes to the preliminary draft.

The Draft Final Report was submitted on 28 June 2002, incorporating the changes and additions agreed at the May Workshop. The Final National Water Sector Profile was also submitted at this time.

The Final National Workshop was held on 13 September 2002 to finalise the main issues of the Strategy and MTIP. Based on the discussions

from the Workshop, the Final Report has been completed and submitted on 2 October, 2002.

The final documents which make up the Water Sector Strategy are: The Executive Summary, Volume 1; the National Water Sector Strategy, Volume 2, which is a concise version of the Water Sector Strategy; the Medium Term Investment Plan, Volume 3, the Detailed Strategy Formulation, Volume 4, which presents supporting information for the Strategy and a detailed discussion of the strategy formulation. The detailed background information on the water sector in Pakistan is given in the National Water Sector Profile, Volume 5.

S.5

Brief Summary of the National Water Sector Profile

The National Water Sector Profile provides the background information on the current state of the Water Sector in Pakistan, projections of future needs and an agenda for action. The first section, an overview of the sector, is summarised here:

Population and Administration

Pakistan's current population of 141 million people is expected to grow to about 221 million by the year 2025. The most pressing need for the water sector over this time will be the provision of the basic needs of food, power and domestic water requirements.

The federal government has the responsibility for coordination and policy formulation at the national level. National distribution of water and management of multipurpose reservoirs on the Indus and its tributaries are also a federal responsibility. Otherwise the provinces administer their own water sectors. Under the new decentralization process, water supply and sanitation have come under District control.

Economic Indicators

During 2000-01, Pakistan's GNP amounted to Rs. 3,411 billion while for the same period the GDP amounted to Rs. 3,472 billion. The agricultural sector, with a share of about 25%, was the largest contributor to the GNP. Manufacturing, trade and transport and communication sectors respectively accounted for 17%, 10% and 15% of the GNP. During this

period, the country's exports amounted to Rs. 444 billion of which the shares of primary, semi manufactured and manufactured goods were respectively 12%, 15% and 73%. During 2000-01, the per capita GNP was about Rs. 24,528, which in nominal terms was 6.3% larger than 1999-2000.

Provincial household income levels vary little from the national average (2 to 5 percent) except in NWFP which are 20 percent lower. Income disparities are greater between urban and rural populations, where average income levels for the rural population are 37% lower than the urban population, with 39.8% of the rural and 35.2% of the urban population classified as poor.

The Indus River Basin

The Indus Plain covers 25% of the total land area, most of the irrigated agriculture takes place here and 80 to 85% of the population is centred here. The Indus Basin Irrigation System commands an area of 36.2 million acres, is the largest contiguous irrigation system in the world and is the agricultural and economic centre of the country.

The Indus River and its tributaries on average bring about 152 million acre feet (MAF) of water annually. This includes 143 MAF from the three Western rivers and 8.4 MAF from the Eastern rivers. Most of the inflow, about 104 MAF, is diverted for irrigation, with 38 MAF flowing to the sea and about 10 MAF consumed by system losses.

Irrigation System

The Indus Basin Irrigation System comprises three major reservoirs, 16 barrages, two head-works, two siphons across major rivers, 12 inter-river link canals (all in Punjab), 44 canal systems and more than 107,000 water courses. The aggregate length of the canals is 34,834 miles. The System also utilises an estimated 41.6 MAF of groundwater pumped through more than 600,000 tube wells (mostly private) to supplement the canal supplies. In addition, there are over 200 civil canals in NWFP, which irrigate about 0.82 million acres and are managed by local tribal populations.

Outside the Indus Basin, there are two smaller river basins in Balochistan. The Makran Coastal Basin includes the Dasht, Hingol and Porali rivers, which discharge individually into the Arabian Sea. The closed Kharan Basin comprises the Kharan Desert and Pishin Basin and includes Pishin, Mashkel and Baddo rivers which discharge into shallow lakes and ponds that dry out completely in the hot season. The total inflow of the two basins is less than 4 MAF annually. The streams are flashy in nature do not have perennial supply. About 25% of the inflow is used for flood irrigation.

Agriculture

Agriculture is the single largest sector of Pakistan's economy, contributing 24.7% of GNP (2000-2001) and more than 60% of foreign exchange earnings. Some 68% of the rural population depend on the sector and 46% of the labour force is employed in it.

The principal crops include wheat, rice, cotton, sugarcane, oilseeds, fruits, vegetables and pulses. While there have been improvements in productivity of some crops, the overall yield per hectare of most crops is far below their demonstrated potential. Main reasons for this include an uncertain policy environment for pricing and marketing of staples, generation and dissemination of technology to the farmers and inefficient post harvest processing and storage.

Waterlogging and salinity pose a major threat to the sustainability of irrigated agriculture in about 30 percent of irrigated lands, which is directly related to the low efficiency of irrigation systems, which in turn is a result of inadequate irrigation management both at the system and at farm level.

Domestic and Industrial Water Use and Waste Water Disposal

Access to water for domestic purposes in the urban areas is limited to about 83% of the population, with 57% having piped supply to their homes. Present water use in the urban sector is of the order of 4.3 MAF. The demand is expected to increase to about 12.1 MAF by the year 2025. Rural domestic water use is currently 0.8 MAF, with only about

53% of the rural population having access to drinking water from public water supply sources.

Water consumed by major industries is about 1.2 MAF per year, mostly from ground water.

Environment

Water pollution is a main concern in Pakistan. The source is from both municipal and industrial uses, with only about 1% of wastewater treated before disposal. This has become one of the largest environmental problems in Pakistan.

Hydropower Generation

Total installed power generation capacity in Pakistan is 17,980 MW, which includes hydropower generation capacity of 5,042 MW, thermal power generation capacity of 12,509 MW and nuclear power generation capacity of 462 MW. The thermal capacity includes 6,003 MW supplied by private power plants developed and operated by the private sector. Pakistan presently has surplus power generation capacity but this will change in the near future.

Floods

Localised and widespread flooding is common in Pakistan, resulting in loss of life, substantial damage to urban and rural property and infrastructure, public utilities 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 main causes of floods in Pakistan are the progressive denudation of river catchments and the general deterioration of the river channels from significantly reduced flows during non-flood seasons. It is estimated that between 1950 and 2001 total losses from floods have been of the order of US \$10 billion and over 6,000 lives were lost.

S.6

Brief Outline of the Pakistan Water Sector Strategy

The Water Sector Strategy is intended as a roadmap for the planning, development and management of the Water Sector, with a planning

horizon of 2025. It covers the Water Sector as a whole, with main cross-cutting issues and objectives, as well as specific objectives for each sub-sector. Sub-sectoral objectives and strategies are provided in the Strategy Framework at the end of this section. Major issues for the sector as a whole are summarised as:

Institutional and Management Issues

Specific institutional and management issues include the following:

- (i) Inadequate coordination between all water user organisations;
- (ii) Difficulties in reaching consensus between the provinces on the issue of additional storage, retarding growth in water resources development;
- (iii) Absence of an inter-ministerial, inter-provincial body to oversee water sector planning, development and management;
- (iv) Changing administration under the Devolution Plan, and uncertainty in technical ability during the transition, especially in the domestic water supply and sanitation sub-sectors;
- (v) Insufficient data base and information on water.

Social and Financial Issues

The main social and financial issues affecting water sector development are:

- (i) Rapid population growth and changing demographics;
- (ii) High level of poverty, with some potential to be improved through water sector investment;
- (iii) Low level of involvement of women in water sector decision making, with potential for improvement, especially in domestic water supply and sanitation;
- (iv) Inequity in water distribution within the irrigation systems;

- (v) Limited availability of funds for the water sector and high financial requirements to meet the needs of the future;
- (vi) Inadequate financial sustainability in water sector services due to low levels of public sector funds and insufficient cost recovery;
- (vii) Low crop prices reducing farmers' ability to contribute to irrigation and drainage management;
- (viii) Limited private sector investment or participation;
- (ix) Limited stakeholder participation in decision making in all sub-sectors;
- (x) Inadequate public awareness and understanding of water issues;

Technical Issues

The main technical issues are:

- (i) Increasing demand for water, food and power;
- (ii) Insufficient water resources for the demands of the future;
- (iii) Inefficient use of water in all sub-sectors with greatest potential for improvement in the irrigation sub-sector;
- (iv) Low crop yields;
- (v) Deteriorating water quality;
- (vi) Low coverage and quality of service in domestic water supply and sanitation;
- (vii) Deteriorating infrastructure in the domestic and irrigation and drainage sub-sectors;
- (viii) Overuse of water in many irrigated areas, the main cause of (ix) below;
- (ix) Waterlogging and salinity on irrigated land and disposal of saline drainage effluent.

The Water Sector Strategy goes beyond the infrastructural development of the various water sub-sectors and has emphasised the elements which are essential to the sustainable achievement of the objectives of the water sector. Key Strategy Objectives for the sector as a whole are:

- (a) Provision of water for all through water conservation, additional storage, providing improved water allocations;
- (b) Improvement of institutional and management capacity through establishing an inter-ministerial and inter-provincial National Water Council and a supporting Water Resources Apex Body, whose first task will be to prepare an Integrated Water Resources Master Plan to determine the needs and development priorities for conservation, storage, watershed management and water resources development as a whole. A Coordinating and Support body is also proposed for the domestic water and sanitation sub-sector, which would provide support for strategic planning to all urban areas.
- (c) Poverty reduction, mainly through the irrigation and drainage and urban and rural water supply and sanitation sub-sectors.
- (d) Improving the involvement of women in water mainly through the rural water supply and sanitation sub-sector;
- (e) Increasing equity in water distribution for poverty alleviation, increasing irrigation efficiencies and reducing dependence on groundwater;
- (f) Increasing stakeholder participation in irrigation and drainage and domestic water supply and sanitation;
- (g) Improving public awareness and understanding and information to provide the foundation for increased stakeholder participation;
- (h) Improving agricultural yields and production to meet the food needs the future.
- (i) Increasing cooperation between irrigation and agriculture to accomplish improvements in irrigation efficiency and increased crop yields.
- (j) Enacting the National Water Policy;
- (k) Improving cooperation and resolving conflict in the water sector.
- (l) Improving financial efficiency through targeting investments to the objectives of the strategy and achieving financial sustainability in water services and involving the private sector.
- (m) Improving water quality.

A Framework for the Water Sector Strategy which outlines the key issues, objectives and responsibilities of each of the sub-sectors, as well as a cost summary is provided in the following table.

Two A3 pages between page 10 and 13

i.e., page 11 and 12

Page 12

A3 page.

S.7

Brief Outline of the Medium Term Investment Plan

The Medium Term Investment Plan (MTIP) accompanies the overall Water Sector Strategy. Where the Water Sector Strategy is intended as a road map for water sector development for the next quarter century (to 2025), the MTIP contains specific projects for investment as a first stage of Strategy implementation.

The MTIP has a further purpose to support investment decision making by the international lending agencies, such as the Asian Development Bank, JBIC and the World Bank, in their considerations of investment in the water sector in Pakistan.

The projects presented in the MTIP are based on the agreed selection criteria, developed in collaboration with Working Groups. It is also based on the finances estimated to be available for the water sector during the MTIP period.

The MTIP also covers all sub-sectors of water, but they are grouped differently from the Strategy, as follows:

- Water Resources Development, which is treated somewhat separately due to the high cost of storage development;
- Irrigation, Drainage & Flood Protection;
- Water Supply & Sanitation, which covers urban, rural and industrial sub-sectors;
- Environment;
- Hydropower, which is treated somewhat separately because of the high cost and the potential for private sector investment.

In addition there are projects referred to as “Supporting Activities”, which are either institutional and management oriented or are studies, and which support the efficient targeting of funding for the water sector.

The MTIP contains on-going activities, projects which are either fully underway or have funding committed to them and are likely to start shortly. These were not part of the selection process of the MTIP development but are included due to their budget commitments, especially in the earlier years of the MTIP.

New MTIP activities are the projects selected during the period of the Study. They are made up of projects that are already under consideration and have been developed to the stage of feasibility studies or similar. These are generally engineering / infrastructure projects, though some studies are included.

The new activities also include what are referred to as 'block financial allocations' for certain sub-sectors. The purpose of the block allocations is to ensure that finances are fully considered for urgent activities which have not yet been developed to feasibility stage.

MTIP new activities also include projects or studies that specifically target institutional, social, financial and other improvements. Most of these were developed during the course of the MTIP as the need for them was determined. These are referred to as 'supporting activities' and may be considered for funding through government reserves, by bilateral aid donors, or as TAs through the major international lending agencies.

Finances for the projects have been streamed over the period of the MTIP and beyond, where larger projects or those which start later overrun the horizon of 2011. Storage projects and hydropower projects which are recommended in the Strategy are kept out of the streaming process; storage, because its high cost will require it to be financed as a special project; and hydropower also because of its high cost of development and the good potential for it to be financed by private sector investors.

Cost Summaries

The total costs of On-going and New projects during the MTIP period is summarised in Table S.6.1, with a total just under US\$ 8 billion. A more detailed breakdown of combined ongoing and new projects, including the financial streaming over the MTIP period, is given in Table S.6.2. Selected MTIP projects which have a specific geographical location are shown on Figure S.1.

The cost of additional storage of US\$ 4.4 billion is included separately in Table S.6.1 as it will require special funding as it is beyond the normal

funding available for the water sector. Storage is not included in Table S.6.2 as it is not included in the financial streaming.

	Rs million	US\$ million	Federal %	Provincial %
Federal	202,975	3,383	44	
Punjab	146,664	2,444	32	57
Sindh	65,879	1,098	14	25
NWFP	33,027	550	7	13
Balochistan	12,842	214	3	5
<i>Total without storage</i>	<i>461,387</i>	<i>7,689</i>	<i>100</i>	<i>100</i>
Storage	262,500	4,375		
<i>Total with storage</i>	<i>723,887</i>	<i>12,064</i>		

Table S.6.1: Combined Costs of On-going and New Projects

Hydropower projects are also not included in Table S.6.1 or S.6.2. Table S.6.3 shows the run-of-river hydropower projects for which there is potential for private sector investment.

Table S.6.2 Medium Term Investment Plan - Summary On-Going & New Projects (Rs million)

SUMMARY	2003	2004	2005	2006	2007	2008	2009	2010	2011	MTIP/1	%	
I & D & F	21,092	38,977	47,312	44,306	47,255	48,408	41,630	35,757	31,449	356,185	77.2	
Federal	11,187	28,858	38,077	34,979	34,866	23,764	13,014	9,596	5,096	199,436		
Punjab	4,491	4,670	3,220	5,349	8,622	19,534	22,650	17,182	14,051	99,769		
Sindh	4,205	3,937	3,801	1,402	1,363	2,851	4,033	5,034	5,250	31,876		
NWFP	1,055	1,324	1,055	1,226	1,289	1,204	1,391	3,284	6,633	18,461		
Balochistan	154	188	1,159	1,350	1,115	1,055	542	661	419	6,643		
WS & S	1,984	2,514	2,723	8,471	9,721	12,287	13,273	10,175	10,651	71,799	15.6	
Federal	322	238	223	223	223	223	223	223	223	2,121		
Punjab	336	156	470	5,076	5,077	5,050	5,050	5,050	4,907	31,172		
Sindh	125	125	125	1,267	2,516	5,109	6,095	3,547	3,216	22,125		
NWFP	1,090	1,640	1,550	1,550	1,550	1,550	1,550	1,000	1,000	12,480		
Balochistan	111	355	355	355	355	355	355	355	1,305	3,901		
Environment	23	555	666	2,662	993	830	12,162	11,826	3,026	32,743	7.1	
Federal	23	23	134	134	111	111	111	111	0	758		
Punjab	0	133	133	133	133	133	11,870	2,077	1,111	15,723		
Sindh	0	133	133	133	133	133	0	9,543	1,670	11,878		
NWFP	0	133	133	1,062	296	220	84	44	114	2,086		
Balochistan	0	133	133	1,200	320	233	97	51	131	2,298		
Supporting	192	192	192	132	132	0	0	0	0	840	0.2	
Federal	192	192	192	132	132	0	0	0	0	840		
Total	23,291	42,238	50,893	55,571	58,101	61,525	67,065	57,758	45,126	461,567	100.0	100
Federal	11,724	29,311	38,626	35,468	35,332	24,098	13,348	9,930	5,319	203,155	44.0	
Punjab	4,827	4,959	3,823	10,558	13,832	24,717	39,570	24,309	20,069	146,664	31.8	57
Sindh	4,330	4,195	4,059	2,802	4,012	8,093	10,128	18,124	10,136	65,879	14.3	25
NWFP	2,145	3,097	2,738	3,838	3,135	2,974	3,025	4,328	7,747	33,027	7.2	13
Balochistan	265	676	1,647	2,905	1,790	1,643	994	1,067	1,855	12,842	2.8	5
Budget	45,403	47,673	50,057	52,559	55,187	57,947	60,844	63,886	67,081	500,637	100.0	
Underspensing	22,112	5,435	-836	-3,012	-2,914	-3,578	-6,221	6,128	21,955	39,070	7.8	

Provincial distribution (%)

Note: Not including storage projects

/1 Cost during MTIP-period 2003-11; this is less than the Total Costs as some projects continue after 2011

Table S.6.3 Potential Private Sector Hydropower Projects (Rs million)

Hydro power projects	MW	EIRR	Code	Year	1	2	3	4	5	6	7	8	Total
Jinnah Hydro	96	10.6	P12P	2,673	2,673	2,673	2,673	0	0	0	0	0	10,691
Malakand III Hydro power	81	12.0	P21P	2,540	2,540	2,540	0	0	0	0	0	0	7,620
Duber Khwar Hydropower	130	11.2	P22F	2,580	2,580	2,580	2,580	0	0	0	0	0	10,320
Allai Khwar Hydropower	121	8.2	P23F	2,580	2,580	2,580	2,580	0	0	0	0	0	10,320
Pehur High Level Hydropower (NWFP)	12	13.3	P24N	254	254	254	0	0	0	0	0	0	762
Golen Gol Hydropower (NWFP)	106	11.5	P25N	1,563	1,563	1,563	1,563	0	0	0	0	0	6,251
Khan Khwar Hydropower (NWFP)	72	5.9	P26N	2,025	2,025	2,025	2,025	0	0	0	0	0	8,100
Neelum Jehlum Hydropower	969	16.2	P30F	2,841	3,066	5,122	4,911	7,381	8,733	3,427	2,790	0	38,272
Abbasian Hydropower (AJK)	245	7.6	P31F	4,270	4,270	4,270	4,270	0	0	0	0	0	17,082
Total	1,832												109,418

Note: These projects could not be ranked as there is insufficient information for the ranking process

