

**Chapter****9****Water Resources Development**

Irrigated agriculture is the backbone of the national economy. The level of agricultural production is directly related to the availability and effective use of water as a major input. The demand for water is increasing rapidly while the opportunities for further development of water resources or maintaining their use to existing levels are diminishing. The current per capita water availability at 1200 m<sup>3</sup>/person is low, with Pakistan in the category of a high water stress country.

The broad goal of development of water resources sector is to uplift the agro-based economy on the national level by maximizing crop production, through progressively increasing surface water supplies and conserving them using the latest available technologies and protecting land and infrastructure from waterlogging and salinity, floods and soil erosion in an integrated manner. The goal also includes catering to the increasing demands for drinking water supplies and for industrial and commercial activities in a cost effective manner.

The key issues that have been addressed in Medium Term development Framework (MTDF) 2005-10 include (a) the absence of a holistic, integrated and sustained approach in water resources management, (b) sub-optimal use and low productivity of water, (c) inadequate storage capacity with water escapages to sea, (d) extensive seepage losses in the irrigation system, (e) inadequate operation and maintenance and poor cost recovery, (f) excessive groundwater pumpage without groundwater recharge (mining of groundwater), (g) absence of measures for rainfall harvesting, (h) unsafe disposal of drainage effluent to the sea, (h) inadequate protection of infrastructure from floods, (i) lack of private sector participation, (j) deteriorating institutional capacities of key water sector institutions, (k) increased poverty in backward irrigated areas, and (l) poor linkage among water, agriculture and rural development projects and related research.

The National Water Policy aims at integrated water resources management and water conservation, high efficiency irrigation systems by farmer's participatory management and gender mainstreaming. The main features of the policy are:

- i) Providing adequate and safe drinking water for all;
- ii) Providing food security for all and feed security for livestock;
- iii) Providing hygienic sanitation facilities for urban and rural population;
- iv) Maintaining water quality and protecting water resources by preventing their pollution;
- v) Treatment and possible reuse of waste water – domestic, agricultural and industrial;
- vi) Restoring and maintaining the health of the environment and ecology;
- vii) Flood management to mitigate floods and minimize flood damages;
- viii) Hydropower development for economic growth;
- ix) Security of benefit streams of the water related infrastructure for sustained provision of services,
- x) Conservation and optimizing water use efficiency.

The water sector strategy centers around three important elements i.e. water augmentation, water conservation and efficient water use. In this context a comprehensive set of measures for the development and management of water resources are to be formulated and effectively implemented. This includes the development of additional medium and large-size reservoirs, integrated resource use, the introduction of water efficient techniques, containment of environmental degradation, institutional strengthening, capacity building and human resource development. The Government has announced three new priority water storage dams i.e. Akohri, Basha including Kala Bagh Dams to be completed upto 2016, in addition to on-going projects such as Mangla Raising, Gomal, Satpara, Kurram Tangi and Sabakzai Dams.

### **Landmarks of MTDF**

During the first two years of Medium Term Development Framework (MTDF), maximum resources were allocated to the Water Sector high priority mega projects especially in dams, canals and on-farm water management projects. Against the MTDF allocation of Rs 91.79 billion for first two years (2005-06 to 2006-07), an amount of Rs127.96 billion (39% higher than the MTDF allocation) has been allocated for water sector development projects during the year 2005-06 to 2006-07. The landmark of the first two years of MTDF are:

- Completion of Mirani dam;
- Substantial completion of Raising of Mangla and Sabakzai dam.
- Improvement of 35,222 watercourses;
- Completion of 43 new minors and remod. of existing 49 minor canals in Balochistan;

Whereas physical progress of RBOD-I, II & III, lining of irrigation channels, Improvement of irrigation infrastructure in Punjab, Sindh, & NWFP remained satisfactory.

### **Review of 2006-07**

The program for 2006-07, the second year of MDTF 2005-2010, focused on the irrigation, drainage and flood control sub-sectors. The maximum resources were allocated to complete the on-going projects and high priority storage and canal projects in an effort to overcome the scarcity of water through augmentation. The overall implementation remained satisfactory and the planned targets were generally achieved, especially in case of dams, canals and improvement of irrigation infrastructure, National Program for watercourse improvement, lining of irrigation channels in Punjab & Sindh, Right Bank Outfall Drain (RBOD-I, II & III) projects. However in some programs/projects, such as the lining of irrigation channels in Sindh and new projects started during 2006-07 in Sindh and NWFP, the achievement was lower than the planned targets due to a variety of implementation problems.

It is expected that the revised financial allocation of Rs 57,050 million for the year 2006-07 would be fully utilized by the end of June 2007. The overall water availability of 16.94 Mhm (137.78 MAF) in 2005-06 is expected to have increased to 16.95 Mhm (137.80 MAF) during 2006-07 against the target of 142.15 MAF (17.48 Mhm)). Out of the total water availability during 2006-07, about 10.76 Mhm (87.48 MAF) was from surface water supplies and 6.21 Mhm (50.32 MAF) from underground water.

Under Irrigation sub-sector, the overall physical progress of fast track (high priority) projects namely Raising of Mangla, Sabakzai, Satpara, Gomal Zam Dam and Kurram Tangi Dams, Greater Thal, Kachhi, Raineer and Extension of Pat Feeder Canals, Lining of irrigation channels and improvement of irrigation infrastructure in Punjab, Sindh and NWFP remained satisfactory in addition to completion of Mirani Dam. An amount of Rs 1,000 million was allocated to Punjab, Sindh and Rs 750 million to NWFP for lining of irrigation channels. Under this program, the planned target in Punjab and NWFP was achieved. However the planned target in Sindh could not be achieved, due to, inter alia, the late and inadequate releases of allocated budget.

Under drainage sub-sector, the progress of RBOD-I, II and III remained satisfactory and it is expected that all three stages would be completed by 2008. During 2006-07, a sum of Rs 5,000 million was allocated to continue the on-going activities of the RBOD-I, II & III, in addition to the allocation of Rs 3,000 million for completion of National Drainage Program (NDP) during the year 2006-07.

The national program for water-course improvement was implemented in 2006-07 to achieve the revised target of 18,000 watercourses in all the four provinces. A sum of Rs 8,500 million was allocated to achieve the planned target.

Under the ADB-assisted Second Flood Sector Project, the outstanding project's liabilities were cleared and the project was completed with the revised budget allocation of Rs 120 million. Under the normal flood protection program, the allocation of Rs 950 million was utilized to complete the priority schemes of all provinces. The sector-wise physical achievements are given in Table 9.1.

**Table 9.1 Key Physical Targets 2006-07 and 2007-08 and Achievements.**

Item	Unit	Targets 2006- 2007	Achievements 2006-2007		Target 2007-08
			Physical	%age	
<b>Irrigation</b>					
a) Water Availability (Cumulative)	Mhm	17.13	16.95	98	18.16
	MAF	138.86	137.80		147.65
b) Earthwork for dams & canals	MCM	84	114	135	80
c) Concrete work for dams & canal	MCM	2.05	1.50	73	13
d) Land Acquisition	Ha	9,320	10,890	116	9,000
<b>Drainage &amp; Reclamation</b>					
a) Disastrous area protected	Mha	0.24	0.10	42	0.24
b) Surface Drains (Earthwork) (Extension, rehab. & remodelling of canals)	MCM	22.14	15.0	68	26
<b>Flood Control Program</b>					
Under Normal Flood Program	No	38	38	100	25
<b>OFWM Program</b>					
Watercourse Improvement	No	12,000	18,000	150	9,000

Source: WAPDA, Provincial Irrigation Departments

MAF: Million Acre Feet, MCM : Million Cubic Meters, Mhm : Million Hectare Meters, Mha : Million hectares

### Program for 2007- 08

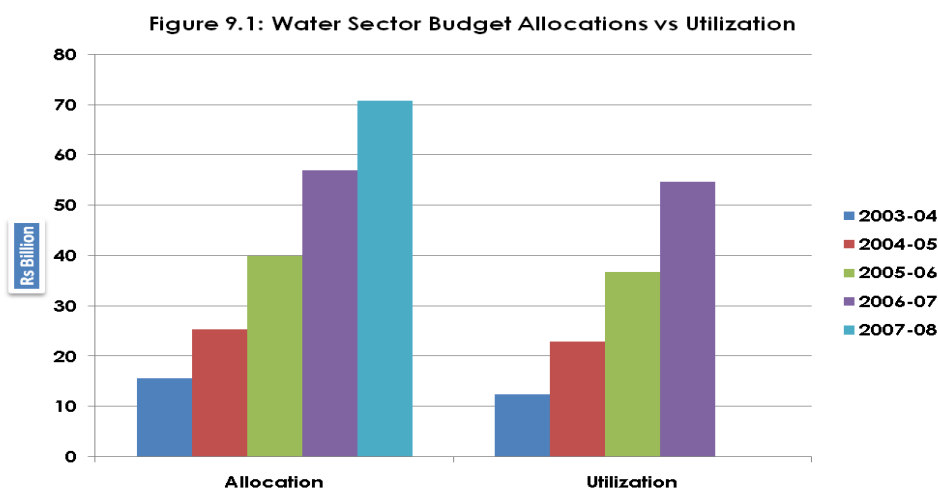
Water Sector has been given the highest priority in the budget allocation for 2007-08 with an allocation of Rs 70.91 billion, which is 24 percent higher than the last year

budget allocation of Rs 57.00 billion. Maximum resources have been given to the timely completion of on-going projects, including water storages and canal. The main strategy adopted in water sector is to achieve the planned target under MTFD. The comparison of the budgetary allocation and utilization for the water sector for the year 2003-04 to 2006-07 is given in Table 9.2.

**Table 9.2 Water Sector Budget Allocation vs Utilization**  
(Rs Billion)

Years	Allocation	Utilization
2003-04	15.728	12.433
2004-05	25.417	22.984
2005-06	40.05	36.829
2006-07	57.05	54.805 (provisional)
2007-08	70.91	-----

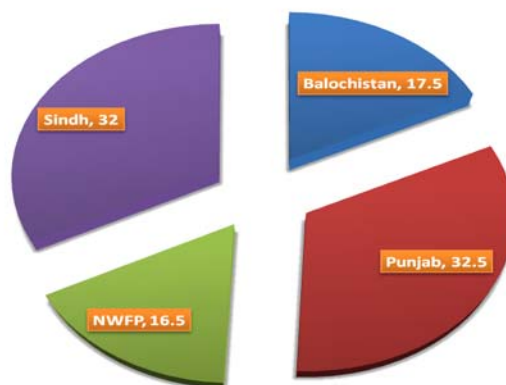
**Source:- WAPDA, Provincial Irrigation Departments**



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Out of total allocation of water sector in PSDP 2007-08, the respective shares of Punjab, Sindh, NWFP and Balochistan stand at 32.5, 32.0, 16.5 and 17.5 percent (Figure 9.2).

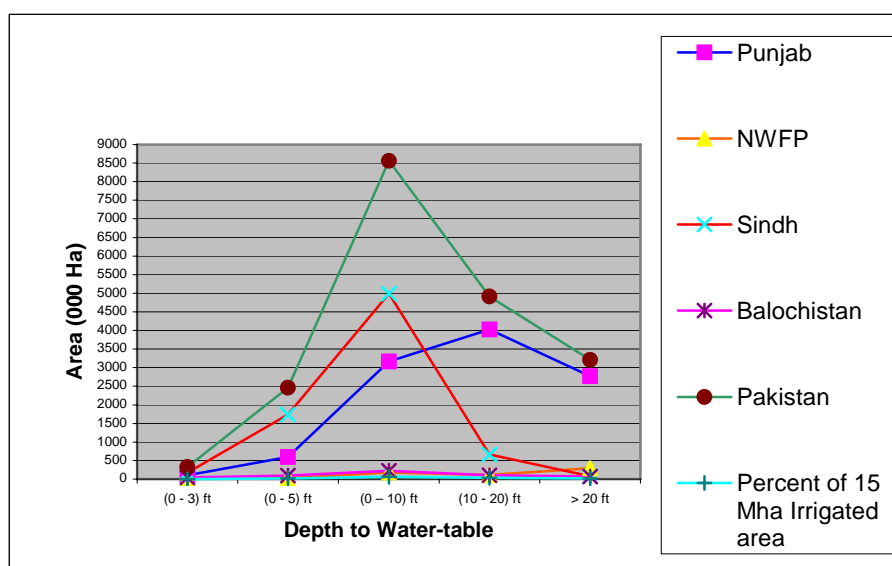
**Figure 9.2 Provincial Share in Federal PSDP 2007-08**



It is expected that the overall water availability will increase from 16.95 Mhm (137.80 MAF) in 2006-07 to about 18.16 Mhm (147.65 MAF) in 2007-08. This would include about 11.97 Mhm (97.33 MAF) from surface water supplies through canal withdrawals, watercourse improvement, canal lining/remodelling, irrigation system rehabilitation program and small irrigation schemes, and the remaining 6.19 Mhm (50.32 MAF) from underground fresh water aquifer mainly by private tubewells. The water availability will be improved through a major emphasis on water conservation measures such as remodelling/rehabilitation/lining of canals and watercourses, and completion of on-going mega projects being implemented on fast track basis.

In the drainage sub-sector and improvement of irrigation infrastructure, in line with the MTFD target, 0.24 Mha of disastrous area is planned to be reclaimed from water logging and salinity through excavation of 26 MCM of earth work for surface drains, 13 McM of concrete canal lining, more than 50 MCM earthwork irrigation infrastructure/system improvement and construction of about 2,000 major /minor structures. The area under various depths to water-Table is shown in figure 9.3.

**Figure 9.3 Area under Various Depths to Watertable (000 Hectares)**



Source: WAPDA

Under National On-Farm Water Management Program, more than 9,000 watercourses will be improved. A sum of Rs 6,000 million has been allocated to this program for the financial year 2007-08.

Under Normal/Emergency Flood schemes, it is planned to spend an amount of Rs 1.80 billion to complete the emergent flood schemes in Pakistan. The main programs/projects to be implemented during 2007-2008 are discussed below:

#### **i) Irrigation**

An amount of Rs 54.14 billion (76 percent of the total water sector's allocation) has been allocated for irrigation projects (dams, canals, lining and improvement of irrigation infrastructure) during 2007-08. Under this sub-sector, ten on-going dams/canals projects (Gomal Zam, Raising of Mangla, Sabakzai, Satpara Dams, Kurram Tangi, Construction of Bolan Dam, Greater Thal, Kachhi, Raineer and Khirthar canals) have been protected for timely completion whereas adequate funds have also been provided for revamping/rehabilitation of irrigation system of Sindh, Punjab and NWFP, Lining of Irrigation Channels in Punjab, Sindh and NWFP and extension of Pat Feeder canal in Balochistan. The major irrigation projects are as under:

#### **Major On-going Projects**

- **Raising of Mangla Dam.** The construction of main dam, land acquisition/compensation, infrastructure development in new city, Dhanghali bridge and works on Bong canal would continue during 2007-08. An amount of Rs 20.00 billion would be utilized for timely completion of these works.
- **Satpara Dam.** The dam would have a storage capacity of 0.045 MAF and would irrigate 19,920 acres of land in Skardu Valley. An amount of Rs 900 million has been provided during 2007-08 to undertake works on irrigation system, main dams, structures, power house and spillway.
- **Sabakzai Dam.** The physical works of main dam has been completed. The development of command area of dam is in progress. A sum of Rs 200 million has been allocated to clear remaining liabilities.
- **Gomal Zam Dam.** An amount of Rs 1.80 billion would be expended during 2007-08 for irrigation and drainage works, Hydropower works and land acquisition of 2700 acres.
- **Greater Thal Canal.** A sum of Rs 2.50 billion has been allocated for 2007-08 for 15 MCM of earthwork, 0.05 MCM of concrete lining, about 1500 acres of land acquisition and construction of 500 structures.
- **Kachhi Canal (Punjab Portion 300 km lined contract No. KC-I to KC-V).** An amount of Rs 8.50 billion has been allocated for land acquisition of 10,000 acres, 16 MCM of earthwork, 0.4 MCM of concrete work and construction of about 200 structures. Phase-I of the project will be completed by December 2008.
- **Raineer Canal.** The total length of canal is 164 km. RC-I, II, III and IV have been completed. Work on RC-IV to RC-VII is in progress. An amount of Rs 2.50 billion has been allocated for construction of 6 Cum of earthwork, 0.70 Cum of concrete

work of main canal and distributaries, construction of about 6,000 minor structures.

- **Revamping/rehabilitation of Irrigation & Drainage System in Sindh.** The project costing Rs 12.96 billion includes strengthening of 8,082 km of canals/drains, silt clearance of 3,635 km of branches, stone pitching of 380 km of canal banks, repair/remodeling of 241 regulators and rehabilitation of 1,596 SCARP tubewells. During 2007-08 a sum of Rs 2.00 billion has been allocated to complete the on-going works.
- **Punjab Irrigation System Rehabilitation Punjab.** The project includes strengthening of 1000 km of canals/drains, earthwork of 198 MCM for silt clearance of branches, stone pitching of canal banks, repair/remodeling of 90 regulators, 50 bridges and rehabilitation/remodeling of 17,500 modules. An amount of Rs 2.70 billion has been allocated for this program for the year 2007-08.
- **Lining of Irrigation Channels in Punjab, Sindh and NWFP.** Lining of irrigation channels in saline zones are being undertaken in three Provinces to save the seepage and other losses. A sum of Rs 3.25 billion has been earmarked to this program for the next fiscal year 2007-08.
- **Extension of Pat Feeder Canal.** A sum of Rs 900 million has been allocated for this projects during 2007-08 for remodeling and remaining extension works.
- **Lower Indus Right Bank Irrigation & Drainage Project (RBOD-I).** The project has been revised at a cost of Rs 14.71 billion. The main components of the project include extension/widening of RBOD-I, rehabilitation of Miro Khan and Rehabilitation of Shahdad Kot. An amount of Rs 1.90 billion has been allocated to complete the on going works.
- **Right Bank Outfall Drain from Sehwan to Sea (RBOD-II).** The revised project, costing Rs 29.00 billion, has been approved. It includes construction of 273 km of drains for disposal of 3,525 cusecs of drainage effluent into sea. The project has been delayed by two years. About 14.49 MCM of earthwork and 0.60 MCM of stonework for the main drain and construction of 125 structures are expected to have been completed by June 2008. An amount of Rs 4.60 billion has been earmarked during 2007-08 to complete the on-going contracts.
- **Balochistan Effluent Disposal into RBOD (RBOD-III).** During 2007-08, an amount of Rs 800 million has been earmarked for earthwork of 2.0 MCM, construction of 71 structures and land acquisition of about 200 ha.

## ii) Conservation and Efficient use of Water

The OFWM program aims at reducing conveyance losses and field losses by improving watercourses, precision land leveling and organization of water user associations and establishing demonstration plots. In addition, water storage tanks are to be constructed and lifting devices installed on streams so as to provide irrigation water to barani agricultural land. The watercourse improvement would be accelerated to save water, minimize water loss and alleviate poverty. The remaining 86,500 water-courses have been proposed to be improved during the MTFDF resulting in saving of about 8 MAF of water. A sum of Rs 6.00 billion has been made to meet the target of improvement of

9,000 watercourses under the National On-Farm Water Management program costing Rs 66.40 billion (Federal share Rs 50.65 billion).

A new initiative costing Rs 18.53 billion is being launched on efficient use of water at farmland to enhance farm irrigation efficiency from 60 to 80 percent within an allocation of Rs 1.250 billion by encouraging farmers to use modern trickle and sprinkler irrigation.

### iii) Flood Protection Program

The flood control works are being undertaken under Normal/Emergent Flood Works, whereas, Second Flood Sector Project and Improvement in the Flood Forecasting System for Lai Nullai have been already completed. An amount of Rs 1.80 billion has been allocated for the on-going Normal/Emergent Flood program during 2007-08.

### iv) Survey, Investigation and Research

Survey, Investigation and Research is a continuing program being carried out by WAPDA. During 2007-2008, the work will continue on a number of important schemes such as International Waterlogging & Salinity Research Institute, Mona Reclamation & Experimental Project, Lower Indus Water Management & Reclamation Research Project, WAPDA's engineering studies for small dams (Hingol, Naulong, Winder, Sukleji dams), feasibility study for construction of new small dams in Balochistan & NWFP, Hydrological Investigation in Noshera, Land & water Monitoring of Indus Plains and feasibility study on causes for waterlogging and remedial measures along C.J Link Canal, Adopting measures to control rising water table at PAF base and Master Planning study for integrated development for Chitral, Swat and Kabul rivers. A sum of Rs 274 million has been allocated for this program during 2007-08.

### Presently Irrigated Areas and Proposed Water Projects (Figure-I)

