WAPDA
ANNUAL REPORT 2012-2013

Pakistan Water and Power Development Authority

www.wapda.gov.pk

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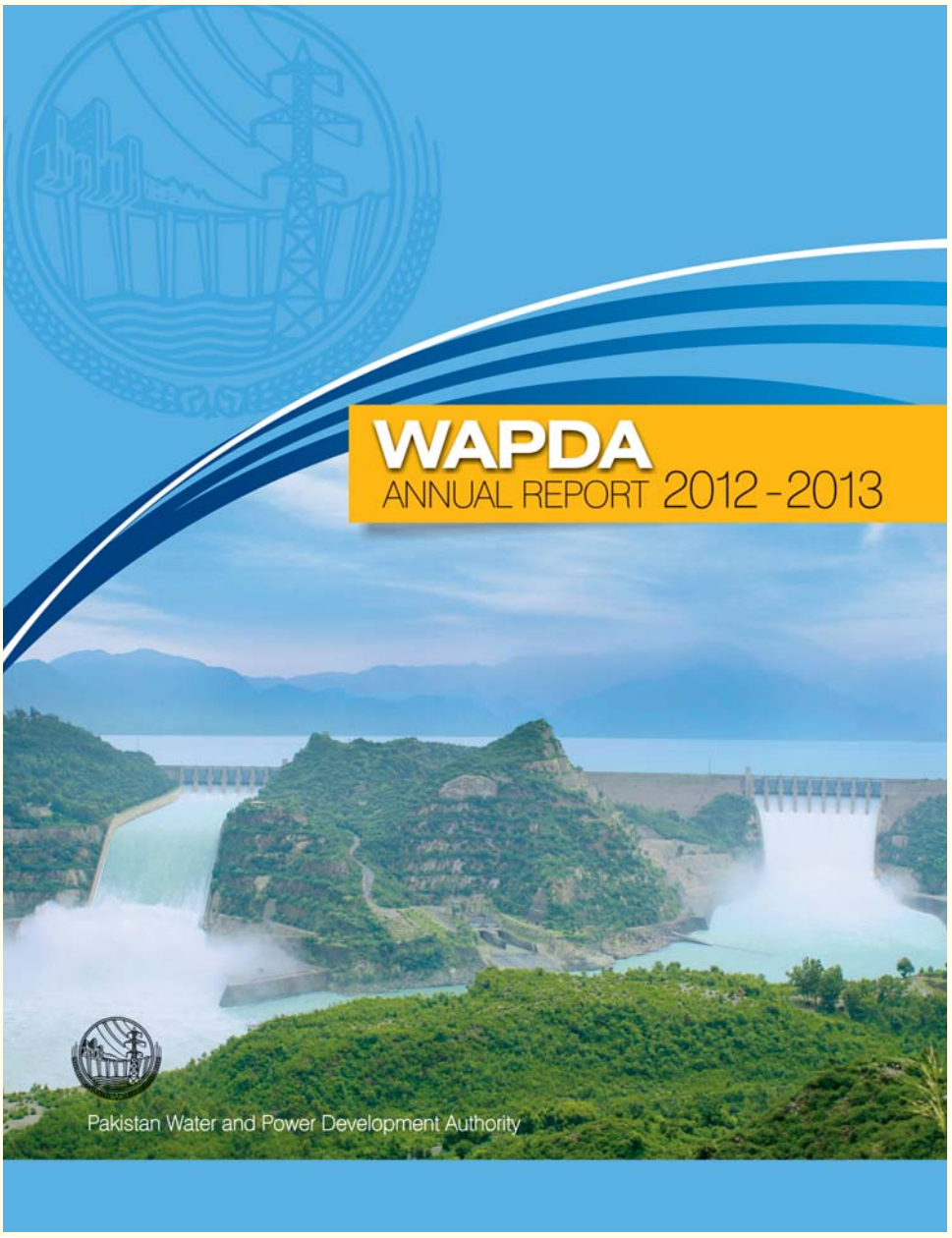

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Authority
as on June 30, 2013

Syed Raghib Abbas Shah
Chairman

Hasnain Afzal
Acting Member (Water)

Member & M.D. (Water)

- CEO (NJHPC)
- GM (C&M) Water
- GM (Hydro Planning)
- GM/PD (NJHPC)
- GM TDP Tarbela
- GM Ghazi Brotha
- GM (P&D)
- GM (M&S)
- GM (Central) Water
- GM (Basha Dam)
- GM (CDO) Water
- GM (Projects) North
- GM (Projects) South
- GM (Projects) NA
- GM (TS)
- GM (LA&R)
- GM (Fin.) Water

Rizwan Ahmed
Acting Member (Power)

Member & M.D. (Power)

- GM (Coord.)
- GM Hydel (Operation)
- GM Hydel (Development)
- GM (Finance) Power
- GM (Training)
- GM/PD (UET) Faisalabad
- Principal (WSC) Islamabad

Syed Nazakat Ali Shah
Acting Member (Finance)

Member Finance

- GM (Fin.) Coord.
- GM (I&P)
- GM (CCC)
- Chief Auditor

Muhammad Imtiaz Tajwar
Secretary WAPDA

Acknowledgement

Pakistan Water & Power Development Authority (WAPDA) a federal autonomous body came into existence through an Act of Parliament in 1958. WAPDA Authority comprises of a Chairman, three Members (Water, Power & Finance) and a Secretary. The Government of Pakistan had assigned to WAPDA the responsibility for optimal utilization of water & power resources in the country. Simultaneously it was also given the task of Planning of hydel generation, designing, construction and installation of transmission and distribution lines (500KV, 220KV, 66KV and 11KV Feeders) except in areas of Karachi & AJ&K. In 2007, WAPDA through an Ordinance was bifurcated into two entities i.e. WAPDA and PEPCO. The functions of hydropower, generation and operation maintenance of power houses remained with WAPDA whereas the power wing i.e. DISCOs, GENCOs and NTDC were placed at the disposal of PEPCO.

In accordance with Section 21(I) of WAPDA Act 1958, an Annual Report on the development of water & power resources is prepared and submitted to the Government of Pakistan.

In this regard, the detail of all activities, being undertaken beside a comprehensive programme of development of water & hydropower projects (Vision-2025) being executed on behalf of Government of Pakistan has been elaborated in the subsequent pages. The feasibility studies, detailed engineering design for different mega, medium and small hydel projects and dams with the generation capacity of 25000 MW either have been completed or at an advance stage of finalization. The portfolio of small/medium dams has also been prepared for the prosperity and development of remote, barren and under developed areas of the country.

WAPDA has chalked out a detailed programme for the construction of five multi dimensional water storages dams during the next ten years to cater for the requirements of water shortage and to provide cheap electricity. WAPDA Authority appreciates the collaborated efforts and collective wisdom and support, provided by various organizations and other agencies of Provincial/Federal Governments as well as the donor agencies i.e. IDB, World Bank, ADB, AFD, KfW, CIDA, Kuwait Fund, Chinese Govt., China Exim Bank, Korean Investment Bank, OPEC, SFD, USAID etc. In the current scenario and in view of the difficulties faced by the population due to shortage of electricity, WAPDA is determined to face the development planning challenges as detailed below:

Improvement in Operational Efficiency

WAPDA Hydel Power Stations produced 28,206 million KWh net energy during the FY 2012-13 which is 32% of the total hydel/thermal generation mix of the power system. The preventive maintenance of generating units was properly carried out to ensure high availability and reliability of cheap hydropower.

WAPDA has also taken in hand rehabilitation of its old existing hydel power stations to ensure more reliable and sustainable operation of these cheap sources of power generation. Rehabilitation of 22 MW Jabban Hydroelectric Power Station is nearing completion. Detailed design for the upgradation and refurbishment of Mangla Power Station has been completed, the scheme envisages enhancement of total installed capacity of the power station from 1000 MW to 1310 MW through optimum utilization of additional water and higher head available after completion of Mangla Dam Raising Project. USAID has committed to provide a grant of US $ 150 million for upgradation of units 5+6 and other miscellaneous works in the first stage, out of which US $ 72 million has been provided yet.

Feasibility study and detailed design for rehabilitation, upgradation and modernization of Warsak Power Station has been completed which will ensure the running of the plant at its full capacity of 243 MW for another life cycle of 35 to 40 years. The implementation of project will start soon after the required financing is arranged.

Planning work for upgradation of Renala and Chitral Hydel Power Stations is under progress which envisages enhancing their capacity from 01 MW to

04 MW and 01 MW to 05 MW respectively. Besides, special repair and maintenance of Tarbela Power Station is also being carried out under FARA / USAID.

Revival of WAPDA as a Development Organization

WAPDA has embarked on the implementation of Vision-2025 Programme under which a comprehensive & integrated approach for development of water resources and hydro power projects would be undertaken to give a boost to the economy of the country. This will also revive WAPDA's primary developmental role as laid down in WAPDA's charter of duties.

In the first phase of the programme the development work was initiated on four (04) canals, five (05) dams and five (05) hydropower projects. Out of which three (03) dams (Mirani, Sabakzai & Mangla Raising) and 01canal (Greater Thal) have been completed. The construction works on remaining projects is at advance stages of completion. In addition to these projects, WAPDA has initiated the construction work on Darawat Dam, Nai Gaj Dam, Ghabbir Dam, Noulong Dam, Neelum Jhelum Hydropower Project and Golen Gol Hydropower Project respectively.

Detailed engineering design & tender documents of Keyal Khwar (122 MW) has been completed while detailed engineering & tender document of Bunji (7100 MW), Dasu (4320 MW), Mohmand Dam (740 MW) and Phandar (80 MW) hydropower projects is in progress. Feasibility studies of Lower Palas Valley (665 MW), Lower Spat Gah (496 MW), Harpo (34.5 MW), Basho (40 MW) has been completed while feasibility study of Pattan (2800 MW), Thahkot (2800 MW), Dudhnial Multi-Purpose Dam Project (960 MW), Trappi Multi-Purpose Dam Project (30 MW) and Tangir (20 MW) Hydropower Project are in progress.

The construction of Neelum Jhelum Hydropower Project (969 MW) is in progress. The work on excavation of tunnels has been speeded up due to the installation of tunnel boring machines which will ensure completion of this project in 2015-16 thus making available cheap hydropower of 969 MW with total annual energy generation of over five (05) billion units. The construction activities on Golen Gol Hydropower Projects (106 MW) and Duber Khwar (130 MW) are near completion. The new hydropower projects Allai Khwar (121 MW) and Jinnah (96 MW) have started functioning.

To meet the ever increasing water demands of the agriculture sector of Pakistan, WAPDA is working on various Water Sector Projects which includes resettlement works of Mangla Dam Raising (additional 2.88 MAF Storage and 120 MW electricity). Mangla Dam Raising Project and Dhan Gali Bridge under the same project were inaugurated on 13th October, 2011 whereas the construction work on Gomal Zam Dam (0.892 MAF live storage and 17.4 MW) was completed and inaugurated on 12.09.2013 by Kh.Muhammad Asif, Minister for Water & Power and American Ambassador jointly. Furthermore, the construction work on Satpara Dam (0.053 MAF live storage and 17.3 MW), Darawat Dam (0.120 MAF live storage), Nai Gaj Dam (0.30 MAF live storage) and Kurram Tangi Dam (0.90 MAF live storage and 83.4 MW) is in progress. The Mirani Dam (0.152 MAF live storage) and Sabakzai Dam (0.0147 MAF live storage) have been completed and are in operation. Recently, Sabakzai Dam has been handed over to govt. of Balochistan in June, 2010. Irrigation projects of Rainee Canal (Phase-I) & Kachhi Canal (Phase-I) are under implementation whereas the Phase-1 of Greater Thal Canal has successfully been completed and handed over the Punjab Irrigation and Power Department.

WAPDA has also initiated activities on drainage projects. Right Bank Outfall Drain (RBOD-I) located in Shikarpur, Dadu and Larkana Districts in Sindh Province, this will increase agriculture production in an area of 1,141,209 acres. Right Bank Outfall Drain (RBOD-III) located in Nasirabad, Jaffarabad districts of Balochistan and Jacobabad & Shahdadkot districts of Sindh will positively impact agriculture production over an area of 709,536 acres.

To meet with the future requirements, WAPDA is working on studies of various new projects; namely

Munda Dam (740 MW & 0.67 MAF live storage) and Chashma Right Bank Canal (Lift Cum Gravity). Feasibility study of Akhori Dam (600 MW & 6.0 MAF live storage) was completed and PC-II submitted for approval. WAPDA and AFD (Finance) has signed an agreement for detailed engineering design of Munda Dam, wherein AFD (France) has allocated US$ 10 million for execution. The feasibility study and detailed engineering design of Diamer Basha Dam (4500 MW & 6.4 MAF) has been completed. The infrastructure constructions work of Diamer Basha Dam has been awarded and main work is planned to be awarded during year 2014. Demarcation of land for Kurram Tangi Dam is under process.

To meet with the future requirements, WAPDA is working on studies of various projects; namely Munda Dam (740 MW & 0.67 MAF live storage) and Chashma Right Bank Canal (Lift Cum Gravity). Feasibility study of Akhori Dam (600 MW & 6.0 MAF live storage) was completed and PC-II submitted for approval in 2006. The feasibility study and detailed engineering design of Diamer Basha Dam (4500 MW & 6.4 MAF) has been completed. The infrastructure constructions work of Diamer Basha Dam has been awarded and the main work contract is planned to be awarded during year 2014. Demarcation of land for Kurram Tangi Dam is under process.

WAPDA has signed four projects for seeking Carbon Credits, namely Duber Khwar, Allai Khwar, Golen Gol and Jinnah Hydropower Projects respectively. These projects will be ranked first in the country to make efforts for reduction in Global Warming, besides setting an example for others. In addition to this, special research has been initiated on glacial monitoring in the wake of Global Warming and future strategy to store/conserve the additional water from melting of glaciers.

WAPDA has taken up lining of Muzaffargarh canal to control water logging due to Muzaffargar & T.P Link canal. WAPDA has also carried out a detailed study of a pilot project on lining of main canals (Dadu, Rice Rohri at Upper reach). Besides this for the treatment of RBOD drainage effluent, a plant of 40 Cusec has been installed during 2011. For making Manchar Lake pollution free two options are under consideration which includes:

(i) Installation of five purified Water Treatment Plants on Manchar Lake.

(ii) Completion of RBOD-II by government of Sindh for the diversion of RBOD-III waters through RBOD-II to the Arabian Sea.

WAPDA submitted a PC-I for installation of Pilot Treatment Plant along RBOD System at a cost of Rs. 3.353 billion to ECNEC for approval. Efforts of WAPDA for providing pollution free water at Manchar Lake have been appreciated by the Supreme Court of Pakistan.

WAPDA has actively participated in the strategic dialogue on Water with the United States Government, wherein emphasis has focused on the introduction of reforms of the full Water Sector. Besides this USAID has also provided special assistance for the rehabilitation of Tarbela Power House Unit 1,3,4 and construction of Gomal Zam & Satpara Dams, respectively. WAPDA has signed agreement with USAID for construction of Waran Canal under Gomal Zam Dam Project. In addition, WAPDA has signed MOU with IWHR China and M/s Three Gorges China Company for the capacity building & training of WAPDA staff. WAPDA has also initiated work on Inland Waterways Transportation System. WAPDA is also doing studies on the potential of storing water in underground shells during floods and near hill Torrents.

WAPDA Sports Board was established in 1960 for promotion of sports in WAPDA with the ultimate goal of increasing the organizations participation at the national level. It obtained affiliation with the Pakistan Olympic Association in 1984. WAPDA has shown noteworthy achievements in the field of sports by wining 137 medals (Gold, Bronze and Silver) in the National Games.

A Scheme named as "WAPDA Endowment Fund for Sports" has been launched by WAPDA in 2010 to provide a regular source of financing for provision of sports and education facilities to our youth together with an ultimate aim to enhance the medal tally of Pakistan in International competitions. 73 youngsters enrolled in this scheme are being paid education stipend and diet allowances. WAPDA earnest endeavors are reflective of its commitment to support the national economy and help in poverty alleviation through improved hydel thermal mix of power generation, provision of electricity at affordable rates and above all perspective planning and timely execution of projects to meet water and power demands of the growing population.

(Syed Khalid Akhlaq Gillani)
Secretary WAPDA

Foreword

In line with statutory requirement of WAPDA Act 1958, Public Relations Division is pleased to present the 55th issue of Annual Report of the Pakistan Water and Power Development Authority. The Report lists the details of water and hydropower projects WAPDA is currently working on and mentions the progress it has made on each project. It also spells out the details of the upcoming projects in the water and hydropower sectors.

Timely completion of these projects is of immense importance to meet the growing water and electricity demands for fast-paced socio-economic and industrial development of the country. In addition to developing water storage capacity for agriculture, WAPDA is also committed to inexpensive, affordable and environment-friendly hydropower generation and working zealously for the purpose.

While working on the Annual Report, every care has been taken to present authentic, credible information of the projects and accurate account of WAPDA's achievements. We believe that authenticity and accuracy are the foundation-stone on which edifice of a good and reliable report is erected.

In order to facilitate the readers, charts, tables and illustrations have been incorporated in the Report to enable them to develop their understanding of a wide range of activities and immense scope of functions documented in this issue.

The Editorial Board has kept the material to the basic minimum for the sake of clarity and brevity. Necessary background information and details that are a must to form holistic view of subject have been added and every extra detail has been purposely left out.

It is hoped that the Annual Report at hand will be of tremendous benefit not only to policy makers, researchers, academicians and general readers but also to all those associated with relevant disciplines.

The stupendous task of compiling and releasing this Annual Report will not have been accomplished without cooperation of various WAPDA formations. The Editorial Board would like to place its appreciation on record for all of them.

Despite every possible effort to produce a comprehensive and valuable document, the room for improvement still remains. We look forward to valuable comments of readers, as these comments always help in bringing about improvements.

(Muhammad Abid Rana)
Executive Editor

WAPDA in 2012-13

Overview

An overview of the performance of WAPDA including its operational and developmental activities during the year ending June 30, 2013 is as under:

Water Wing

The projects completed by Water Wing under Indus Basin Settlement Plan and those with WAPDA for operation and maintenance purpose kept functioning satisfactorily.

Irrigation releases from three reservoirs – Tarbela, Mangla and Chashma – registered constant trend. In aggregate, 14.66 million acre feet of water was released from these reservoirs corresponding to irrigation indents, in the fiscal year 2012-13.

The work initiated in the preceding years for water resource development gained momentum. Under"the Water Resources and Hydropower Developement Programme – Vision 2025". Mangla Dam Raising Project, Jinnah Hydropower Project and Satpara Dam were substantially completed. Work on Gomal Zam Dam, Rainee Canal and Kachhi Canal continued while construction work on two drainage projects, namely RBOD-I and RBOD-III progressed satisfactorily.

Preparatory works to initiate construction of Diamer-Basha Dam, the largest-ever project in the history of Pakistan, also continued. The construction work on 12 contracts for WAPDA offices, colonies, contractors camps, model villages for affectees, roads and infrastructure in the project area is progressing at a good pace. The process to acquire land is also continuing.

In addition to above-mentioned projects, WAPDA is also working on 32 small/medium dams in the country. In Phase-I, construction of 12 small/medium dams including, Naulong, Winder, Hingol, Pelar & Garuk in Balochistan, Bara, Daraban Zam & Tank Zam in Khyber Pakhtunkhwa, Darawat & Nai Gaj in Sindh and Ghabir & Papin Dam in Punjab is being carried out. Dam body of Darawat Dam Project is complete while irrigation system of the project is nearing completion. Likewise, construction work on Nai Gaj is in progress.

Special studies/researches have been initiated on global warming system and management of additional water, due to melting of glaciers.

Power Wing

Operation and maintenance of the existing hydropower stations were carried out efficiently in the fiscal year 2012-13. WAPDA hydel power stations generated as many as 29,554 GWh during the year under report.

The 121 MW Allai Khwar Hydropower Project was completed during 2012-13. The work on various hydropower projects, including Duber Khwar, Keyal Khwar hydropower projects, Jabban Hydropower Project, Neelum-Jhelum Hydroelectric Power Project, Golen Gol Hydropower Project remained in progress while 4500 MW Diamer Basha Dam Project is ready for construction. WAPDA also carried out feasibility studies and detailed engineering designs of various hydropower projects generation including 1410 MW Tarbela 4th Extension, 7100 MW Bunji, 4320 MW Dasu, 83 MW Kurram Tangi and 740 MW Mohmand Dam.

Besides planning and constructing new hydropower projects, rehabilitation of Tarbela Power Station has also been undertaken. WAPDA is also planning to take up rehabilitation of Warsak, Mangla and Renala Hydel Power Stations for their reliable operation.

PERFORMANCE AT A GLANCE 2012 - 13

SECTOR	SUBJECT	2012 - 2013 (Million Rs.)
Water	Public Sector Development Programme (PSDP)	22,708.532
Power	Total Capital Expenditure during the Financial Year Sources of Funds Self Financing 40,648.794 Cash Development Loan 2,747.794 Foreign Loans 11,785.491 TOTAL 55,182.079	55,182.079
WATER	Water Releases from Reservoirs (Million Acre Feet) Mangla Tarbela Chashma	 4.47 7.99 2.20
	Total	14.66
Power	Installed Generating Capacity (MW)	6,733 MW
	Hydel Generation (GWh)	29,554 GWh

The Authority

WAPDA Charter
Human Resources
Authority Fund

WAPDA House, Lahore

Authority

WAPDA Charter

The Pakistan Water and Power Development Authority (WAPDA) was established through an act of parliament in February, 1958 for integrated and rapid development and maintenance of water and power resources of the Country. This includes controlling soil salinity and water logging to rehabilitate the affected land in order to strengthen the predominantly agricultural economy of the country.

As per the charter, amended in March, 1959 to transfer the existing electricity departments from the federating units to it, WAPDA has been assigned the duties of investigation, planning and execution of projects and schemes for:

- Generation, Transmission and distribution of power,
- Irrigation, water supply and drainage,
- Prevention of water logging and reclamation of saline land,
- Flood control and
- Inland navigation.

Under the later on developments, vis-à-vis the "Energy Policy 1994", setting up of thermal power generation projects was shifted to the private sector. Similarly, as a result of restructuring of the Power Wing, the utility part was corporatised into independent companies. This shift from convergence to divergence gave birth to 14 entities to operate in different zones. These are National Transmission and Dispatch Company (NTDC), four thermal power generation companies (GENCOs) and nine distribution companies (DISCOs). The present status of these companies is of corporate public limited entities under. The residual Power Wing is therefore now responsible for major hydro-electric power projects and schemes in operation.

Human Resources

The Authority comprises of a Chairman and three members, each heading Water, Power and Finance wing.

The Members oversee the affairs of their respective wings through General Managers for the streamlined operations in their respective areas.

During past 55 years of its operations, WAPDA has

developed its human resource as a reservoir of knowledge, competence and expertise through training and experience gained at the accomplished projects and remaining associated with diversified development activities. These include professionals, specialists, scientists, economists, administrators, accountants and skilled workers for planning, building, managing and operating various projects.

Water Wing

Member (Water) controls the water wing, which is divided into North, Central, South and Northern Areas zones. These zones cover, in general, Khyber Pakhtunkhwa (KPK), Punjab, Sindh and Balochistan and Northern Areas respectively. The activity of water wing involves execution of surface and sub-surface water development and drainage-Salinity Control and Reclamation Projects (SCARPs). Chief Engineers and Project Directors at various levels are responsible for effective and timely implementation of Water Wing Projects. Financial affairs of this wing are looked after by GM Finance (Water).

Power Wing

Member (Power) controls the Power Wing, through General Managers and Chief Engineers in the field of hydro-electric power, coordination and WAPDA Power Privatization Organization.

WAPDA has an elaborate setup headed by a General Manager for training of its officers and officials at different levels covering all the wings of the organization. Financial affairs of this wing are looked after by GM Finance (Power).

Finance

Member (Finance) is responsible for the functioning of the departments of Finance, Budget and Coordination and Internal Audit headed by GM Insurance and pension, Director General Finance (B&C) and Chief Auditor (Internal Audit) respectively. He also exercises administrative control over General Manager (Central Contracts Cell), and Director Public Relations in respect of financial matters.

Managing Director (Admn) is vested with the responsibility for overall administration and services.

Secretary WAPDA in addition to looking after day-to-day affairs of the Secretariat, prepares minutes of the Authority's meetings, maintains records of its decisions and issues its directives and coordinates among the three Wings besides monitoring and implementation of Authority's decisions.

Authority Fund

The Authority Fund consists of the following:

- Loans and grants obtained from the federal and provincial governments
- Proceeds of WAPDA Bonds/ SUKUK/TFCs
- Loans obtained by the Authority with general sanctions of the government
- Foreign aids and loans obtained from International Loan giving Agencies on such terms and conditions as may be approved by the government
- Sale of power
- All other sums received by the Authority

The Government of Pakistan assign highest priority to construction of Water Reservoirs (Dams) and Conveyance Channels (Canals) for harnessing the potential of available land and water resources for socio-economic uplift of the country. Further, Water Wing WAPDA has been entrusted with planning, designing and execution of Water Resources Development Projects in sub-sector of Irrigation, Drainage and Hydropower. Accordingly, funds as Grants through Development Expenditure Budget of Water & Power Division are being provided under Public Sector Development Programme for Dams/Reservoirs, Canals and Engineering Studies. The Cash Development Loan allocated for Drainage Projects which are re-payable by the Provincial Governments on transfer of the infrastructure built, whereas the Foreign Loans to Water Sector Projects are on lent to Provinces for amortization. For upkeep of Khanpur and Hub Dam Projects, budget cover is earmarked under Interest Free Loan of the Finance Division, while for O&M of CRBC, the Government of Punjab and Khyber Pakhtunkhawa is to provide funds as per agreed formula.

WAPDA has so far completed 15 Water Storage Dams and 4 Canal Projects (CRBC, Pat Feeder Canal, Mardan Canal and Pehur High Level Canal) with an expenditure of Rs. 11,722 million and Rs. 32,735 million respectively while executed 71

Drainage and Reclamation Projects at a total cost of Rs. 62,669 million. Moreover, an amount of Rs. 8,035 million has also been booked on Investigation/ Research and Monitoring Schemes, whereas expenditure of Rs. 19,742 million relates to Indus Basin Projects (IBP) executed works, through Water Sector Development Budget.

Currently, Water Wing is engaged on a programme which includes 11 Dams (including 7 No. Medium Irrigation Dams) and 5 Canals of national importance aiming at to bring green revolution in the country with progressive expenditure of Rs. 181,380 million on June, 2013. Further, an investment of Rs. 20,429 million stands made in Drainage Sector i.e. RBOD-I and RBOD-III including Rehabilitation/Re-construction of Flood Damages-2010 while expenditure for a sum of Rs. 3,947 million has been recorded uptill now on On-going Investigation/ Research and Engineering Studies & Recurrent Schemes. The upkeep and maintenance of Khanpur Dam, Hub Dam Projects and CRBC has also been carried out against designated sources besides internal funding.

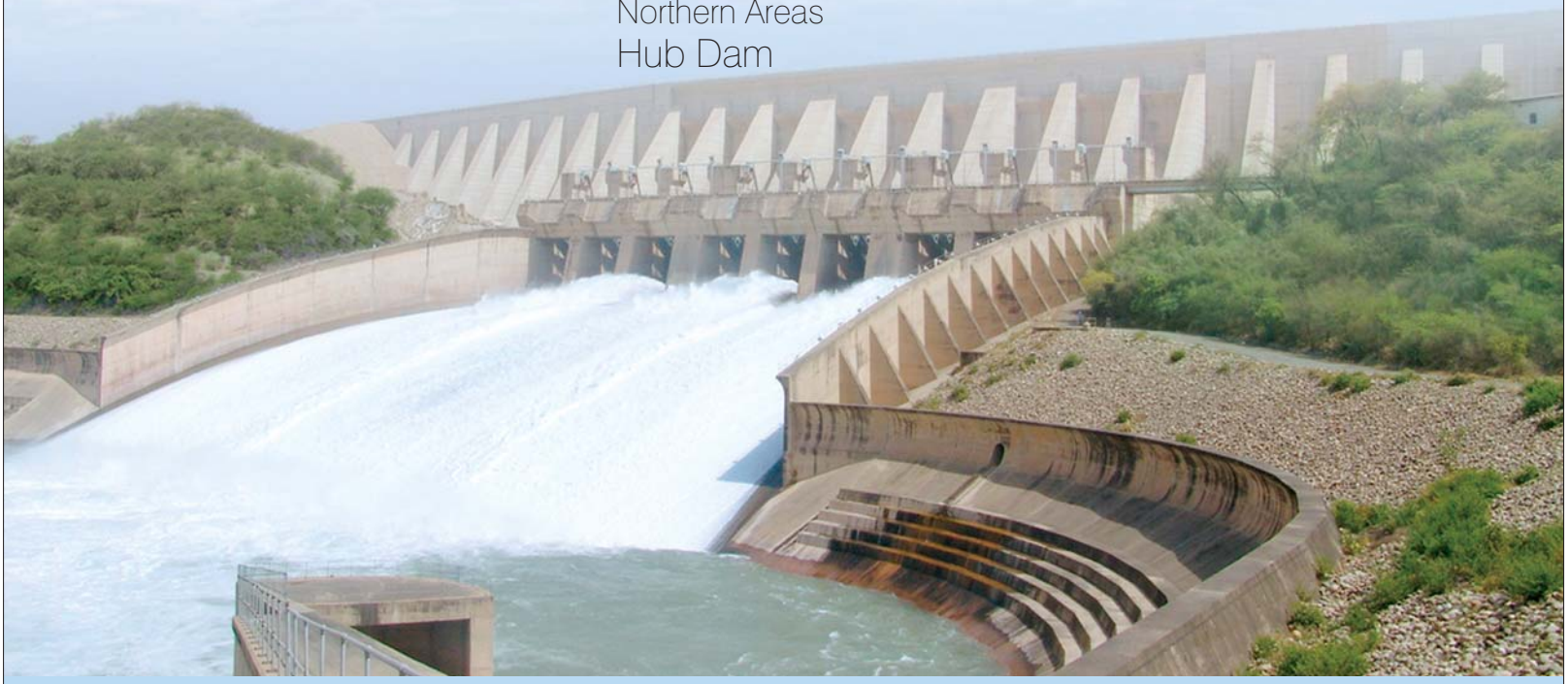
The major work activities executed during 2012-13 relate to Mangla Dam Raising Project (Resettlement Works) Gomal Zam Dam, Satpara Dam, Nai Gaj Dam, Darawat Dam, Rainee Canal, Kachhi Canal Projects. Engineering Studies including consultancy cost of Munda Dam & Hingol Dam Projects were also remained underway. USAID funding for Gomal Zam Dam and Satpara Dam project amounting to Rs. 4,931 million and Rs. 1,926 million respectively has been received as part of Fixed Amount Reimbursement Agreement (FARA). Construction of Medium Irrigation Dams has been started in the province of Baluchistan, Sindh and Punjab. At Greater Thal Canal winding up remained in progress. Raising of Mangla Dam is also heading towards completion as impounding has been started in the current monsoon.

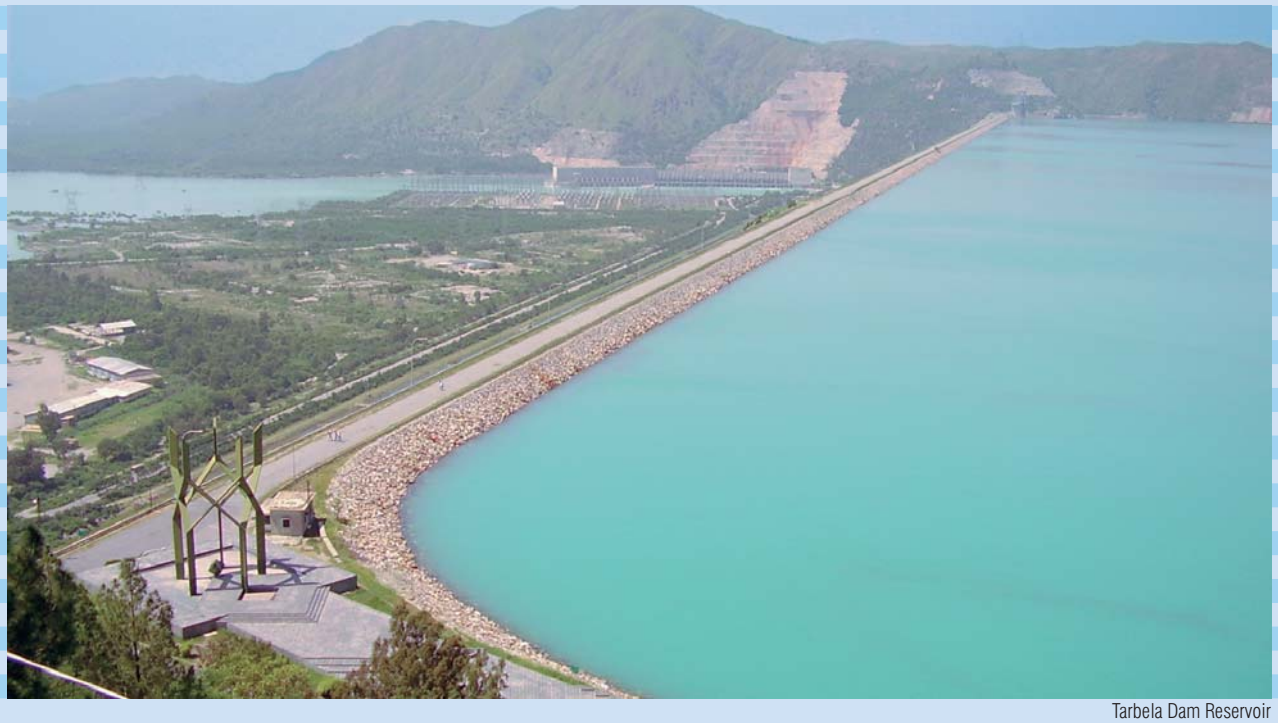
Further, various hydroelectric power projects located in KPK i.e. Khan Khwar (72 MW), Allai Khwar (121 MW) and Duber Khwar (130 MW); required considerable financing which was contributed in particular case financed by Islamic Development Bank and through SUKUK Bond Issues of Rs.16 billion in two tranche i.e. 8 billion each through SPV (SUKUK companies 1 & 2).

The above financing mechanism comforts the Khwar projects for completion and provides 323 MW to national grid as cheap source of electricity to the nation.

Water Wing

Water Development
Indus Basin Settlement Plan
Tarbela Dam
Ghazi Barotha Hydropower Project (GBHP)
Chashma Hydel Power Station
Mangla Dam Raising Project
Diamer Basha Dam Project
Land Acquisition & Resettlement
Technical Services Division
Planning and Design
Centeral Design Office (Water)
Hydro Planning Organization (HPO)
Neelum-Jhelum Hydroelectric Project
Water Divisions
Central
South
North
Northern Areas
Hub Dam





Tarbela Dam Reservoir

Water Development

Pakistan is graciously bestowed with a bounty of water resource. The snow-clad peaks of the mountain ranges, in the North, generate the fortune. The descending snow-melt and monsoon water flow into the country's largest Indus River and its tributaries.

Passing through the plateau and the plain, across the Indus Valley, the rivers embrace the Arabian Sea, in the South.

Irrigated agriculture being backbone of the country's economy, the sector is the major use of water, consumption to continue to dominate water requirements. About 106 Million Acre Feet (MAF) out of 157 MAF of surface water is being, annually, diverted to the Indus Basin Irrigation System. This is around a century old world's largest man-made canal system. This provides irrigation facilities to 365 million acres. The country has a large cultivable land base of 77 million acres. Hence, the irrigated land base at present corresponds to 465 per cent of the total cultivable area. Around 48 MAF is pumped from ground water. Direct rainfall contributes less than 15 per cent of the water supplied to crops.

With increasing population, Pakistan is fast heading towards a situation of water shortage. Per capita surface water availability, which was 5,560 cubic meters in 1951, had reduced to 1400 cubic meters in 2000. The country would have reached the stage of "Water starvation" by year 2012. This calls for rapid development of additional water resource to bring the potential over 22 million acres of virgin land under plough. In the face of existing three storages (Tarbela, Mangla and Chashma) rapidly losing their capacities due to excessive sediment, 5.8 MAF or 34 percent to lose by year 2010, more water storages for timely and adequate irrigation releases to maximize crop production has become all the more important.

WAPDA's role in the field of arresting water logging and salinity aims at the life-saving action for Pakistan's agriculture which remains backbone of the national economy. During past 55 years, WAPDA has executed Salinity Control and Reclamation Projects (SCARPs) covering million acres of the affected land to put the waterlogged and saline acreage back into production.

This section of the Annual Report covers achievements of the following organizations through which WAPDA's Water Wing operates:-

- Indus Basin Settlement Plan
  Mangla Dam
  Chashma Barrage
  Tarbela Dam
- Ghazi Barotha Hydropower Project
- Planning and Design
- National Drainage Programme (NDP)/Water Central
- Water (North)
- Water (South)
- Technical Services
- Water (Northern Areas)

SALIENT FEATURES OF COMPLETED PROJECTS

Project	Cost Rs. (Million)	Technical Data	Objectives
Chablat Kas Lift Irrigation Scheme completed in 1961	0.40	Pumping Water from Chablat Kas near Hassan Abdal involving lift of about 90 ft.	Provision of irrigation facilities for 1,400 acres
Rawal Dam Completedin 1962	21.20	Type: Stone masonry gravity dam. Height: 113.50 ft. Length: 700.00 ft. Live storage capacity: 4,300 acre ft.	Provision of 20 million gallons per day of potable water to Rawalpindi/Islamabad and irrigation of small area.
Guddu Barrage Completed in 1962	474.80	Type: Gate Controlled weir with navigation lock. Width 64 spans of 60 ft. each Maximum Discharge capacity: 1.2 million cusecs.	Controlled irrigation supplies (including extension) for 2.9 million acres in Jacobabad, Larkana and Sukkur districts of Sindh and Nasirabad district of Balochistan.
Tanda Dam Completed in 1965	66.80	Type: Earth Fill Dam. Height: 115 ft. Length: 2,340 ft. Outlet capacity: 2,000 cusecs	Irrigation of about 3,200 acres in Kohat Valley.
Karachi Irrigation Project (Hub Dam) Completed in 1983	1,022.60	Type: Earth Fill Dam. Height: 151 ft. Length: 21,360 ft. Reservoir capacity: 106,000 acre ft. Spillway capacity: 458,000 acres	Irrigation of 21,000 acres in Lasbela and 1,000 acres in Karachi district. Drinking water supply of 89 MGD for Karachi and 15 MGD for industries in Balochistan.
Khanpur Dam Completed in 1984	1,385.00	Type: Earth-cum-rock Fill Dam. Height: 167 ft. Length: 1,547 ft. Reservoir Capacity: 106,000 acre ft. Spillway capacity: 166,000 cusecs	Irrigation of 36,470 acres in Attock, Rawalpindi and Abbottabad districts and supply of 131 MGD of water to Islamabad, Rawalpindi, POF Wah and Industries around Taxila.

PROJECTS COMPLETED BY WAPDA UNDER INDUS BASIN SETTLEMENT PLAN

Project	Main Technical Features	Objectives
Mangla Dam on River Jhelum (12th largest dam in the world)	• Type: Earth Fill • Height: 380 ft. (above river bed) • Length: 10,300 ft. • Gross storage capacity: 5,88 MAF • Live storage capacity: 5.34 MAF • Main Spillway capacity: 1,010,000 cusecs • Emergency Spillway Capacity: 2,30,000 cusecs • Lake area: 100 sq. miles	• Water Storage for supplementing irrigation supplies • Hydropower generation: 1,000 MW from ten units of 100 MW each • Incidental flood regulation completed in 1967
Tarbela Dam on River Indus (The largest rock and earth fill dam in the world)	• Type: Earth and Rock Fill. • Height: 485 ft. (above river bed) • Length: 9,000 ft. • Gross storage capacity: 11.6 MAF • Live storage capacity: 9.7 MAF • Main Spillway capacity: 6,50,000 cusecs • Auxiliary Spillway Capacity: 8,40,000 cusecs • Lake area: 100 sq. miles	• Water Storage for supplementing irrigation supplies • Hydropower generation • Units 1 to 4 = 700 MW in 1977 • Units 5 to 8 = 700 MW in 1982 • Units 9 to 10 = 350 MW in 1985 • Units 11 to 14 = 1728 MW in 1992-93 • Repair remedial and additional works completed in 1983 • Reservoir works completed in 1977
Link Canals (Eight) • Trimmu-Sidhnai • Sidhnai-Mailsi • Mailsi-Bahawal • Rasul-Qadirabad • Qadirabad-Balloki • Balloki-Sulemanki • Chashma-Sulemanki • Taunsa-Panjnad Link Canals Remodelled (Three) • Marala-Ravi • Bambanwala-Ravi-Bedian-Depalpur (BRBD) • Balloki-Sulemanki-I	These link canals comprise a total of 389 miles and have 400 principal structures with discharge capacities varying between 4,100 cusecs and 21,700 cusecs. Besides a total of 1,02,900 cusecs can be diverted through these link canals.	Completed progressively between 1965 and 1970. These canals are meant to transfer water of three western rivers, namely Chenab, Jhelum and Indus to the canals dependent on the three eastern rivers, namely Sutlej, Beas and Ravi.
Barrages/Syphon • Sidhnai on River Ravi • Qadirabad on River Chenab • Rasul on River Jhelum • Chashma on River Indus • Marala on River Chenab • Mailsi Syphon on River sutlej	These barrages and syphon comprise a total length of over three miles (16,926 ft.0 with combined design capacity of 4.38 million cusecs to facilitate aggregate diversion of 1,02,900 cusecs into the link canals.	Completed progressively between 1964 and 1971. These barrages are aimed to provide river control for diverting water from three western rivers to the three eastern rivers.

Indus Basin Settlement Plan

Conceived to resolve the water dispute between the two neighbouring countries, Pakistan and India agreed upon the historic Indus Basin Settlement Plan (IBSP) in consonance with the Indus Basin Treaty signed between the two parties in 1960 under the auspices of the World Bank.

The IBSP acknowledges the proprietary rights of Pakistan over water of the three Western rivers, namely, Chenab, Jhelum and Indus and provides water of the three Eastern rivers Sutlej, Beas and Ravi to India. In order to feed the irrigation network of Pakistan, which is the largest man-made canal system in the world, in absence of the eastern rivers gone to India, an elaborate civil works programme was devised. The so designed Indus Basin Project (IBP) gave birth to two large dams (Tarbela and Mangla), five barrages, one gated syphon and eight inter – river link canals. Remodeling of three existing link canals formed part of this project to convey water of the Western rivers for diversion to irrigation canals off-taking from the Eastern rivers. The IBP involved largest civil works ever undertaken in this part of the world at that point of time.

WAPDA, in its infancy, executed all the sixteen IBP components within the stipulated period of time, of a decade except Tarbela Dam completed in 1974 on behalf of the Government of Pakistan. The replacement system came to flourish the agriculture in Pakistan in the following years, sustaining the country's agriculture-oriented economy and generation of low-cost hydro-electric power from multipurpose Tarbela and Mangla Dam projects.

All the projects when completed were handed over to the respective provincial irrigation departments except for Tarbela and Chashma Dams, Chashma Barrage and Chashma-Jhelum Link Canal which remain with WAPDA for operation and maintenance (O&M) purposes.

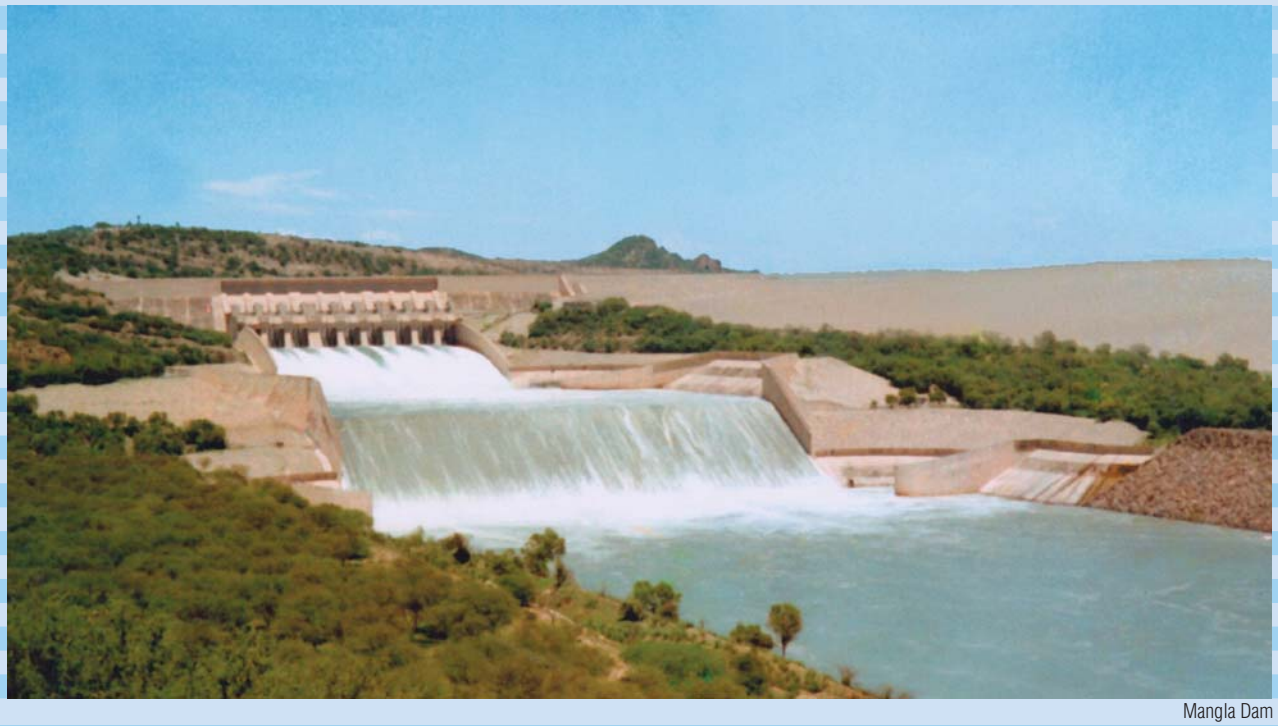
Mangla Dam

Mangla Dam was constructed across river Jhelum about 60 Miles South-East of the Federal Capital, Islamabad. The project is one of the biggest Earth & Rock filled dams of the world. Main components of the project include four embankments, two spillways, five power-cum-irrigation tunnels and a 1000 MW Power Station. Provision of 40 ft. raising of dam was made in its design at the time of construction. Keeping in view the economical and environmental viability, the dam has been raised by 30 ft. whereas the maximum conservation level of reservoir has been raised by 40 ft.

The length of Main Dam after raising has increased from 10,300 ft. to 11,150 ft. and maximum height above core trench has increased from 454 ft. to 484 ft. The reservoir area of Mangla has also increased from 97.7 Square Miles to 125 Square Miles. The gross and live capacities of the reservoir at original conservation level of 1202 ft. SPD were 4.577 Million Acre Feet (MAF) and 4.509 MAF respectively as per hydrographic Survey-2012. These capacities have now increased to 7.460 MAF and 7.393 MAF respectively after raising of Mangla Dam. Since first impounding in 1967, sedimentation has reduced the gross storage capacity of reservoir to the extent of 1.303 MAF (nearly 22%). After raising the dam by 30 ft., the life of Mangla reservoir has been calculated as 308 years at conservation level of 1242 ft. SPD the effective remaining life of the reservoir is 262 years. Main spillway is capable of discharging 945,306 Cs at Raised Conservation Level of 1242 ft. SPD.

Reservoir Operation and Hydrology

The reservoir was operated according to the irrigation requirements as per indents of Indus River System Authority (IRSA). The Reservoir was filled upto 1206.50 ft. level on 26th September, 2012 with a corresponding gross capacity of 4.888 MAF. During drawdown period in 2012-13, the reservoir did not reach at dead storage level i.e. 1040 ft. SPD. The minimum drawdown level was achieved on 25th March, 2013 was 1101.15 ft. Peak inflow of 213,500 Cs was recorded on 18th September, 2012. Total rainfall at Mangla was recorded as 34.9 inches during the year 2012-13. The Main spillway was operated for 10 days during the year.



Mangla Dam

Monitoring and Surveillance

Instrumentation

Total 1120 instruments are available for the Project structures to check the pore water pressure and settlement of the fill/foundation and lateral displacement. Additional 177 instruments were installed during Mangla Dam Raising Project among which 90 Electrical Piezometers have been handed over to MDO Mangla.

The response of functional instruments remained within the permissible limits during the year. The boiling points appeared through foundation sand stone beds of Main Dam and Sukhian Dam were closely monitored by recording their seepage intensities and no significant change was found.

Seismicity

The telemetry micro-seismic network installed in/around Mangla for seismic monitoring/surveillance of the project area remained in operation round the clock. The seismic data collected through eleven stations of this system indicates that this region is located in active seismic environment.

As many as 916 seismic events were recorded within 500 Km around Mangla during the period under report. An earthquake of magnitude 5.8 originated 200 Km off Mangla was felt on 1st May, 2013 with mild shaking (Intensity-IV). Blue drill was initiated at the project as per O&M manual. However, no abnormality was found in project structures. No significant earthquake was felt in the project area which would necessitate further analysis of data regarding structural behavior as per O&M manual.

No significant change in seismicity level was observed. The state of the art six digital accelerographs installed in 2006 remained operational during the year under report.

O&M (Civil)

Physical Inspection

Periodic and routine patrolling of main components of the project comprising Main dam, Intake structure, Sukian Dyke, Jari Dam, Bong Escape, Main & Emergency Spillways was carried out as per O&M manuals. Drainage networks have been cleared for safe passage of storm water. Rain water chute along Bong Canal were cleared periodically. Debris from main drains of seepage chamber have been removed. Wild growth has been removed from upstream and downstream slopes of the Dam, Power House, Switchyard and under high tension

transmission lines. Watch and Ward of trees in Project Areas have been carried out vigilantly. Routine maintenance and repair work of residential and non-residential buildings of three colonies was carried out. Mangla Fort and WAPDA Rest house were maintained and upkept.

Field staff was deputed to check the encroachments in Project Area and encroachers were dealt strictly. Close liaison and coordination was made with District Management of Mirpur and Jhelum to stop encroachment activities & lifting of earth material from reservoir/river area.

Transport

All light and heavy vehicles were maintained properly for meeting different requirements of the Organization. Routine maintenance and repair of vehicles of MDO Mangla, Power Station Mangla and SE SHPS Mangla was carried out satisfactorily in MDO Workshops. Survey reports of unserviceable material were initiated for its disposal. Purchase order for purchase of one new water tanker and two fire tenders is under process.

Miscellaneous Works

The following works have been completed during 2012-13:-

- Work for protection measures for transmission line towers installed for overhead connection between Power House and Switchyard.
- Construction of Parda Wall and brick paving of streets at Left Bank Colony and Right Bank Colony (Bruti).
- Carpeting/resurfacing of roads in Baral & Right Bank Colony.
- Supply and fixing of diesel generator set of 100 KV at Booster Pump Station Baral.

Mangla Power Station

With the total installed capacity of 1000 MW from 10 Units of 100 MW each, the Power Station remained one of the major contributors of Power to the National Grid during the year. Maximum load of 1115 MW and maximum daily generation of 22.170 MKWh was recorded during the year at various occasions. The Power Station supplied 4713 million units during the year. Total generation since commissioning of Power Station is 203.944 billion units (KWh) upto 30th June, 2013. Brief data for the year 2012-13 is given here under:-

Total Energy Generation	4713 MKWh
Net Electrical Output	4576.548 MKWh
Max. Monthly Generation	600.205 MKWh
Max. Daily Generation	22.170 MKWh
Maximum Load Attained	1115 MW

Comparison of reservoir level, mean monthly inflows, outflows, outflows through turbines on mean daily basis (MDB) and energy generation of Mangla for the fiscal year 2011-12 and 2012-13 is shown in the following table:-

RESERVOIR LEVEL OF MANGLA
(ON 15TH OF EACH MONTH)

MONTH	2011 - 12	2012 - 13
July	1189.25	1139.40
August	1200.60	1167.10
September	1210.00	1194.75
October	1203.35	1198.10
November	1187.40	1178.55
December	1158.35	1149.70
January	1145.85	1138.40
February	1124.40	1129.95
March	1040.00	1108.20
April	1066.60	1108.00
May	1092.80	1105.40
June	1101.60	1164.10

DESCRIPTION	2011-12	2012-13
Average Inflows (Cusecs on M.D.B)	23,633	28,722
Average Outflows (Cusecs on M.D.B)	27,057	25,176
Through turbines (Cusecs on M.D.B)	26,704	25,023
Energy Generation (MKWh)	4,799	4,713

Major Works

- Feasibility study regarding impact of puncturing of Jari Tunnel and Enlarging existing tapping from 31.5" to 66" dia for providing additional water to Azad Jammu Kashmir (Mirpur & Hamlets) by Consultants MWH-NESPAK JV has been completed.

- Installation, testing and commissioning of new 132/220 KV low impedance bus bar protection to replace the existing Electro Mechanical bus bar protection at Switch Yard Mangla Power Station is in progress.

- Replacement of old low rating 132KV & 220KV Air Blast circuit breakers with new high rupturing SF6 Circuit breakers at Switch Yard Mangla Power Station is in progress.

Financial Benefits

IRSA made 4.47 MAF of Storage releases for irrigation purpose during 2012-13 against 5.13 MAF during 2011-12. Mangla Power Station generated 4713 million kilowatt hours (MKWh) of electricity which is 86.08 million units i.e. 2% less than the last year generation (i.e. 4799 MKWh) due to less inflows. Project benefits till 30th June, 2013 are given in the table below:-

WATER AND POWER BENEFITS OF MANGLA DAM
(1967-68 TO 2012-13)

YEAR	Storage Releases (MAF)	Total Generation (MKWh)
1967-68 to1999-2000	152.34	141,633.63
2000-01	4.13	2,799.95
2001-02	3.54	3,398.89
2002-03	5.57	5,363.17
2003-04	5.23	5,058.94
2004-05	3.89	4,218.53
2005-06	4.97	5,442.94
2006-07	4.17	6,150.91
2007-08	5.57	4,687.33
2008-09	5.51	4,797.43
2009-10	5.22	4,772.40
2010-11	4.29	6,107.63
2011-12	5.13	4,799.25
2012-13	4.47	4,713.19
Total	214.03	203944.19

Hydel Training Center Mangla

General

Hydel Training Center Mangla is playing a pivotal role in capacity building of officers and officials of Hydel Organizations. It is imparting training to all the technical/non-technical employees of WAPDA Power and Water wing formations. During the period under report ten (10) Senior Engineers, Thirty-eight (38) junior engineers and one hundred forty-eight (148) officials have been imparted training. One hundred and eighty-five (185) officials participated in Departmental Promotion Exams (DPE) conducted by this training center. In addition ninety-one (91) students of Engineering Universities completed their internship from Hydel Training Center Mangla. Thus total of 472 trainees were provided training during the year 2012-13.

Courses Conducted

Refresher Course (pre-promotion) for Sr. Engineers (RC), Sector Specific Course (Pre-promotion) for Jr. Engineers (SSC), Jr. Engineer Induction course (JIC), Upper Technical Subordinate Staff (UTS), Internship Training Course of student engineers, Advance Operators Training Course (AOC), Basic Operators Training courses (BOC), Advance Craftsman Training Course (ACC), Basic Craftsman Training Course (BCC), Ministerial Staff Training Course for Jr. Clerks, Sr. Clerks, Assistants (MTC-1), Ministerial Staff Training course of Jr. Clerk to Steno-II (MTC-2), Training course of Steno Grade-II to Grade-I (MTC-3), Training course of Telephone Staff (TST), Drawing staff Training Course (DST), Training course of Store staff (SST) and Computer Office application course (COA) for local staff. Apart from that special training courses Data Entry Operator, Plant Operators and Lift Operators were also conducted for the officials whose timescale up-gradation was pending for want of DPE and mandatory pre promotion departmental training.

Upgradation of Hydel Training Center Mangla as WAPDA Hydropower Training Institute (HPTI)

A study was carried out to upgrade the existing Hydel Training Center, Mangla as Pakistan's First Multi-disciplinary Hydropower Training Institute (HPTI) for meeting training needs of WAPDA, other Public Organizations as well as Private Sector with a view to further developing it as a National Center of Excellence. On its completion the proposed HPTI Mangla is expected to be a learning facility and a multipurpose Training Institute for providing training to Electrical, Electronics and Mechanical Engineers and Technicians deployed on various assignments at new Hydropower Projects and existing hydropower plants and will meet the needs of future hydropower plants through sophisticated facilities and equipment. The training center project is being financed through AFD France Loan of 1.5 million Euro (Rs.180 Million). The progress made during financial year 2012-13 is given here under:-

HPTI Building

- Architectural drawings and detailed engineering drawings for construction of HPTI proposed site at Bruti Mangla have been prepared by CDO WAPDA Lahore.

Training Aid Equipment

- Tender for procurement of laboratory equipment for training centre have been floated.
- Procurement of 10 No. new computers along with all related peripherals has been completed.
- Purchase orders for purchase of 4 No. Vehicles for HPTI have been placed and two of them have been received and delivery of remaining two vehicles is expected shortly.
- Purchase of IT equipment i.e. One Public address system a/w all accessories, Two Lap-Tops, Two Multimedia projectors, Two VGA WIFI presentation dongle along with Projector Screens (motorized) is in process.

Security

Day & night mobile patrolling was carried out within the available resources to beef up security of vulnerable points of Mangla Dam and Small Hydel Power Stations particularly the Electrical and Mechanical installations. Utmost preventive remedial measures were adopted to ensure foolproof security of the Project. Efforts were made to man the vulnerable areas and adequately equip the security force with arms and ammunitions. Escort/security cover was provided to foreigners, VVIPs and senior officers of the Authority during their visits to Mangla Dam Project.

Public Relations

Briefings and multimedia presentations were arranged for various visitors coming from WAPDA Staff College Islamabad, WAPDA Engineering Academy Faisalabad, other training institutions of WAPDA and PEPCO formations, VVIPs and the visitors from USAID, JICA, Army Staff College, NIPA and CSS Training Academies, foreign/local Consultants of various projects and other renowned training institutions. Students of Colleges and educational institutions visiting Mangla as part of their instructional and recreational tours were imparted information and valuable technical knowledge about this gigantic and gorgeous project.

Small Hydel Power Stations (Punjab)

Five Small Hydel Power Stations namely Rasul (22 MW), Shadiwal (13.5 MW), Nandipur (13.8 MW), Chichoki (13.2 MW) and Renala (1.1 MW) with total installed capacity of 63.6 MW collectively generated 177.549 million units during the year 2012-13 as compared to 180.114 million units in 2011-12 indicating slight decrease of 2.565 MKWh (1.42%) in energy generation due to shortage of water share provided by Irrigation Department (Punjab).

The repair and maintenance work of all the generating units along with station auxiliaries were carried out satisfactorily during the year.

Major Works

The following works were carried out in Small Hydel Power Stations during the year 2012-13:-

Rasul Hydel Power Station

a. Four (04) No. new 11 KV digital energy meters have been installed and commissioned. Procurement of more 11 KV digital energy meters (in place of defective ones) is under process.
b. Procurement of plante type station batteries is under progress.

The following civil works have been completed during the year:-

a. Re-construction of rain water course.
b. Construction of mosque (capacity 70 persons).
c. Reconstruction of fallen boundary wall.
d. Road has been resurfaced from Colony entrance to Power Station.

Shadiwal Hydel Power Station

a. Procurement/manufacturing of spare Governor Oil Pump is under process.
b. Construction of 03 Nos. Cat-III Bungalows has been completed during the year.

Chashma Barrage

Nandipur Hydel Power Station

a. Fabrication & machining of 4 No. new Runner blade of Unit No. 1 was carried out from HMC Taxila.The runner blades have been refitted. Static balancing of the turbine is under process.
b. Demolishing of six unserviceable bungalows alongwith servant quarters, boundary walls & dispensary etc. has been completed.

Chichoki Hydel Power Station

a. Three (03) No. new 11 KV digital energy meters have been installed and commissioned. Procurement of more 11 KV digital energy meters (in place of defective ones) is under process.
b. Construction of 5 No. Watch towers has been completed.
c. Estimate for removal of an Island from downstream water channel has been prepared by CDO and the work will be carried out in next financial year.

Renala Hydel Power Station

a. After repair and maintenance of Runner No.4 of Unit No.1, unit has been put on bar successfully.
b. One (01) No. Runner of Unit No.2 has been got repaired from Gas Turbine Faisalabad and repair of one runner is under progress.

Chashma Barrage

Chashma Barrage is located on Indus River. Since its commissioning in 1971, the Barrage has been functioning satisfactorily as a Barrage-cum-reservoir, providing diversion facilities for Chashma Jhelum Link Canal on its left and Chashma Right Bank Canal on the right. The reservoir is also functioning as a regulatory storage for the releases from Tarbela, which during the year 2012-13 enabled the reservoir to store about 2.205 MAF of water and released 2.526 MAF during the year under report. About 87.17 MAF of irrigation water was received in Chashma Reservoir out of which 0.236 MAF was released downstream Indus River at Chashma Barrage, 4.974 MAF into Chashma Jhelum Link Canal and about 2.300 MAF diverted into Chashma Right Bank Canal. The downstream releases through Chashma Barrage gates were to the extent of 33.767 MAF, Chashma Power House were 42.635 MAF after generating energy and 0.843 MAF for cooling requirement of Chashma Nuclear Power Plant of Pakistan Atomic Energy Commission Kundian, which returned back to the river.

The Annual routine Inspection of Chashma Barrage and its allied structures including river training works was carried out during January-2013 by Dams Safety Organization. A team from ISRIP carried out the 5th

Hydrographic Survey of the reservoir and 2 Miles downstream to assess the reservoir capacity after passing the super flood-2010 and according to therir final report submitted to this office, the present storage capacity of the reservoir is 0.348 MAF against the original storage capacity of 0.87 MAF. Routine maintenance and up-keeping of the Barrage structure and its accompaniments continued during the year. The regulation of the Barrage was carried out as per indents received from IRSA.

Chashma Barrage Benefits

Since commissioning of Chashma Barrage, 76.402 MAF of water was released from the storage and benefits worth Rs.44.231 million have been attained. Year-wise break-up is given in the following table:-

Year (July to June)	Storage Releases (MAF)	Benefits (Rs. Million)
1992-93	16.19	3,238
1993-2000	22.00	6,600
2001-05	17.991	16,192
2005-06	2.594	2,335
2006-07	4.003	3,603
2007-08	2.310	2,079
2008-09	3.713	3,342
2009-10	1.662	1,496
2010-11	1.942	1,748
2011-12	1.792	1,613
2012-13	2.205	1,985
Total	76.402	44,231

Note: Upto 1992-93, the benefits have been circulated at the rate of Rs. 200/- per acre foot, for 1993-2000, these have been calculated at the rate of Rs. 300/- per acre-foot, but thereafter, the benefits have been assessed at the rate of Rs.900/- per acre-foot.

Chashma Jehlum Link Canal

Indented irrigation water requirements were met by diverting 4.974 MAF of Indus flow to Jehlum River through CJ Link Canal. The canal was run and regulated for 279 days during the year 2012-13.

The CJ Link is an earthen channel, a large portion of which is passing through sandy area. The portion of the canal from RD:160 to RD: 215 is in filling causing a huge seepage which has turned low lying areas i.e. Adhikot, Chan and Rangpur villages into water-logging.

CHASHMA BARRAGE STORAGE BENEFITS

Year (July-June)	Storage/Releases (MAF)	Benefits (Rs. Million)
1980-81	8.41	1682.00
1981-82	0.74	148.00
1982-83	0.7	140.00
1983-84	0.49	98.00
1984-85	0.49	98.00
1985-86	0.49	98.00
1986-87	0.49	98.00
1987-88	0.49	98.00
1988-89	0.45	90.00
1989-90	0.28	56.00
1990-91	0.45	90.00
1991-92	2.7	540.00
1992-93	2.52	756.00
1993-94	3.57	1071.00
1994-95	2.53	759.00
1995-96	2.44	732.00
1996-97	2.56	768.00
1997-98	2.16	648.00
1998-99	3.24	972.00
1999-2000	2.98	896.00
2000-01	2.84	2556.00
2001-02	3.31	2979.00
2002-03	3.89	3501.00
2003-04	3.75	3375.00
2004-05	2.852	3781.00
2005-06	2.594	2335.00
2006-07	4.003	3603.00
2007-08	2.310	2079.00
2008-09	3.713	37389.00
2009-10	1.662	1496.00
2010-11	1.942	1748.00
2011-12	1.792	1613.00
2012-13	2.205	1985.00
Total	76.402	44531.00

WAPDA installed 25 tubewells of 3 Cusecs each during 1971 in Adhikot area and 15 tubewells of 1.5 Cusecs each in Chan area during 1975 for anti water-logging measures which are being operated and maintained by Punjab Irrigation Department. 21 No. centrifugal pumps having total discharge capacity of 51.5 Cusecs were also installed at five different pumping stations to minimize the pounding of seepage water. These are being operated and maintained by WAPDA along with its allied structures and drains.

Routine maintenance of structures, regulators and

banks was continued during this period. A team of ISRIP carried out the study for developing new rating curves on all four regulators including GTC head regulators. A separate study to check the adequacy of additional discharge for two new PAEC plants was finalized by Central Design office Lahore. Plantation of Gul e abbasi, Narki and Sarkanda was done on newly filled raincuts.

A budget plan of F.Y. 2013-14 was submitted for the maintenance/protection of the canal.

Tarbela Dam

Tarbela Dam, built under the historic Indus Basin Settlement Plan, has greatly enhanced the agricultural and industrial potential of the country. The dam has now become a major support to the country's economy.

The total cost including Power Units 1 to 14 was US $ 2.63 billion with local and foreign currency components in almost equal proportions. The Rupee cost was met entirely by Pakistan Government while Tarbela Development Fund (TDF) which was established in 1968 to take care of foreign currency requirements.

The balance amount available from Indus Basin Development Fund (IBDF) was diverted to RDF and bilateral loan agreement was signed with European Countries, Canada and USA. Later in 1980, agreement with Saudi Arabia, Kuwait and Abu Dhabi had to be entered to augment the fund.

MAIN FEATURES

RESERVOIR		
Length	60 mi	97 Km
Maximum depth	450 ft.	137 M 24,
Area	60,000 Acres	300 Ha
Usable capacity above El. 1378 (420 M)	6.625(Initial 9.4) MAF	8172(Initial 11,600)M m^3
Dead storage below El. 1378 (420 M)	1.107(Initial 1.9) MAF	1365.65(Initial 2,300) M m^3
Gross capacity El. 1550 Ft (473 M)	7.732(Initial11.3) MAF	9538.54(Initial 13,900) M m^3
Mean Annual Inflow	64 MAF	79,000 M m^3
MAIN EMBANKMENT DAM		
Length at crest El. 1565 (477 M)	9,000 ft.	2,743 M
Max. Height (from lowest foundation point)	470 ft.	143 M
Embankment volume	139 M yd^3	106 M m^3
Blanket volume	30 M yd^3	23 M m^3
AUXILIARY DAM NO. 1		
Length at crest El. 1565 (477 M)	2,340 ft.	713 M
Maximum height	345 ft.	105 M
Volume, including blanket	20 M yd^3	15 M m^3
AUXILIARY DAM NO. 2		
Length at crest El. 1565 (477 M)	960 ft.	293 M
Maximum height	220 ft.	67 M
Volume	2.4 M yd^3	1.8 M m^3
SERVICE SPILLWAY		
7 Gates	50 ft. wide x 61 ft. high	15.2 x 18.6 m
Discharge capacity	615,000 cfs	17,400 cms
Concrete volume	390,000 Yd^3	298,000 m^3
AUXILIARY SPILLWAY		
9 Gates	50 ft. wide x 61 ft. high	15.2 x 18.6 m
Discharge capacity	795,000 cfs	22,500 cms
Concrete volume	551,000 Yd^3	421,000 m^3
TUNNELS AT RIGHT BANK		
Four, with lengths of	2,400 to 2,700 ft.	731 to 823 m
Cone.-lined upstream of gate shafts, diam.	45 ft.	13.7 m
Steel-lined downstream of gate shafts Tunnels 1, 2 and 3, diam.	43.5 ft.	13.3 m
Tunnel 4, diam.	36 ft.	11 m
Main Gates, two on each tunnel	15.5 x 46.5 ft. each	4.7 x 14.2 m
RADIAL IRRIGATION OUTLET GATES	16 x 24 ft. each	4.9 x 7.3 m
Tunnels 3 and 4, two on each tunnel Gandaf Irrigation Tunnel, (1st stage only)		
Compl. length of tunnel plus intake, gate shaft, underground stilling basin	1,670 ft.	509 m
LEFT BANK TUNNEL		
Length	3,675 ft.	1120.1 m
Cone.-lined upstream of gate shaft, diam.	45 ft.	13.7 m
Steel-lined downstream of gate shaft, diam.	36 ft.	11 m
Main gates, two	15.5 x 46.5 ft. each	4.7 x 14.2 m
POWER PLANT		
Initial: 4 units @ 175 MW	700 MW	
Inlet Valves, 4	192 inches	4.88 m
Turbines, Francis, 4	239,000 hp	
By-pass valves, 4	102 inches	2.59 m
Transformers, 12 (1 spare)	79,000 KVA	
Ultimate:14 (10@ 175 MW and 4 @ 432 MW)	3,478 MW	

Tarbela Reservoir

Project Benefits

Self sufficiency in food has been achieved thus helping in accelerating the pace of country's economic development. Billions of units of hydro-electric energy generated at Tarbela Power Station has reduced the gap between supply and demand and also saved handsome amount of foreign exchange of the country's exchequer required otherwise for thermal power generation besides helping to keep the overall tariff down.

To meet the energy crises of the country, extension of the Power House at Tunnel 4 is expected to be started soon. On completion, it will add a good quantum of energy to the National Grid.

Project benefits for/up-to the year 2012-13 will be submitted after 30th June, 2013 i.e completion of the report period.

Survey and Hydrology

Sedimentation Survey

Annual Sedimentation Survey of Tarbela reservoir including Haripur Basin & Brandu River was conducted during the month of September-October, 2012 computation of data and drawings completed.

Incoming sediments during the year = 0.067 MAF. Reduction in gross and live storage computed as follows:-

Storage	1974(MAF)	2012(MAF)	Reduction (MAF)
Gross	[11.62	7.568	-4.052(34.87%)
Live	[9.679	6.581	-3.098 (32.00%)

Sediment delta pivot point has no advancement and is at R.L. 12 i.e. at 5.45 miles from Main Embankment Dam with elevation 1382.0'. The minimum operating level of the reservoir has been fixed as 1378' A.M.S.L.

Elevation of pivot point is 4 ft. above elevation of minimum operating level (MOL) i.e 1378 ft. in order to implement the recommendations of dam safety organization, a case has been processed for raising MOL from 1378 to 1380 ft. amsl for the year 2012.

Annual Sedimentation Report for the year 2012 completed and sent to concerned quarters. Suspended sediment sampling data through Power Outlets of Tarbela and GBHP i.e. its collection, posting and processing continued throughout the year.

WATER AND POWER BENEFITS FROM TARBELA DAM PROJECT

Year July - June	WATER		POWER		Total Benefits (Rs. Million) (3)+(5)	Remarks
	Releases (MAF)	Benefits (Rs.Million)	Generation (MKWH)	Benefits (Rs.Million) (31 Rs.0.30/- per unit		
1	2	3	4	5	6	
1975-76	3.33	666.00	—	-	666.00	
1976-77	9.07	1814.00	138.30	41.49	1855.49	
1977-78	10.00	2000.00	3367.20	1010.16	3010.16	
1978-79	8.71	1742.00	3726.00	1117.80	2859.80	
1979-80	9.91	1982.00	4123.00	1236.90	3218.90	
1980-81	10.63	2126.00	4128.80	1238.64	3364.64	
1981-82	11.33	2266.00	4200.50	1260.15	3526.15	
1982-83	9.12	1824.00	5228.20	1568.46	3392.46	
1983-84	9.18	1836.00	7450.80	2235.24	4071.24	
1984-85	9.24	1848.00	7253.94	2176.18	4024.18	
1985-86	9.76	1952.00	7993.59	2398.08	4350.08	
1986-87	9.98	1996.00	8121.23	2436.37	4432.37	NOTE:
1987-88	7.52	1504.00	9402.64	2820.79	4324.79	Up to FY 1991-92 the benefit of water re-leases have been worked out at the rate of Rs. 200 per acre foot, from 1992-93 to 1996-97 at the rate of Rs.300 per acre foot and thereafter from 1996-97 at the rate of Rs.900 per acre foot.
1988-89	11.12	2224.00	10378.22	3113.47	5337.47	
1989-90	7.32	1464.00	9981.50	2994.45	4458.45	
1990-91	6.19	1238.00	11356.00	3406.80	4644.80	
1991-92	5.93	1186.00	11765.00	3529.50	4715.50	
1992-93	6.31	1893.00	13955.00	4186.50	6079.50	
1993-94	9.41	2823.00	12956.26	3886.88	6709.88	
1994-95	5.39	1617.00	14765.19	4429.56	6046.56	
1995-96	8.17	2451.00	14922.36	4476.71	6927.71	
1996-97	9.15	8235.00	14230.17	4269.05	12504.05	
1997-98	8.66	7794.00	15084.90	4525.47	12319.47	
1998-99	9.04	8136.00	16377.84	4913.35	13049.35	
1999-00	8.71	7837.20	14747.64	4424.29	12261.49	
2000-01	8.69	7820.10	12811.24	3843.37	11663.47	
2001-02	8.21	7385.40	13495.05	4048.52	11433.92	
2002-03	8.66	7797.60	14676.69	4403.01	12200.61	
2003-04	8.36	7522.20	15119.76	4535.93	12058.13	
2004-05	8.10	7292.70	12308.00	3692.40	10985.10	
2005-06	9.12	8207.10	15822.97	4746.89	12953.99	
2006-07	8.50	7647.30	16131.60	4839.48	12486.78	
2007-08	7.64	6879.60	14937.63	4481.29	11360.89	
2008-09	9.28	8350.20	13964.97	4189.49	12539.69	
2009-10	7.80	7020.90	13902.03	4170.61	11191.51	
2010-11	7.52	6765.30	16002.69	4800.81	11566.11	
2011-12	7.23	6508.80	14109.12	4232.74	10741.54	
2012-13	7.99	7198.20	14769.02	4430.71	11628.91	

Tarbela Dam Outlet Structure Sounding

Sounding of outlet structures of Tarbela Dam i.e Plunge pools of Auxiliary Spillway, Service Spillway, Tunnel # 5 and Dal Dara Weir were completed. Computation and plotting of data drawings completed.

Horizontal and Vertical Movement Observation Survey

Horizontal and Vertical movement Observation Survey of Tarbela Dam and Ghazi Barotha Hydropower Project structures remained continued throughout the year.

General Survey

Topographic survey carried out of proposed area for residential accommodation relevant to 4th Extension Project at Right Bank Colony and shed at Horbour.

Harbour

The boats, barges were kept in working conditions during the period to cope with the following assignments:-

- Hydrographic Survey
- Sedimentation sampling of upstream reservoir
- Conducting V.V.I.P visits/ inspections of major delta
- For access to seismological networks installed in Sawabi Mera
- Conducting raids against illegal fishing on the request of Fisheries and Security departments.

Sedimentation Management Study of Tarbela Reservoir (SMST)

The government of Pakistan has obtained a credit for water sector capacity building and advisory services project. To improve management and investment planning of water resources in Indus River Basin, Water and Power Development Authority has commissioned Mott MacDonald Limited of UK and MM Pakistan (Pvt.) Ltd, in association with HR Wallingford of UK, to carry out consultancy services for the Sediment Management Study of Tarbela Reservoir.

The Tarbela Dam, was completed in 1976, comprises a reservoir formed by main embankments primarily used to supply water for irrigation and to generate hydroelectric power.

Sedimentation Problem

Sedimentation in Tarbela reservoir is severe. The average annual sediment discharge into the reservoir is about 181 million tones. The trap efficiency of the reservoir is over 95 % in most of years. The original reservoir capacity, at commissioning, was 14.34 billion m3 (11.62 million acre-ft), which, according to 2012 reservoir survey, has reduced to 9.335 billion m3 (7.568 million acre-ft) i.e. reduction of 34.87 % in 35 years. The fore-set slope of the delta is deemed subject to failure during a seismic event. Clogging of tunnels during such an event will prevent water releases for agriculture and power generation.

Objectives of the Study

The main objectives of the study are:-

i. To analyze and evaluate the recommendations which had emerged from Tarbela Dam Sediment Management Study by TAMS Consultants in 1997, and the fifth periodic inspection of Tarbela Dam (2007).

ii. To prolong useful life of the Dam, recommended the study related to consequences of sediment transport downstream of Tarbela Dam resulting from sediment evacuation from the reservoir.

• Initial Duration of Contract (15 Months)	Completion date: 31.08.2012
• 1st Revised Duration (20 Months)	Revised completion date: 31.01.2013
• 2nd Revised Duration (24 Months)	Revised completion date: 31.05.2013
• Total Loan Amount (WCAP)	USD 3 Million
Contract Cost	
• As per Original Contract	USD 622, 472 & PKR 201,033,231
• As per Addendum-I	USD 817,014 & PKR 183,718,992
• As per Addendum-II	USD 980,832 & PKR 1,979,236
Physical Progress	
• Contract signing date	May 17, 2011
• Commencement Date	June 01, 2011
• Mobilization of Foreign Staff	June 17, 2011
• Inception Study	
• Collection of Existing Reports	Complete
• Review of Existing Reports	Complete
• Review of Project Assignment	Complete
• Submission of Inception Report	July 27, 2011
• Client Review and Comments	Oct 27, 2011
• Workshop on SMST	Sep 24, 2011
• Project Status Presentation to World Bank	Jan 11, 2012
• Project Status presentation to Pravin Karki of World Bank	Feb 02, 2012
• Procurement of Equipment	Completed

Sub-Contracts

- Contract was signed between M/s MMP and ISRIP on 1st February, 2012 for carrying out Sediment Sampling and Testing at 3 sites. The task is completed and report has been submitted to consultants.

- The contract for Off-shore drilling and Sediment Sampling in delta area at 10No bore hole locations has been signed between M/s IVCC and M/s MMP on 13th October, 2012 which has been completed on 29th May, 2013.

Survey Activities

- Training of survey equipment incorporating WAPDA staff is almost completed.

- Bathymetric survey and sub-bottom profiling survey has been completed in Tarbela reservoir.

- Bathymetric survey with ACDP in Ghazi Pond, Chashma Barrage, Jinnah Barrage, Taunsa Barrage, Guddu Barrage, Sukkur Barrage and Kotri Barrage has been completed.

Deliverables submitted up to date

- Inception Report
- Interim Delta Exploration report
- Sedimentation Report by hydrographic survey with latest equipment including training of WAPDA Staff
- Seismic Study report addressing the liquefaction potential of Delta
- Hydrographic Data Report
- Interim Environmental Studies Report/ Scoping document

Deliverables yet to be submitted

- Environmental Studies Report
- Modeling Report
- Chashma Modeling Report
- Draft Feasibility Report
- Final Feasibility Report

Safety Performance of Tarbela Structures

General

The performance of the three embankment dams and their abutments, spillways tunnels and civil structures of powerhouse generally remained satisfactory. The reservoir was drawn down to El. 1378 (two times) and operated for 39 and 24 (total 63) days at a minimum recommended pool level of 1378.00 ft. amsl (above mean sea level) and raised up to maximum conservation level of 1550 ft. on 12-09-2012. The live storage has got reduced from initial 9.679 MAF to 6.581 MAF due to sedimentation up to year 2012 while operated at minimum level 1378 ft. The inflows during the year 2012 were 53.566 MAF against the annual average of 64 MAF. The 2012 hydrographic survey of reservoir indicated gross storage reduction from 11.620 MAF to 7.568 MAF which comes out 4.052 MAF i.e. 34.87 %.

The performance has been compared with 2011. Reservoir stay at maximum reservoir level 1550 ft. in 2011 and 2012 was 30 days and 16 days respectively.

Main Dam

The performance of upstream blanket remained satisfactory during the year 2012. There was general reduction in pore pressure potential values. Aging effect of about 41 year old instruments cannot be ignored. Contractual ditch was headed up due to power house tail race level in 2012 without any flow in the relief wells. The Tarbela outlets discharges effects on foundation pore pressure were also less as compared to previous years. No sinkhole has appeared in the upstream blanket after 1986.

The pressures in the punctured tube of gauges P4-54, P4-56 & P4-65 located in the affected core zone at MB section of MED showed almost a stable behavior. Sudden rise/ jump observed during previous years at maximum reservoir level, was not observed this year. The piezometers located at El.1135 ± ft. in transition zone had not shown any increase in seepage from the core. Wire loops installed at the sinkhole location were found intact and no physical subsidence was reported. New piezometers at MB section installed in 2006 had not shown any abrupt change but only effected by changes in Tarbela outflows or in Barrage levels. The other sections also showed stable behavior during 2012 impounding.

Tarbela Dam

Left Abutment of Main Dam

Generally the performance of left abutment remained satisfactory during the impounding of reservoir in year 2012. Generally pore pressures were lower while slight increase in seepage in LAA-2 system was recorded in 2012 as compared to 2011.

Right Abutment of Main Dam

In the light of POE recommendations, during Third & Fourth Periodic Inspections, the grouting works under a phased program since 1996 were carried out in RGA-3 and RGA-5 for strengthening of grout curtain to lower down the pore pressures near the core/rock contact area. The grouting operations were completed this year 2012.

The piezometric levels during 2012 reservoir impounding were generally higher in rock contact area as compared to 2011. Grout curtains and drainage curtains performance in various Adit systems remained satisfactory. Seepage remained constant in RAA-2 and RDA-22 system.

The outlet cut slope protection works continued to perform well. No new cracks or abnormal opening up of old cracks were observed at the berms.

Auxiliary Dam-1

The XA section of Auxiliary Dam-1 where the washed zone had developed/observed in the core in 1990 remained stable. The recorded pore pressures did not show any fluctuations in the washed zone both during reservoir filling and draw down cycle of 2012. Physical inspection during low reservoir period did not reveal any sink at the upstream face at EL 1500 ft. where depression of sinkhole was expected due to physical movement in the core. Water levels recorded at T. I. Casing in downstream were almost same in 2011 and 2012. Drop of water level also observed during reservoir stay at El.1550.

At XB section of Auxiliary Dam-I, the performance remained satisfactory. The pore pressures remained same. The water levels recorded by T.I. casings downstream the axis of Auxiliary Dam-I was less as compared to 2011.

At the right abutment of Auxiliary Dam-1, the pore pressures were lower as compared to 2011. No change was observed in the abutment foundation seepage. Less saturation observed in the area downstream of the toe.

Auxiliary Dam-2
The performance of foundation of Auxiliary Dam-2 generally remained satisfactory. The recorded foundation pressures were lower from previous year while seepage showed slight reduction during 2012.

Embankment Movements
The settlement of embankment fills has reduced considerably and continued at a much slower rate. Horizontal movements generally respond elastically to the cyclic loading and unloading of reservoir.

Service Spillway
The performance of service spillway remained satisfactory. Pore pressures were slightly higher on right side. Performance of grout curtain and drainage curtain remained satisfactory. The total collected seepage in the drainage networks was comparatively more as compared to 2011. The behavior of the plunge pool protection works remained satisfactory. During 2012 the spillway was operated for 129.5 hrs, with maximum discharge of 130500 cfs on 9th September, 2012.

Auxiliary Spillway
The overall performance of Auxiliary Spillway structure remained satisfactory. Pore pressures were lower but the impact not transferred in the downstream. Two drains passed fines during the year, were plugged. The total collected seepage was slightly less in 2012 as compared to 2011. Repair works on floor carried out in 2009 were intact. Patch was repaired at right chute slab which extruded during 2011 flows. In 2012, the spillway was operated for 502 hrs with a maximum discharge of 105200 cfs on 3rd September, 2011. Overall performance of plunge pool protection works remained satisfactory

Dal Darra Channel and Weir
The Dal Darra channel particularly the channel portion between the protected rock narrows and the Indus River continue to erode at high flows while almost stable for low outflows. The remedial works for hydraulic improvement at Dal Darra weir continue to perform satisfactory. Repairs done in 2011 on left corner of left bay have again showed erosion impression. Cavity formation in rock underneath right wall foundation observed during 2010 high flows will also be repaired in 2013 low flow period.

Tunnels
Tunnel-4 operated for 2 hours with maximum discharge of 82300 cfs on 7th July, 2012. Overall performance of civil structure was satisfactory.

The performance of Tunnel No.5 remedial works carried out during 1999 remained satisfactory. The pore pressure performance in the foundation rocks under the outlet concrete structure and in rock around the Tunnel-5 remained satisfactory. Tunnel-5 remained in intermittent operation for 288 hrs from 8th June, 2012 to 23rd Aug, 2012 including one hour test operation on 9th February, 2012. Tunnel operated at a maximum discharge of 86400 cusecs on 23rd Aug, 2012.

Data Of Project Litigation Cases Before Various Lower / High / Supreme Courts of TDP/ KDP

Tarbela Dam Project

Name of Court	No. of Cases
Supreme Court, Islamabad	05
High Court, Abbottabad	25
Lahore High Court	09
Haripur Courts	08
Ghazi Courts	02
NIRC Peshawar	01
F.S.T, Islamabad	09
Total:	59 Cases

Khanpur Dam Project

Name of Court	No. of Cases
Revenue Board at Abbottabad	03
High Court at Abbottabad	04
Lower Court at Haripur	05
Lower Court at Rawalpindi	01
District Officer Revenue, Haripur	03
Total:	16 Cases

Tarbela 4Th Extension Hydropower Project
Tarbela 4th Extension Hydropower Project (T4HP) is an extension Project with proposed additional generating capacity of 1410 MW. Three units having 470 MW capacities each would be installed on existing irrigation tunnel 4 of Tarbela Dam. It would generate 3840 GWh of electric energy per annum. As per detailed engineering studies, the Project has been determined technically feasible,

Tunnel No. 5, Tarbela Dam

environment friendly plus economically and financially viable.

The Project also includes construction of raised Intakes for tunnels 3 & 4 to facilitate silt free water flow through these tunnels for reliable and smooth operations of new powerhouse and existing units 11~14. The output of the powerhouse (500 KV) will be injected into national grid through extension in the existing switchyard of Tarbela units 1~14.

At present, the Project is in bidding stage after prequalification of potential bidders. The bids for the Civil Works have been received and are under evaluation. The estimated Project cost as per approved PC-I is Rs. 83.6 billion. World Bank has already sanctioned a loan amounting to Rs. US $ 840 million to meet the cost of the Project.

Khanpur Dam Project

Description of the Project

Khanpur Dam, commissioned in 1984, is a dual purpose Project for irrigation and municipal water supply. The Project is located 50 Km North of Islamabad. The dam has been built on the Haro River which is a small tributary of the Indus River.

The main Project features comprise a Main Embankment Dam (167 ft. height), three saddle dams on the right; one saddle dam on the left; a gated spillway and an irrigation system. The main dam is an earth and rock fill embankment. The Khanpur Reservoir currently has a live storage capacity of 81,650 Acre-feet. The maximum and minimum conservation levels of the reservoir are 1982 feet and 1910 feet (SPD). The spillway of Khanpur Dam has five radial gates each having dimensions of 40 feet by 35 feet. It has a maximum discharge capacity of 166,000 ft^3/s.

Catchment Area

The Haro River rises in the hills of Moshkpuri at an elevation of 9258 feet. The general shape of the catchment is oblong with a maximum length of 34 miles and maximum width of 11 miles, the average width being 8 miles. The total catchment area is 308 Square Miles of which 202 Square Miles is above and 106 Square Miles below the elevation of 3500 feet. The upper reaches of the catchment area are afforested with pines and thick under growth, while the lower reaches are covered by bushes, shrubs and small trees.

Water Supply from Khanpur Reservoir

Water from Khanpur Reservoir is released through two canals known as the Left Bank Canal (LBC) and the Right Bank Canal (RBC). The RBC which has a

design discharge of 110 $ft^3/s.$, is meant only for irrigation whereas the LBC having a design discharge of 440 $ft^3/s.$ supplies water both for irrigation as well as municipal and industrial purposes. The Left Bank Canal at its tail delivers water to the Sangjani Raw Water Reservoir which is operated and maintained by the Capital Development Authority (CDA) Islamabad. From the Sangjani Raw Water Reservoir, CDA Supplies water to Islamabad and Rawalpindi after treatment.

The length of LBC and RBC are 18 Km and 11 Km respectively and the total area irrigated by both canal systems in District Haripur of Khyber Pakhtunkhwa and Districts Attock and Rawalpindi of Punjab, is over 36,470 acres. Both the Left and Right Bank Canal Systems of Khanpur Dam Project were handed over to the Provincial Irrigation Departments of Khyber Pakhtunkhwa and Punjab in 1985 and 1987 respectively. The said Provincial Irrigation Departments are responsible for O&M of these canals within their respective jurisdiction. WAPDA is now only responsible for the O&M of Khanpur Dam.

The beneficiaries of Khanpur Dam Project include:-

A. Irrigation
   1. Irrigation Department, Government of Khyber Pakhtunkhwa
   2. Irrigation Department, Government of Punjab

B. Municipal / Industrial
   1. Project Monitoring Organization (Defence)
   2. Heavy Industries Taxila (Defence)
   3. Fecto Cement Industries
   4. University of Engineering & Technology Taxila
   5. Islamabad (CDA)
   6. Rawalpindi (RCB & WASA)

In the year 2012-13 (1st June 2012 to 31st May, 2013), 84,102 Acre-feet of water was supplied to all beneficiaries from Khanpur Reservoir, out of which 39,196 Acre-feet was supplied for irrigation and 44,906 Acre-feet for municipal use.

Operation and Maintenance (O&M) Activities

Collection, processing and preliminary analysis of instrumentation data was carried out and reports forwarded to Dam Safety Organization (DSO) for review on regular basis. Project monitoring (instrumentation) data has been computerized and it is transmitted to DSO via email as well.

Maintenance works carried out during 2012-13 included - maintenance of spillway machinery; clearance of vegetation from embankment slopes and drains; special repair of residential buildings in the colony; improvement works for rest house, mosque and office block. In addition, fish seed stocking was also done in the reservoir.

The spillway was operated eight times to release excess water after the reservoir had reached its maximum conservation level in March, 2013.

Annual Inspection of Khanpur Dam Project was carried out by the Dam Safety Organization (DSO) in November, 2012.

Ghazi Brotha Spillway and Hydel Power Station

Ghazi Barotha Hydropower Project (GBHP)

Introduction

The shortage of electrical power at affordable cost has long been identified as one of the main hurdles to the industrial and economic growth of Pakistan. The demand for electricity is growing rapidly and requires a considerable increase in the rate at which new generating capacity is introduced. Presently, demand is met through a mix of Thermal and hydroelectric plants. The percentage of thermal power generation has continued to increase in recent years, with a noticeable impact on unit cost of generation. WAPDA has continually sought to maximize the country's capacity for hydropower generation and reduce the dependence upon thermal power generation. Ghazi Barotha Hydropower Project with a generation capacity of 1,450 MW and an average energy output of 6,600 GWh is a large, renewable and emission-free source of energy towards WAPDA's Vision 2025 goals.

The Project

Ghazi Barotha Hydropower Project is located on the Indus river downstream of Tarbela Dam. The Project utilizes the hydraulic head available between the tailrace at Tarbela Dam and the confluence of the Indus and Haro Rivers for power generation. In this reach Indus river drops by 76 M in a distance of 63 Km. This Project possesses the minimum of environmental and social impacts.

Ghazi Barotha Hydropower Project consists of three main components, the Barrage, the Power Channel and the Power Complex. The Project utilizes the normal Tarbela Dam releases to provide year round maximum power generation during the daily hours of peak demand, including the months of May and June when reservoirs of Mangla and Tarbela Dams are historically at their lowest. This enhances the capacity of the whole power system by providing much needed relief in the form of cheap hydel energy.

The Barrage

The Barrage located 7 Km downstream of Tarbela Dam, provides a pond which re-regulates the daily discharge from Tarbela by diverting the flow into the Power Channel. The principal features include 20 No. Standard Bays, 8 No. Undersluices and 8 No. Head Regulator Bays in addition to rim embankments, fuse plug and dividing island.

The Barrage can pass the design flood of 18,700 Cumecs, equivalent to the flood of record, through

the standard bays and undersluices at the normal pond level of El. 340 M. The fuse plug has been provided to pass the extreme flood up to the capacity of Tarbela's spillway and tunnels equaling 46,200 Cumecs.

The Power Channel

Ghazi Barotha Hydropower Project holds the record for the biggest lined channel in the world. The channel is 51.90 Km long with a concrete lining and design flow of up to 1,600 Cumecs at a water depth of 9 M and a bottom width of 58.4 M.

The Power Channel has a nearly contour alignment with hills on the left side and the land naturally draining towards the Indus River on the right side. The Power Channel intercepts fifty three nullahs (natural drains) of which twenty seven major nullahs have been passed over the Power Channel by providing super-passages. The remaining twenty four minor nullahs are being discharged into the Power Channel through individual inlets while one nullah is passing underneath the channel through a culvert.

In addition to the thirty four road bridges, including bridges for both Islamabad-Peshawar Motorway and the G.T. road, there are 12 pedestrian crossings over the Power Channel.

The main railway line joining Rawalpindi to Peshawar also crosses the power channel and requires the construction of the second largest single span railway bridge in Pakistan. This may be the last riveted bridge of its type, constructed in Pakistan.

The Power Complex

The Power Complex having two headponds with a combined live storage capacity of approximately 25.5 million cubic meter, is sufficient for the daily requirement of 4 hours peak generation. This means that in May and June when there is reduced generation from Tarbela and Mangla power houses, due to low reservoir levels, Ghazi Barotha provides peak production of 1,450 MW.

The five generating units in the Powerhouse are each fed by a 10.6 M diameter steel lined penstock. Each of the five 290 MW Turbo Generators can take a peak flow of 460 Cumecs.

Power Complex has been provided with a self priming siphon spillway of 1600 Cumecs capacity, having energy dissipation in a stilling basin and a baffle chute.

The Power transmission is through 500 KV double circuit lines to WAPDA's national grid system.

Mechanical and Electrical Equipment

The installed generating capacity is 1,450 MW, consisting of five units each of 290 MW. The units have a design flow of 400 Cumecs at optimum gate opening and 460 Cumecs at full gate opening for a design head of 69 M.

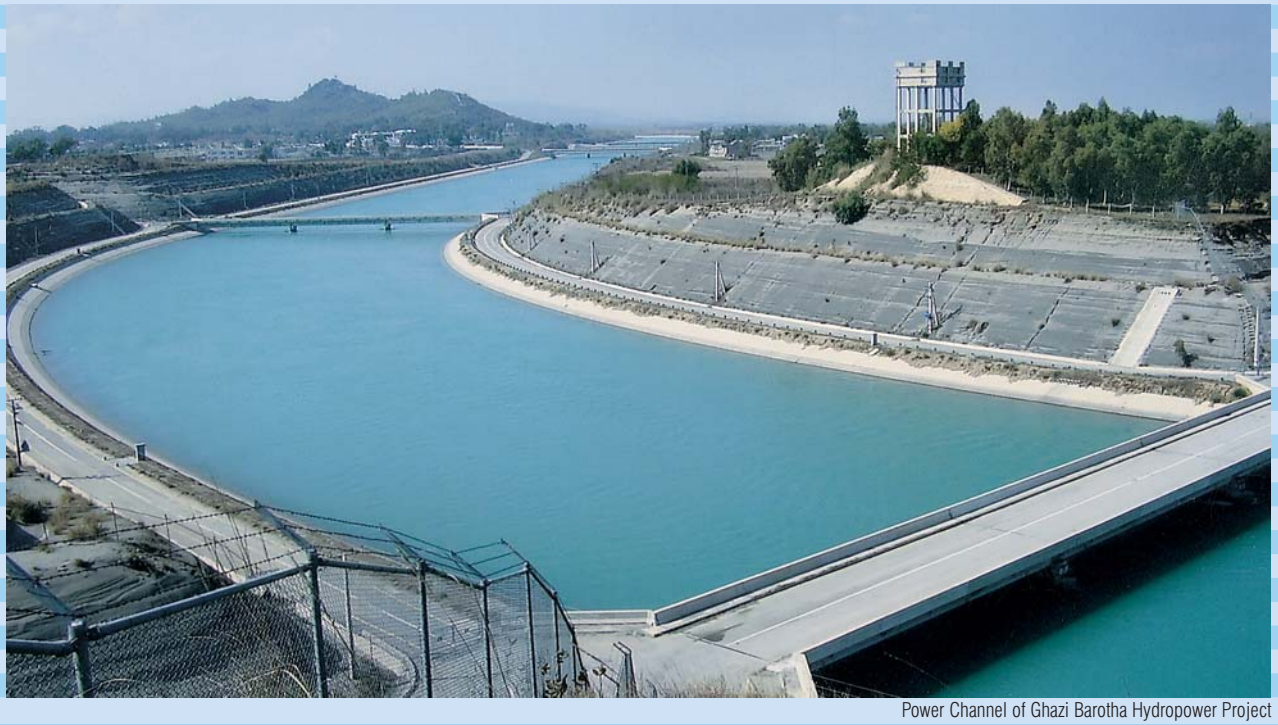
The principal items of power equipment are as follows:-

- Five Francis turbines each with a 290 MW generator which together have a combined power generating efficiency of 94%.
- Five three-phase banks of transformers, each single-phase unit being 107.5 MVA.
- 500 KV conventional outdoor switchgear configured in one-and-a-half breaker arrangement.
- 12 cranes with lifting capacities from 6 to 450 tones.

Environmental, Resettlement and Social Aspects

The guiding principle for Ghazi Barotha Hydropower Project has been to maintain close contact between the engineering and environmental planners, social scientists, the local community groups and NGOs right from the feasibility stage to Project construction.

This process allowed the planning teams to identify and avoid or mitigate all potentially serious adverse environmental, social and archaeological affects. The locations for Barrage and Power Complex as well as the alignment of the Power Channel has been selected in such a way that it avoids where possible, the disruption of villages, cultural properties and other infrastructures. However, only 110 dwellings were affected, and for them three resettlement villages have been established in the vicinity of the Project area where all the basic amenities like water



Power Channel of Ghazi Barotha Hydropower Project

supply, sewerage, schools, moseques etc. have been provided by WAPDA to the affected households resulting no out of area resettlements.

A Project NGO, namely Ghazi Barotha Taraqiati Idara (GBTI) was established and funded by WAPDA to assist in mitigating the genuine public concerns on the matters relating to land valuation and compensation, displacement of affectees and resettlement, loss of livelihood, employment and other social and environmental concerns. In addition to this, GBTI has implemented an integrated regional development plan and carried out development activities in the project affected areas.

The power channel alignment is mostly in cut, having a total of 76 million cubic meter of excess spoil material extracted out of the channel excavation. To avoid hauling the material over long distances, the spoil material has been used for construction of spoil banks along the power channel, terracing of waste land, reclamation of land along the left bank of Indus River and filling of deep gullies, while providing an environmentally satisfactory permanent solution. The spoil banks and gullies have been leveled, covered with top soil and to be provided with tubewell irrigation. It has been planned to sell back these developed banks to the interested affectees for cultivation purposes.

Against this disruption to the local community the construction works employed about 13,500 local people and many local companies. Over the course of the construction this influx of capital into the local economy has had a significant effect on improving the business opportunities and economic growth particularly in the project area.

To avoid the environmental concerns of the people residing along the banks of Indus River downstream of Ghazi Barrage, compensation water is being released through barrage into the original course of the river. For the villages on the both sides of power channel, 46 No. of crossings have been provided over the power channel.

Project Implementation

In the feasibility report, the time for project implementation of civil and M&E contracts was estimated as 63 months starting from 1st April, 1993. With the approval of PC-1 of Preparatory Works including land acquisition, relocation, resettlement, construction of colonies and other infrastructure for the Project were commenced in 1995. The implementation of the Project ultimately came to fruition with the inauguration ceremony of the Commissioning of Unit No. 1 and Unit No. 2 on 19th August, 2003 by the President of Pakistan. The work on the commissioning of other units continued

and Unit No. 5 was commissioned in April, 2004. The construction of the North Headpond was completed in December, 2004 thus completing the implementation of the Project works.

Project Financing

The PC-1 of the Project was approved by Government of Pakistan in July 1994 at a total cost of Rs. 89,840 million. The total cost which has been incurred on the Project is Rs. 96,957 million. When the project was approved for construction the estimated total project cost was US $ 2,250 million (World Bank, SAR, 1995 price levels). Latest estimates for the Project out-turn costs are $ 1,922 million.

The Project has been funded by WAPDA supported by the following international lending agencies:-

- World Bank.
- Asian Development Bank
- Japanese Bank for International Cooperation
- Kreditanstalt fuer Wiederaufbau (KfW)
- European Investment Bank
- Islamic Development Bank.

This Project is an important component of Pakistan's power system. The least cost of the Project remains valid for the full range of sensitivity analysis performed. The Project has highly favourable economic parameters. It has an EIRR of 22.19% and FIRR of 13.76%. The economic and financial returns have shown that the Project forms a part of the least cost generation expansion plan for Pakistan.

PRINCIPAL PROJECT DATA

BARRAGE	
Normal Pond Level	340.0 m
Live Volume	62 M m^3
Design Flood	18,700 cumecs
Survival Flood	46,200 cumecs
Embankments	
Fuseplug, Rim and Dividing Island	
Standard bays	
No. of Openings	20
Crest Level	332.2m
Undersluices	
No. of Openings	8
Crest Level	326.0 m
Head Regulator	
No. of Openings	8
Crest Level	333.0 m
POWER CHANNEL	
Design Flow	1,600 cumecs
Longitudinal Slope	1:9,600
Length	51,906 m
Full Supply Depth	9 m
Bed Width	58.4 m
Side Slope	IV : 2 H
Lining Thickness	135 mm
Structures	
Road Bridges	20
Railway Bridge	01
Superpassages	27
Drainage Inlets	24
Escapes	05
Culverts	01
POWER COMPLEX	
Headponds and Forebay	
Normal Pond Level	334 m
Live Volume	25.5 Mm^3
Embankments	
Forebay, South and North headponds	
Siphon Spillway	1,600 cumecs

Intake		
No. of Openings	10	
Crest Level	305.5 m	
South Sill		
No. of Openings	3	
Sill Level	323 m	
North Sill		
No. of Openings	10	
Sill Level	321 m	
HYDRO MECHANICAL EQUIPMENT		
Penstocks		
No.	5	
Thickness	28 -35 mm	
Diameter	10.6 m	
Length	220 m	
Gates		
Type		
Radial	40 No.	18.3 x 9 - 2.8 m
Fixed Wheel	10 No.	5.37 x 10.75 m
Vertical Lift	08 No.	9.5 x 9.05 m
Bulkhead	04 Sets	5.66 x 10.75 m
Stoplogs		
Vert. Lift	20 sets (182 sections) 18.3 x 15 - 8 m	
Cranes		
Gantry	05 No.	60/10 to 100/10 ton
Bridge	06 No.	6/2 to 450/60 ton
Mobile	01 No.	100 ton
Turbine		
Type	Francis	
Number	05	
Full Gate Output	295 MW	
Generator Transformers		
Number	05	
Continuous Rated Output	322.5 MVA	
Rated Voltage HV:LV	515 / 3:18 KVA	
Switchyard		
No. of 500 KV Bays	06	
Scheme of Layout	Breaker & Half Scheme	

Status of the Project during 2012-13

Power Generation

The annual generation parameters of the Power Station having total installed capacity of 1450 MW (5 units of 290 MW each) are as follows:-

- Net Electrical Output 66588.891 MKWh
- Maximum monthly generation during October, 2012 775.161 MKWh
- Total units generated during 2012-13 7164.656 MKWh

Operation & Maintenance

- Operation & Maintenance of Civil Structures of the Project remained continued. Monitoring which includes data collection, survey & physical inspection of structures of the project, remained continued.
- Removal of wild growth & unwanted trees around the project structures was carried out with manual labour.
- Routine inspection & maintenance of power house intake structures and draft tubes of different units was carried out after taking shut down from concerned agencies.

Land & Litigation Issues

Total land required for the project was 85205 Kanals, out of which 85125 Kanals have been acquired and awards of the remaining land for 80 Kanals is being pursued by concerned LACs of Punjab & Khyber Pakhtunkhwa provinces.

Total amount remitted by GBHP to LAC was Rs. 4556.902 million, out of which Rs. 4401.384 million have been disbursed to the affectees. The remaining amount will be disbursed as and when the awards are completed.

Total number of litigation cases established by GBHP or affectees, was 2403, out of which 1970 have been decided and 435 are pending in different courts which are vigorously being pursued.

Out of 1970 cases, 1444 have been decided in favour of WAPDA, 270 against WAPDA, 37 cases partially against WAPDA and 83 cases have been withdrawn, while 88 cases have been mutually agreed.

Resale of land at spoil banks is in progress and upto date 2192 Kanals have been sold out to 61 Nos. PAPs in Khyber Pakhtunkhwa.

Chashma Hydel Power Station

Introduction

Chashma Hydel Power Station is located on the Indus River close to Right embankment of Chashma Barrage. It is low head hydel power station utilizing available head of 04 meters to 13 meters. Bulb type turbines have been installed here and it is the 1st one of its type in Pakistan. It is run-of-river plant and its operation/loading is dictated by the releases downstream Chashma Reservoir being controlled by the Indus River System Authority (IRSA).

The annual generation parameters of the power station are as follows:-

The annual generation parameters of the power station are as follows:

Net Electrical output during FY 2012-13 up to 6th October, 2012	1115.134 MKWh
Maximum monthly generation attained during September, 2012	114.038 MKWh
Maximum daily generation attained on 6th October, 2012	4.341 MKWh
Maximum load attained on 28th September, 2012	184 MW
Cumulative generation up to 30th June, 2013	12458.441 MKWh

Reservoir	
Maximum Pond Level	197.8 Masl
Minimum Pond Level	194.5 Masl
Head Race Power Channel	
Length	1000 Meters
Bed Width	136 Meters
Side Slope	4:1
Tail Race Power Channel	
Length	1200 Meters
Bed Width	136 Meters
Side Slope	4:1
Power House	
Turbine	Bulb Type [Kaplan] 1 ~ 8
Make	Fuji, Japan
Output	23 MW
Rotation speed	85.7 RPM
Runner dia	6.3 Meters
Guide Vanes	16 Nos.
Discharge/Unit	298 m^3/s
Head available	4.0~13.8 m
Rated head	8.4 m
Generator	
Make	Fuji, Japan
Output	23 MW
Rated Capacity	26 MVA
Power Factor	0.9
Voltage	11 KV
Transformers	
Make	GE, Alsthom France
Voltage	11/132 KV
Capacity	27.5 MVA

Chashma Hydel Power Station

Operational Availability

The installed capacity of Chashma Hydel Power Station is 184 MW, consisting of 08 units each of 23 MW. The operational availability of the units during the year has been as under:-

Operation	:	93.19 %
Standby	:	02.60 %
Maintenance	:	03.97 %
Forced Outage	:	0.24 %

The energy generation during the year 2012-13 was recorded as 1122.110 MKWh.

A large quantity of trash travels towards intake of power house. The quantum of trash increase manifold during flood and rainy seasons. All the available trash disposable resources are best coordinated to minimize the generation loss for obtaining optimum output. The removal of trash is being handled with the following installed equipment:-

1. Trash Rack Cleaning Machine
2. Mobile Crane
3. Dragline
4. Monorail Cranes

During the year, quantity of trash removed was 53741 m^3 through above mentioned equipments.

Down Stream view of Jinnah Hydel Power Station

Jinnah Hydel Power Station

Introduction

Jinnah Hydel Power house is located on the Indus River adjacent to existing Jinnah Barrage, 5 Km away from upstream township of Kalabagh, Distt. Mianwali, in North West corner of Punjab province. It is low head plant utilizing available head from 3.2 to 6.2 meters. The pit type Kaplan (horizontal) turbines have been installed here and it is first one of its type in Pakistan. It is run-of –river plant, very low head, high water flow & silts conditions. The date of commencement of Jinnah Hydroelecrtric project was 18th February, 2006. Units 1~5 have been commissioned and unit No.8 is under 30 days reliability test run by DEC, while remaining 02 Units are expected to be commissioned up to mid of August, 2013.

Annual Maintenance of Units

Annual maintenance of units No.1 & 3 along with associated equipments/auxiliaries were carried out as per prescribed check sheets.

Events	Unit No. 1		Unit No. 2		Unit No. 3	Unit No. 4	Unit No. 5	Unit No. 8
Unit first synchronized	06.01.12		29.09.12	24.08.12	22.06.12	16.0313	20.03.13	30.05.13
72 hrs continuous reliability test run started	08.01.12	14.02.12	04.04.12	25.08.12	24.06.12	18.03.13	20.03.13	31.05.13
72 hrs continuous reliability test run completed	11.01.12	17.02.12	08.04.12	28.08.12	27.06.12	21.03.13	23.03.13	04.06.13
30 days reliability test run started	01.03.12		07.09.12		15.07.12	27.03.13	27.03.13	26.06.13
30 days reliability test run completed	30.03.12		06.10.12		16.08.12	30.04.13	26.04.13	---
Commercial trial run	31.03.12		07.10.12		18.08.12	17.06.13	17.05.13	---

The annual generation parameters of the Power Station are as under:-

Annual Energy generation during Financial Year 2012-13 (January-June)	202.0073 MKWh
Progressive generation since commissioning	231.3407 MKWh
Net Electrical output during Financial Year 2012-13	198.1228 MKWh
Maximum monthly generation attained during April - 2013	32.3983 MKWh
Maximum daily generation attained on 13-04 -2013	1.3013 MKWh
Maximum load attained on 10-04 -1013	59.70 MW

Mangla Dam Raising Project

Mangla Dam Raising Project

Mangla Dam Raising Project is a mega water Project which is being implemented on fast track under Vision 2025 Programme for Water Resources and Hydropower development.

By operating the raised reservoir at full capacity i.e. at EI:1240 ft., the average annual water availability for irrigation releases would increase by 2.9 MAF and the average annual energy output is estimated to increase about 12 percent of the present energy production. The project will also generate employment opportunities and give a fillip to socio-economic activities in the area besides increased flood alleviation and enhancement of quality food fish.

PC-1 Cost

PC-I Proforma of the Project for a total Cost of Rs. 62,552 million was approved by the ECNEC on 27th September, 2003. In view of the substantial increase in the cost of land acquisition, the PC-I Proforma was revised by WAPDA for a total cost of Rs.101,384 million and submitted to the Ministry of Water & Power on 24th July, 2007. CDWP in its meeting on 30th April, 2008 recommended Revised PC-I to ECNEC for approval. ECNEC, in its meeting held on 26th May, 2011 approved the Revised PC-I subject to rationalization of the cost by the committee chaired by Secretary Water & Power and Secretary P & D, Secretary Finance & Chairman WAPDA as member. Chairman CDWP was also authorized to approve the rationalized cost of the Project to be worked out by the Committee. The Rationalization Committee in its meeting held on 29th July, 2011 constituted a sub-committee. The recommendation of the Committee was discussed in the Rationalization Committee in its meeting held on 8th October, 2011 and asked Chairman WAPDA to submit rationalization cost.

In pursuance of the decision of the Rationalization Committee, Chairman WAPDA submitted rationalized cost of Rs. 97.553 billion on 16th February, 2012. The matter, however remained undecided for quite a long time and finally the matter was again discussed by the Rationalization Committee on 12th June, 2013. After in depth discussion, the Rationalization Committee recommended the PC-I at the rationalized cost of Rs. 96.853 billion to the Chairman CDWP for authorization and approval as per ECNEC's decision. The approval by Chairman CDWP is awaited.

Physical Status

The overall physical progress of the Mangla Dam

Raising Project till 30th June, 2013 is 98.4 %.

A brief status of Preparatory Works, Dam Raising works and Resettlement Works is given below:-

Progress of Preparatory Works

Construction of the Saddle Embankment (Contract MDR-02) has been completed since September, 2004.

The Contract for the Construction of Bridge over Bong Canal and Powerhouse Bypass Road (Contract MDRP-06) was awarded to M/s Gammon Sarwar Joint Venture, on 10th July, 2003 and was completed and inaugurated by Prime Minister of Azad Jammu & Kashmir on 13th June, 2009.

Dam Raising Works

The Contract for the Construction of Main Works (Contract MDR-10) of Mangla Dam Raising Project was awarded to a Joint Venture of one Chinese and four Pakistani Contractors (CWEJV) on 14th June, 2004 for an amount of Rs. 13.793 billion.

The Joint venture is lead by Chinese Contractor namely China International Water and Electric Corporation (CWE). The local Contractors in CWEJV include DESCON Engineering, Sardar M. Ashraf D. Baluch, Interconstruct and Sachal Engineering Works. The construction was scheduled to be completed in 39 months by September, 2007.

The construction of major components of Main Works i.e. Main Dam & Intake Embankment, Sukian Dyke, Jari Dam & Rim Works, Main & Emergency Spillways and Mirpur bypass road have been substantially completed on December, 2009. After achieving the significant milestone, formal inauguration ceremony of Mangla Dam Raising Project was held on 13th October, 2011 and the Dam was inaugurated by Honorable Prime Minister of Pakistan Syed Yousaf Raza Gilani. These Works involved Earthworks of about 50 million cu yds while the quantity of concrete placed for Spillways and other structures was about 0.2 million cu yds. Besides the Embankments Raising Works, Special Activities of Construction of Control Weir (Emergency Spillway) (830 ft. long and 65 ft. high) with Roller Compacted Concrete (RCC) and Underwater Toe Weight (1100 ft. x 800 ft. x 80 ft.) were also carried out. Test / partial impounding of water up to El. 1210 ft. was carried out during the monsoon of 2010 & 2011. However, due to non-availability of water in 2012, the further impounding above El. 1202 ft. could not be carried out. All works, including dam raising and resettlement, have now substantially been completed and in view of the completion of works all stakeholders (WAPDA & Government of Azad Jammu Kashmir) are determined for capacity impounding of water up to El. 1242 during the following monsoon of 2013.

Contract MDR-39: Replenishment work of existing Riprap from El. 1170 ft. to El. 1195 ft. on upstream side of Main Dam and Intake Embankment. Contract awarded to M/s Khyber Grace (Pvt.) Ltd., Islamabad in October, 2012. 100% placing of riprap material was completed on 25th May, 2013. Only allied activities are in progress.

Resettlement Related Activities

A very attractive resettlement package was agreed by the Government of Pakistan for affectees of Mangla Dam Raising Project. Compensation of land has been paid at market price along with 15% compulsory acquisition allowance. Compensation of houses was made on replacement cost plus ten per cent allowance. A New City has been developed adjacent to Mirpur City with modern infrastructure and public amenities to resettle the Mangla Dam Raising Project affectees. In addition, Four Small Towns have been developed on periphery of the reservoir for affectees of those areas. The affectees have been allotted plots of 5 Marla to 1 Kanal size. The resettlement package also included vocational training of male and female to improve their earning capacity.

Contract MDR-22: The Contract for the construction of Vocational Training Institute (VTI) at New City was awarded to M/s Shaikh Javaid Ahmed, Engineer & Contractors on 26th March, 2006. The VTI Building was completed on 15th October, 2009. The building is being used for its intended purpose by the Government of Azad Jammu & Kashmir since its completion.

Upgradation of Existing Female Dastkari Schools, execution of Civil Works in Mirpur, Islamgarh and

Mangla Reservoir

Dudial Dastkari schools has been completed. Repair and renovation works of Mirpur and Islamgarh Dastkari Schools have also been completed.

An amount of Rs. 0.306 million has been paid to about 150 female students during the years 2004-05, 2005-06, 2006-07, 2007-2008, 2008-2009 & 2009-2010.

Vocational Training for Males from outside sources is in progress. Training at Construction Machinery Training Institute (CMTI) Islamabad started in January, 2003. So far, 119 affectees completed their training.

Contract MDR-24: Contract for Development of New City was started with award of Contract for construction of 21 Km long Primary and Secondary Roads to M/s Habib Rafiq (Pvt.) Ltd. on 23rd April, 2005. Upon substantial completion of the works, TOC effective from January 27, 2012 was issued. So far payment of Rs. 1,369.59 million has been certified. Work on punch list items is in progress. The progress of work uptill 30th June, 2013 is 97.10%.

Contract MDR-25: Contract for Infrastructure development in New City was awarded to M/s HRL (Pvt.) Ltd. on 17th October, 2006. Upon substantial completion of work, TOC was recommended w.e.f. 31st December, 2012. Up-to-date payment certified is Rs.1,482.71 million. Work on punch list items is in progress. Overall progress is 93%.

Contract MDR-26A: Construction of roads including water supply and sewerage works in small towns near Islamgarh and Chaksawari was initially awarded to M/S KKP (Pvt.) Limited which was terminated on 26th June, 2009 due to non-performance. The Contract was re-awarded to M/S CWE-TTP JV on 8th December, 2009. Upon substantial completion of work, TOC has been issued w.e.f. 31st December, 2012. Up-to-date certified amount is Rs.1,600 million. Progress up till 30th June, 2013 is 97.50%.

Contract MDR-27A: (Construction of roads including water supply and sewerage works in small towns near Dudial and Siakh). Original Contract with M/s KKP (Pvt.) Ltd. was terminated on 26th June, 2009 due to non-performance. The Contract was re-awarded to M/s CWE-TTP JV on 8th December, 2009. Upon substantial completion of work, TOC effective from 30th April, 2012 was issued. Up-to-date certified amount is Rs.1,063.01 million. Work on punch list items is in progress. Progress is 99.10%.

Contract MDR-28A: Original Contract for Public Buildings in New City Package 1 was awarded to

M/s Shaikh Javed Ahmad on 21st February, 2006. Due to persistent poor progress of the Contractor, the Employer finally terminated the Contract on 12th June, 2010. The Contract was then re-awarded to M/s DESCON (Construction of remaining works of public buildings in New City - Package 1). Upon substantial completion of work, TOC effective from 4th May, 2012 was issued. Up-to-date certified amount is Rs. 673.63 million. Work on punch list items is in progress. Overall progress is 99.00%.

Contract MDR-29A: Contract for construction of remaining works of public buildings in New City Package 2 was re-awarded to M/s A.S Khan with commencement date of 8th December, 2009. Upon substantial completion of work, TOC effective from 31st December, 2012 was issued. Up-to-date certified amount is Rs. 489.20 million. Work on punch list items is in progress. Overall progress is 95%.

Contract MDR-32: Contract for water supply intake works in New City was awarded to Friends Engineering Company on 17th May, 2006. The work of distribution lines is substantially completed in New City. Alternate water supply system to be installed at Jari Intake area is left. The overall progress is 87.00%.

Contract MDR-33: Construction of water treatment plant for New City was awarded to M/s DESCON on 28th August, 2006. The works have been completed and Defects Liability Certificate w.e.f 30th September, 2011 issued. Water Treatment Plant was handed over to Government of Azad Jammu & Kashmir on 29th February, 2012.

Contract MDR-34: Contract for sewerage treatment plant was awarded to M/s Habib Rafiq with the commencement date of 9th August, 2007. Sewerage treatment plant (STP) No. 2 was substantially completed and in operation since October, 2011. Work on sewerage treatment plant No. 1 is in progress. Overall progress is 85.40%.

Contract MDR-35A: (Construction of remaining works of public buildings in small towns near Islamgarh and Chaksawari). The Contract was terminated and re-awarded to M/s CWE-TTP JV. The Contract was awarded to M/s CWE TTP JV at a contract price of Rs.597,829,714. Construction activities on buildings (boys & Girls secondary school, Vocational Training School, Basic Health Unit, Social Centre, Mosque, Residences of Imam, Moazzin and Khadim, Shopping Centre, Police Station, Post Office and Public Toilets) is in progress. The overall progress of the Works is 75%.

Contract MDR-36A: (Construction of public buildings in small towns near Dudial & Siakh). Original contract with M/s KKP (Pvt.) Ltd. was terminated on 26th June, 2009 due to poor performance. The contract was re-awarded to M/s TECHNO International Islamabad at a cost of Rs.565.78 on 12th December , 2009. Construction activities on buildings (boys secondary school, Police station, Mozzin House, Shopping centre and Masjid) is in progress. The overall progress of the Works is 60%.

Contract MDR-37: (Electrification in New City). Upon substantial completion of work, TOC effective from 31st December, 2012 was issued. Work on punch list items is in progress. Up-to-date certified amount is Rs. 350.76 million. The overall progress of the Works is 96% achieved by the end of this year.

Contract MDR-38: Contract for electrification in four small towns was awarded to M/s PEL (Pvt.) Ltd. on 14th September, 2007. Upon substantial completion of work, TOC effective from 31st December, 2012 was issued. Up-to-date certified amount is Rs. 351.38 million. Work on punch list items is in progress. The overall progress of the Works is 96.50%.

Confidence Building Measures

The confidence building measures (CBMs) include construction of Bridge over Jhelum River at Dhangali, Kharak Dyke, Panyam Dyke and two Grid Stations, have already been completed.

The progress of CBMs under three new different Contracts as CBMs were added in year 2012-13 and their status is briefly described as below:-

Dual Carriageway

Contract MDR-40: Construction of Mangla-Mirpur Dual Carriageway Package-1: Construction and upgradation of existing Mangla-Mirpur road from Bohr Chowk to Sahab Chowk. Contract awarded to M/s Sachal Engineering Works (Pvt.) Ltd. in February,

Vocational Training Institute, New Mirpur City

2013. Excavation and protection works remained in progress. About 12% progress has been achieved.

Parks

Construction and development of Three Nos. Parks along Mirpur bypass road at Ch 100+00, 119+00 and 193+00 ft. M/s A.S. Khan Construction (Pvt.) Ltd., the Contractor of MDR-29A commenced construction and development of three parks. Works remained suspended in Park-A since April, 2013, 35 % works in each Park-B, & 30% Park-C have been completed by end June, 2013.

Resettlement Action Plan

At the time of original construction of Mangla Dam, land on the periphery of Mangla Reservoir was acquired up to El. 1210.00 ft (368.9 m). For the raised Mangla Reservoir, additional land up to El 1250.00 ft (381.1 m) measuring 16,384 acres (6,630 ha), has mostly been acquired. Out of this about 79 % of the land is in Azad Jammu and Kashmir (AJK) and the remaining 21 % is in Punjab. By raising of the Mangla Dam, about 50,000 persons are being displaced and about 13,300 houses and other buildings are affected.

For resettlement of displaced population, a New City adjacent to the existing Mirpur City is being developed with modern infrastructure and public amenities. In addition, four small towns adjacent to the existing towns of Islamgarh, Chaksawari, Dudial and Siakh are also being developed on periphery of the Mangla Reservoir for the Project affectees near their original habitat. Development of infrastructure of the New City and four small towns covered under the Project Cost.

Allotment of Plots to the Affectees in New City and Four Small Towns

The process of handing over of developed plots in New City and four small towns to the Government of Azad Jammu & Kashmir for further allotment to the affectees was started in March, 2009.

All the required plots (10,326) have been developed and handed over to the Government of Azad Jammu & Kashmir.

Baseline Inspection of Raised Mangla Dam

Baseline inspection of raised Mangla Dam started by Mangla Joint Venture (MJV) Consultants in collaboration with Mangla Dam Organization (MDO) WAPDA in September, 2012 and site visits of all the experts related to concerned disciplines were completed by 28th April 2013. Preparation of report by MJV is in progress.

Overall Progress of Project Works

The overall progress of the project works upto 30th June, 2013 is 98.40% against planned progress of 100%.

MANGLA DAM RAISING PROJECT DETAILED ANNUAL PLAN
WAPDA (WATER WING) 2012-13

Name of Project	Unit	Physical Progress Upto 30-6-12	Physical Targets For 2012-13	Actual Achievement Upto 30-6-13	Physical target fixed for 2013-14
Construction of Saddle Embankment	%	100.00%	0.00%	100.00%	-
Construction of Power House By-pass Road & Bridge on Bong Canal	%	100.00%	0.00%	100.00%	-
Renovation of Office & Camps for WAPDA and Consultants	%	100.00%	0.00%	100.00%	-
Construction of Main Works	%	100.00%	0.00%	100.00%	-
Resettlement works (Infrastructure Development in New City & Four Small Towns)	%	83.40%	16.60%	92.30%	7.70%
Compensation of land, houses & old affectees	%	98.00%	2.00%	100.00%	-

Site of Diamer Basha Dam

Diamer Basha Dam Project

The Project

The project is located on Indus River, about 315 Km upstream of Tarbela Dam, 180 Km downstream of the Gilgit-Baltistan capital Gilgit city and 40 Km downstream of Chilas city. The proposed RCC dam would have a maximum height of 272 m, and impound a reservoir of about 8.1million acre feet (MAF), with live storage of 6.4 MAF. Mean annual discharge of Indus River at the site is 1977 Cumecs. The dam will impound 15% of the annual river flow. The project would cover an area of 110 Km^2 and the reservoir would extend 100 Km upstream of the dam site upto Raikot Bridge on Karakoram Highway (KKH).

Need of the Project

Agriculture is the backbone of Pakistan's economy. Pakistan today is among one of the World's fastest growing population, now estimated as over 150 million. Due to lack of large river regulation capability through sizeable storages, the country is already facing serious shortages in food grains. Given the present trend, Pakistan could soon become one of the food deficit countries in the near future. Therefore, there is a dire need to build storages for augmenting agriculture production.

Tarbela, Mangla and Chashma reservoirs have already lost about 5.3 MAF due to sedimentation. It is estimated that by year 2016, this loss would increase to 6.6 MAF, almost equal to the original combined capacity of Mangla and Chashma reservoirs. Due to state of stalemate in the development of additional sizable multi-purpose storage projects in the system after commissioning of Tarbela Dam in 1976, sustainability of existing irrigated agriculture of Pakistan is in serious jeopardy.

In addition, the present demand of electricity in the country is above 17,000 MW, which is estimated to cross 30,000 MW by the year 2017. A large-scale injection of dependable, cheap and renewable energy thus becomes inevitable. The Hydropower projects will provide the dependable power/energy at affordable price. Contribution of 4500 MW power from Diamer Basha Dam will go a long way in alleviating this situation.

Resettlement Action Plan

- Resettlement and Environment management plans have been prepared on the international norms as per ADB Safeguard Policy Statement June-2009.

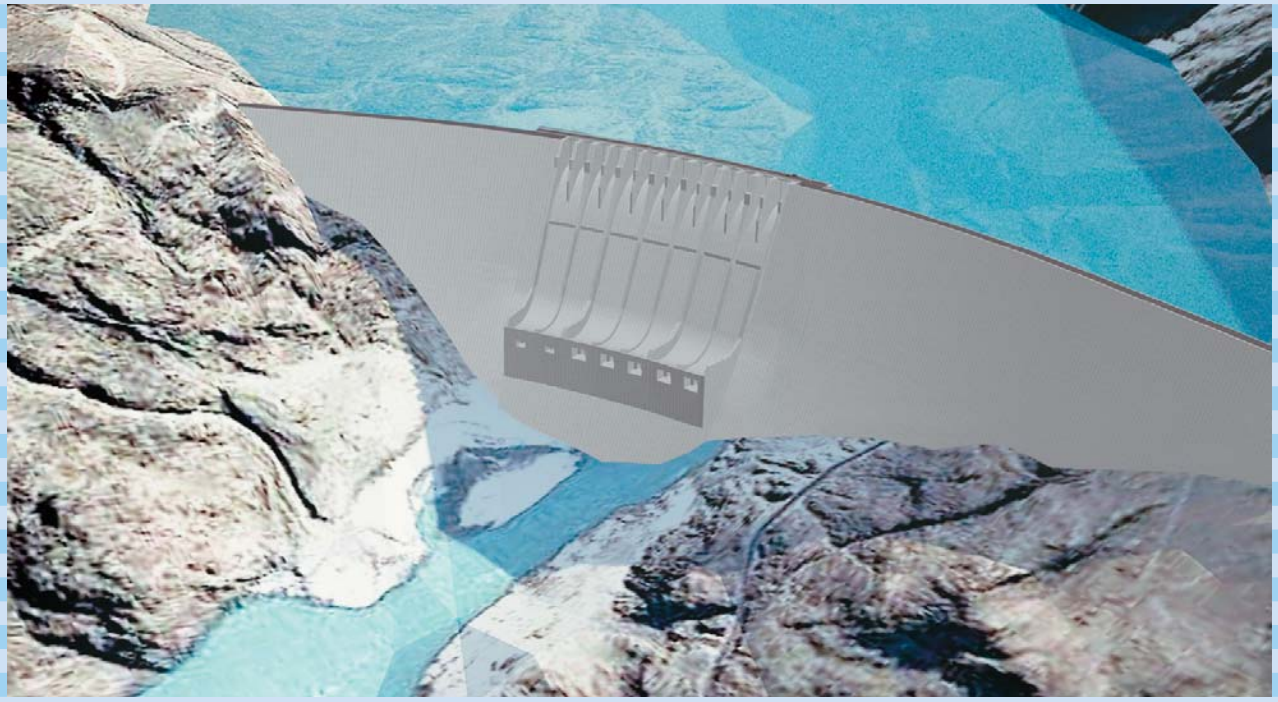
MAIN FEATURES

Main Dam	
Maximum height	272 M
Type	Roller Compacted Concrete (RCC)
Diversion System	2 No. Diversion Tunnels (right side) 1 No. Diversion Channel (right side) Upstream and Downstream Coffer-dams
Main Spillway	
No. of gates	14
Size of gate	11.5 x 16.24 M
Reservoir	
Full supply level	1160 masl
Crest elevation level	1170 masl
Gross storage	8.1 MAF (10.0 BCM)
Live storage	6.4 MAF (7.9 BCM)
Min. operating level	1060 masl
Outlets In Dam Body	
Low level	2
Flushing	5
Power House(s)	2
Total installed capacity	4500 MW
Location and type	Underground, one each on right and left side
No. of Units	12 each of 375 MW
Average generation	19208 Gwh/year (Diamer Basha = 18097 Gwh/year) (Tarbela = 1111 Gwh/year)
ESTIMATED COST	US $ 11.178 billion (As per approved PC-I 2009)
UPDATED COST	US $ 13.684 billion (Updated July, 2012)
Concerned Authorities	
Sponsoring	Government of Pakistan
Execution	Water & Power Development Authority (WAPDA)
Operation & Maintenance	Water & Power Development Authority (WAPDA)
Concerned Federal Ministry	Ministry of Water & Power, Government of Pakistan

Project Benefits

- Availability of about 6.4 MAF annual surface water live storage worth US $ 0.63 billion
- Harnessing of renewable source of clean and cheap energy through installed capacity of 4500 MW generating revenue of US $ 2.216 billion per annum.
- Extending life of Tarbela reservoir by 35 years by blocking the sediments upstream.
- Additional annual generation at Tarbela 1111 GWh worth US $118.3 million
- Saving in foreign exchange of equivalent electricity generated on imported oil worth US $ 2.85 billion
- Carbon credit benefits costing US $ 0.300 billion
- Employment opportunities, particularly to the locals during the construction and subsequently in agriculture, industry and the commercial sectors.
- The project will pay back its cost in 8 years

Environment And Cultural Heritage Impact Assessment	
No. of villages affected	32
No. of households / families affected	4228
Population affected	30,350
Agricultural land submerged	2660 Acres
Length of KKH submerged	100 Km
Length of KKH relocated	140 Km
Prehistoric rock carvings	33000 Nos.
Infrastructure	Electricity lines, roads etc.
Total land to be acquired	37,419 acres (Private land = 18,357 Acres) (Govt. land = 19,062 Acres)



Model of Diamer Basha Dam

- Three Composite Model Villages with all the amenities shall be developed for resettlement of 4228 affected households / families. Each affected households / families shall be given a residential plot of one kanal free of cost.
- Infrastructure development works like Right Bank Periphery Road and Integrated Area Development Plan will be implemented for sharing of benefits among the indirect affectees of the project.
- Selected important rock carvings shall be displayed in a museum in Chilas others shall be preserved in situ.

Main Project Implementation

Implementation / construction activities of main project which were scheduled to commence in 2012-13 and completion is envisaged in 2022-23 but could not be commenced due to non arrangement of funds from donor agencies. Implementation of the main project has been divided in 5 Lots as discussed below:-

Government of Pakistan's Approvals

- PC-I of Diamer Basha Dam Project amounting to Rs. 894257 million with F.E.C of Rs. 312943 million was approved by ECNEC on 20th August, 2009.
- Diamer Basha Dam Project was approved unanimously by Council of Common Interests (CCI) on 18th July, 2010 for National Consensus.

Lot No.	Description
LOT - 1	Concrete Dam and Related Structures including Diversion Tunnels and Permanent Access Bridge. (Local Rs.87680 + Foreign Rs.58480 = Total Rs.146160 million)
LOT - 2	Underground Power House Works and Related Structures (Left and Right Banks) (Local Rs.40960 + Foreign Rs.13840 = Total Rs.54800 million)
LOT - 3	Hydro-Mechanical Equipment and Hydraulic Steel Structures (Local Rs.3360 + Foreign Rs.30400 = Total Rs.33760 million)
LOT - 4	Power Plant Generation Equipment (Left and Right Bank) (Local Rs.8240 + Foreign Rs.74160 = Total Rs.82400 million)
LOT - 5	Electrical High Voltage Equipment and Power Plant Electrical Equipment (Left and Right Bank) (Local Rs.8720 + Foreign Rs.76320 = Total Rs.85040 million)

Land Acquisition

Land Acquisition process was started in 2010 and will be completed within three years. Government of Pakistan had allocated Rs.7.785 billion for acquisition of land & resettlement during the year 2012-13.

- Total Land to be acquired = 37,419 Acres
- Private Land being purchased = 18,357 Acres
- Government Land to be transferred free of cost = 19,062 Acres
- Land Acquired (Upto June 2012) = 1,945 Acres
  GBA 1,783 Acres
  KPK 162 Acres

- Funds to the tune of Rs. 6563.000 million have been released for payment of compensation to affectees in Gilgit-Baltistan against the ADP allocations made upto 2012-13. Acquisition of remaining private land is actively under consideration of GBA.
- Rs.262.000 million has been released to D.C. Kohistan for land acquisition of Khyber Pakhtunkhwa area for Contractor's Camp.
- One Window Compensation Cell has been established by Deputy Commissioner, Diamer.

Project Colony at Thor Valley

Project Colony and offices in Thor Valley, Chilas, district Diamer are being constructed through16 contract packages. 12 contracts have been awarded. Work at site is in progress.

Construction of Composite Model Villages

Three Composite Model Villages at Thak Das, Harpan Das and Kino Das with all the amenities shall be developed for resettlement of 4228 affected households/families. Each affected households/ families shall be given a residential plot of one kanal free of cost. The construction work of Composite Model Village-II (Harpan Das) is planned through six contract packages. Two contracts have been awarded, other contracts are in pipeline.

Construction of Bypass from Shatial to Thor Nullah to existing KKH (35 Km) by NHA as WAPDA's Deposit Work

During construction of main dam, the existing KKH is to be used for construction activities while the Bypass on KKH from Shatial to Thor Nullah being constructed by NHA as WAPDA deposit work will be utilized for uninterrupted traffic flow. Contract has been awarded and work is in progress at site.

Construction of Permanent Access Bridge over Indus River Downstream of Diamer Basha Dam Project

Permanent access bridge over Indus River downstream of Main Dam shall be constructed for contractor movement from Left Bank to Right Bank of River Indus. Selection of consultants for procurement of consultancy services for design, construction supervision and contract administration of permanent access bridge is under process.

Consultancy Services for Core Project Activities

WAPDA has started the process for procurement of consultancy services for construction design, construction supervision and contract administration of Diamer Basha Dam Project. EOI issued, three joint ventures pre-qualified. Preparation of RFP is in progress.

View of a Meeting with Affectees

Land Acquisition & Resettlement Wing

The Project Description

WAPDA on behalf of the Government of Pakistan and International Financial Institutions and especially supported by the Asian Development Bank (ADB), is planning to construct Diamer Basha Dam Project (DBDP) on the upper Indus River located nearly 40 Km downstream of Chilas Town.

The Project has the following salient features: a roller compacted concrete (RCC) dam crest length of over 1000 m and maximum height of 272 m, a spillway, two low level outlets (LLOs), five reservoir flushing outlets (RFOs) and two underground powerhouses on each bank of Indus River at the areas of Khyber Pakhtunkhwa and Gilgit-Baltistan with total installed capacity of 4500 MW. (2250 MW on each bank), average annual power generation will be 18097 GWh.

This energy will be evacuated to the national load centres through 765 kV transmission systems and a separate 132 kV transmission line. In addition, 111GWh of energy will be generated at Tarbela through conjunctive operation with Diamer Basha reservoir.

Gross storage volume at the full reservoir level (FRL) of 1,160 meters above sea level will be over 10 billion cubic meters (BCM). Live capacity with the minimum operating level (MOL) of 1060 Masl will be 7.9 BCM. The reservoir will impound only about 13% of the mean annual Indus River flow of over 62 BCM at the site. Reservoir length will be about 94 Km. At FRL of 1160 masl, the reservoir will have an area of 115.2 Km^2 while at MOL of 1,060 Masl the reservoir will occupy an area of 47.6 Km^2 extending to a length of 73.1 Km. 'Glacier Lake Outburst' based probable maximum flood (PMF) will be routed through the reservoir at elevation 1,167.5 Masl. With an assumed free board of 2.5 m top of the dam will be at elevation 1170 Masl with the corresponding land acquisition zone. Annual drawdown of 100 m (between 1160 and 1060 Masl) will vacate 6760 hectares, ranging in exposure from 2 to 8 months between different parts of the reservoir and provide the facility of productive recession agriculture in the area.

Environmental and Social Impact of Diamer Basha Dam Project

No. of Villages Affected	= 32
Household Families Affected	= 4228
Population Affected	= 30350
Agriculture Land Submerged	= 2660 Acres
Length of KKH Submerged	= 100 KM
Length of KKH Relocated	= 140 KM
Pre-historic Rock Carvings	= 33000 Nos.
Total Land to be Acquired	= 37419 Acres
Private Land	= 18,357 acres
Govt. Land	=19,062 acres

Project Components Involving Land Acquisition

The components and the amount of land to be acquired are as follows:-

Dam and Appurtenant Structures (Outside Acquisition Zone)	219 ha (540 Acres)
Reservoir (Upto Acquisition Zone of 1170 Masl)	12765 ha (31529 Acres)
Incidental Requirements (Camps, Roads, Model Villages)	2166 ha (5350 Acres)
Total:	15150 ha (37419 Acres)

Follow Up of Social/ Community Oriented Activities at The Project Area

The LA&R team under the supervision of GM (LA&R) paid several interactive visits to the Thore Valley. They carried out social mapping of the affected population, collected social-economic data and carried out need assessment and household survey. The team met with district administration, line agencies, MLAs, elders and Ulemas. They also had several meetings with the affectees, discussed resettlement issues with them and finally called a large Jirga meeting in which various decisions were taken. Based on the socio-economic survey, consultation, discussion sessions and need assessment with the affectees, Jirga members, notables, administration of Diamer District (Chilas), a Corrective Action Plan for resettlement and rehabilitation of affectees of Thore Valley has been prepared. Following Activities are the follow up of implementation of CAP.

Activities of Agronomist (LA&R)

Assessment of Kino Das for Development of Agriculture Plots

Field Visit of Kino Das

Assistant Agronomist along with two officers Mr. Nabi-ur-Rehman and Mr. Syed Ahmed from Agriculture Department visited Kino Das on 18.12.2012 for detailed survey and collection of soil and water samples from Kino Das.Kino Das is located approximately 30 Km from Chilas Town on Karakoram Highway towards Gilgit. The Das is located on left bank of Indus River and Gandlogah Nullah divides it in two parts.

Water Source and Water Channel

Water Source for Kino Das is a channel coming from Gandlogah Nullah. The Head of water is 2-3 Km from Kino Das in upper reaches. This Channel was made in 1970s with a lot of investment and hardwork with the aim to develop and cultivate Kino Das to benefit the local community but it could not be done due to dispute among the local community. This water Channel covers almost all the Kino Das legth wise. Very few repair work is required. Presently, the flow of water in Channel is very less because it is only used by the Shepherds according to their needs. Agriculture Officers told that more water can easily be assured when needed for Kino Das because source of water contains lot of water.

Soil and Water Samples

Soil and water samples were collected from different places in Kino Das. One composite soil sample of farmer's field from Gonerfarm was also collected for comparison with Kino Das. The soil samples were collected from 6 inches to 12 inches depths and will be analyzed for following physical and Chemical parameters to assess the fertility of soils of Kino Das.

Physical Parameters

Sr. No.	Description
1	Soil texture
2	Moisture percentage

Chemical Parameters

Sr. No.	Description
1	pH
2	EC
3	Nitrogen
4	Phosphorus
5	Potassium
6	Organic matter
7	TSS
8	SAR
9	Gypsum requirement
10	Chloride
11	Ca+Mg

Replication of Kitchen Gardening Scheme in Thore Valley

Kitchen gardening scheme in Thore Valley was a pilot testing project for agriculture development in DBDP. Although it was a small scale activity yet it has contributed a lot in ensuring food security of the affectees through provision of fresh and healthy vegetables at their doorstep. It has also created good will for WAPDA among the affectees of Project colony as they are well trained on modern agriculture techniques especially women folk of the area who are mainly engaged with agriculture activities.

Considering the success of Kitchen gardening scheme it was replicated for summer season vegetables before the large scale agricultural interventions such as Tunnel farming, Demonstration Plots, Agriculture Services Centre and Apiculture.

Training At Siri Dar- Thore

First training on Kitchen gardening was carried out at Siri Dar Thore on 19th December,2012 by Assistant Agronomist and officers from Agriculture Department. The community participated and cooperated a lot. The previous beneficiaries from Kitchen gardening scheme in Siri Dar told that they got good production from the provided vegetable seeds and methods told for vegetable production.The seeds of summer season vegetables were distributed to the people of Siri Dar Thore.

Training at Shahi Mahal Das

The second training was conducted at Shahi Mahal Das – Thore on 19th December,2012 by Assistant Agronomist and Officers from Agriculture Department. The community participated and cooperated a lot. The seeds of summer season vegetables were distributed to the people of Shahi Mahal Das.

Training at Meak-Thore

The third training on Kitchen gardening was conducted at Meak – Thore on 20th December,2012 by Assistant Agronomist and officers from Agriculture Department. The community participated and cooperated a lot. The seeds of summer season vegetables were distributed to the people of Shahi Mahal Das.

Training at Thurli Chikka

The fourth training was conducted at Thurli Chikka– Thore on 20.12.2012 by Assistant Agronomist and officers from Agriculture Department. The community participated and cooperated a lot. Thurli Chikka is inhabited with very poor people mostly Gujjars and they have no access to any Govt. or other assistance. The seeds of summer season vegetables were distributed to the people of Shahi Mahal Das.

The Community told that they had a lot of issue of water as no storage is present in Thurli Chikka. Due to this problem there is shortage of drinking and irrigation water. In this respect Mr. Nabi-ur-Rehman from Agriculture Department of Diamer told that they have funds for water storage Tanks with their Department, so they will help the local community in establishing a water storage Tank in Thurli Chikka.

First Free Veterianry Vaccination Camp

Livestock has a major contribution in livelihood of people in the rural areas of Diamer District. It produces food, enhances crop production and provides additional economic goods and services as well as cash income. Sales of livestock products provide funds for purchasing crop inputs and for financing farm investments. Livestock often forms the major capital reserve of farming households, in general and enhances the economic viability and sustainability of a farming system.

It is interesting to note that no efforts have ever been made by Government / Non-Government agencies for vaccinating /treating the livestock of these valleys prior to this campaign launched by LA&R Wing of WAPDA. The medicine used during de-worming/ vaccination for different categories of cattle was

given free of cost by WAPDA. The community of area appreciated this useful activity initiated by WAPDA for the treatment of their animals at their doorsteps. Main features of this campaign are highlighted.

The veterinary camps were established at Thore Das, Shahi Mehal, Mehak, and Sri Das of Thore Valley, Thurli and Chikka. According to Corrective Action Plan First Free Veterinary Vaccination Camp was organized in April, 2012.

Starting Activities of Second Veterinary Vaccination Camp

A free veterinary vaccination camp was organized by WAPDA for three days in the month of December, 2012 in Gais Pine, Gais Bala and Bunner Dass. It was arranged to control major diseases of livestock which were observed during the survey and social mapping in month of October in Gais Pine, Gais Bala and Bunner Das. Different places were selected keeping in view that migration pattern of families with their herds to the different villages of Gais Bala,Gais Pine and Bunner Dass such as, Gais pine Das, Gais pine Daak, Gais Pine Balki,Gais Pine Khari, Gias Pine Hiet, Gais Bala Das, Gais Bala Hamti Hiet, Gais Bala Biaariji, Bunner Das and Rai Kot. Accessible areas for the community were selected on the consultation of locals and livestock department. Total 5839 (small and large) animals were vaccinated and treated in these three days.

Conclusion

Veterinary camp was organized in April, 2012 at Thore and Thurely Valley. The impact study October, 2012 reveals a positive change in the livestock health, milk production, decrease mortality rate of animals and household economy as one the moan object in Corrective Action Plan. Veterinary camps should be replicated in Thore and Thurely Valley as well as other valley of project, as demanded by the local community for achievement of livelihood restoration to be affected by construction of Diamer Bhasha Dam.

Total Animals treated by organized vaccination camps

Sr. No.	Animals	Treated
1	Sheep and Goats	3515
2	Cattle	1432
3	Horse	48
4	Donkey & Mule	109
	Total	5104

Impacts of First Veterinary Vaccination Camp

Sr. No.	Activities	Before Vaccination	After Vaccination
1	Average Animals per Household	24	24
2	Mortality Rate	2.79%	1.2%
3	Ghee Production per Household (Goat)	29.43 kg	30 kg
	Milk production per Household (Cow)	2.06 kg	3 kg

Weir of Allai Khwar Hydropower Project

Technical Services Division

Technical Services Division was created in, 2002 to render advisory/expert services on various projects of Vision 2025. Since then, the Division has been providing technical assistance on different water resources and hydroelectric projects, including completion of feasibility study and detailed engineering of Diamer Basha Dam Project. After conclusion of detailed engineering studies, Diamer Basha Dam Project has entered into implementation stage under a separate organization. The office of the General Manager (Technical Services) supervises the following offices/formations:-

1. Chief Engineer (Technical Services)
2. Chief Engineer (Dams Safety Organization)
3. Director General (Environment)/(WEC)
4. Project Director, Central Material Testing Laboratory (CMTL)

Chief Engineer (Technical Services)

Review of Technical Reports

Office of Chief Engineer (Technical Services) reviews various engineering studies being carried out in WAPDA and provides technical support for trouble shooting and problem solving for various projects. Valuable inputs have been provided on detailed engineering design reports of Dasu Hydropower Project. This unit also carries out special inspections of WAPDA projects as and when authorized and prepares necessary technical reports. In addition, the unit also performs coordination functions to streamline the work of lower formations of the Division.

Memorandum of Understanding (MoU) between China Institute of Water Resources and Hydropower Research (IWHR) & WAPDA

In recognition of the mutual interests and close relationship of China and Pakistan, WAPDA and IWHR-China were willing to establish a comprehensive collaboration in the area of water resources and hydropower technology. In this regard, a MoU was signed on 25th July, 2009 between IWHR-China and WAPDA and thereafter, following Executive Contracts were made.

1st Executive Contract under Collaboration Agreement between WAPDA and IWHR- China

The first Executive Contract Agreement was signed on 18th October, 2010 between IWHR- China and WAPDA. Total contract price was US $ 2,314,945.

Different research studies regarding the Gomal Zam Dam Project, Three High Head Hydropower Projects, Upgrading for CMTL, High efficiency Irrigation System in the command areas of Darawat & Winder Dam Projects and Diamer Basha Dam Project were included. These studies are almost completed as IWHR-China had submitted the final reports.

2nd Executive Contract under Collaboration Agreement between WAPDA and IWHR- China

The second Executive Contract Agreement was signed on 10th January, 2013 for Hydrographic Survey, Review and Sedimentation Study of Chashma Reservoir between IWHR- China and WAPDA. Total contract price is US $ 358,068.38.

Scope of work of the agreement is as under:-

Task-1: Review & Analyze the Hydrographic Survey data of Chashma Reservoir

Task-2 Numerical Simulation on future sedimentation in Chashma Reservoir

Task-3: Develop an optimum basic rules of operation manual for Chashma Resrvoir

A high level Chinese delegation came to Pakistan in April, 2013 for visit to China Reservoir for data collection and to identify the sites for sediment sampling. Technical work for the successful completion of the agreement is in progress at IWHR-China.

Activities under WCAP B-3 Component

The World Bank initiated WCAP (Water Sector Capacity Building and Advisory Services Project) in 2008. The main objective of this programme is to support capacity development and water institutions building. The project is scheduled to be implemented over a period of five years (September, 2008-2013). Component B of WCAP relates to WAPDA which is associated with improvement in water resources management and development.

The office of the Chief Engineer (Technical Services) is the focal point for the activities of sub component B-3 i.e. Assets Management, as detailed below:-

(i) Purchase of Antelope Software for Micro Seismic Data Analysis

For the seismic safety monitoring of its large Dams and Hydropower Projects, WAPDA has established a network of 29 stations Micro Seismic Monitoring System (MSMS) in the Northern Pakistan. All the stations are transmitting seismic data to the Central Recording Station (CRS) located at Tarbela through satellite link. Antelope Software was installed at Tarbela CRS for the Online/Offline processing, analyzing and cataloging (PAC) of seismic data with a funding of US $ 0.28 million (during March, 2010) under WCAP. By this network, precise location of earthquake sources and identification of tectonic features may be possible.

WAPDA Authorities now intend to establish two more Data Centers at different geographical locations. These data centers will be at Lahore and Mangla Dam Project.

The main Data Center will be at Lahore while the Data Centers at Tarbela and Mangla will always work as the minor image. The seismic data from any of the Data Center can be assessed and processed for immediate reporting/actions.

Approval of the Authority has been requested for up-gradation of the system by establilshment of additional Data Centers at Lahore and Mangla amounting to US $ 0.60 million to be funded under WCAP.

(ii) Purchase of Equipment for CMTL

The capacity building for CMTL under WCAP is being carried out in two phases. Phase-I consists of procurement of new equipments for up-grading the Rock Mechanics Section of CMTL through open bidding/International Competitive Bidding (ICB) and under Phase-II, the equipments are being procured for the special tests of Roller Compacted Concrete (RCC).

(iii) Dam Safety Training

In order to enhance the capacity and expertise of the WAPDA engineers, foreign training from USBR were planned to be provided in various dams engineering disciplines under WCAP. Twelve engineers have already completed eight weeks training at USA from USBR in the different engineering disciplines.

Dam Safety Organization (DSO)

WAPDA Authority has established a comprehensive system to ensure the safety of its dams, Mangla,

Tarbela, Warsak, Khanpur, Hub and Chashma Barrage alongwith Ghazi Barotha Hydropower Project. Project surveillance staff is responsible for observation, collection and monitoring of performance data while Dams Safety Organization (DSO) is responsible to review/analyze and interpret the data to detect any area under distress. DSO also carries out annual inspection of the projects, a comprehensive inspection report containing observations and recommendations is prepared. Similar services are being provided to Simly Dam, a project of Capital Development Authority (CDA), on deposit work basis. Periodic inspections, normally carried out on five yearly basis by a team of independent experts, are also arranged. Baseline inspection is carried out after completion of the projects by project consultants and contractors. DSO organizes and associates with the consultants during the inspection and later on reviews the inspection reports. Baseline inspections of Ghazi Barotha Hydropower Project, Mirani Dam, Mangla Dam Project and Sabakzai Dam have been carried out so far. The organization also reviews the design aspects of WAPDA projects at planning and design stages. On special requests by Federal Government, DSO provides expertise for the technical problems of federal projects and small dams of the provincial governments.

Tarbela Dam

Annual Inspection - 2012 was carried out from 03-07 September, 2012 at high reservoir level. Implementation status regarding findings and recommendations received from project were reviewed and inspection report has been issued.Monitoring of the project remained in progress. According to the hydrographic survey conducted during September-October, 2012, total sediments deposition in the reservoir was 4.052 MAF. The gross storage capacity of the reservoir has reduced by 34.87% i.e from 11.62 MAF to 7.568 MAF whereas live storage capacity has reduced by 32% i.e from 9.679 MAF to 6.581 MAF. During the year 2012-13, sediment deposition in reservoir was 123.20 MST (0.067 MAF). Previous deposition was 177.46 MST (0.067 MAF) in the year 2010-11.Maximum inflow was 284,000 cfs on 5th August, 2012. The hydrographic survey-2012 shows that delta has advanced by approximately 3000 ft. and is at a distance of 5.45 miles from MED whereas its elevation has raised to 1382 a.s.l. from its previous elevation 1380 ft. a.s.l.

Khanpur Dam Project

Annual inspection of Khanpur Dam was carried out from 18-22 November, 2012. The status of implementation regarding recommendation was reviewed and inspection report has been issued. Monitoring of the project remained in progress. The instrumentation, movement and sedimentation data was analyzed in detail.

The project is playing vital role in supplying 144, 000 AF water for municipal and industrial use to Islamabad/Rawalpindi, total allocation including irrigation is 250,000 AF. The original gross storage capacity of reservoir was 107076 AF. The rate of loss is 650 AF per annum as per 2009 hydrographic survey.

Mangla Dam

Annual inspection for the year 2012 of the project was carried out from 14-19 October, 2012 at reservoir level 1198 ft. The salient findings and recommendations alongwith detailed report were issued after the inspection for implementation. Reservoir level was filled upto El. 1206.4 ft. due to late arrival of inflows. Physical conditions were closely monitored by the project staff during filling of reservoir which indicated normal behavior of all the project structures. Baseline inspection of Mangla Dam was carried out by consultants drawn from Mangla Joint Venture (MJV) from 2nd week of March, 2013 to 4th week of April, 2013 in different disciplines. DSO has participated as counterpart in this inspection. The maximum conservation level will be raised from 1202 to 1242 ft. thus, additional 2.88 MAF of water can be stored in the reservoir. As per last hydrographic survey of year 2012 the sedimentation has reduced the original reservoir capacity from 5.88 MAF to 4.577 MAF (at RL 1202 ft.). The rate of loss is 28336 AF per annum.

Chashma Barrage

The annual inspection of the project was carried from 14-18 January, 2013. Detailed report of the inspection was issued. DSO inspection team emphasized the need to implement the

recommendation. Analysis and evaluation of the project remained in progress.

According to last hydrographic survey of reservoir carried out in year 2012, the original gross storage capacity of reservoir at maximum conservation level 649 ft. has reduced from 0.870 MAF to 0.348 MAF, previously it was 0.321 MAF. The increase in storage capacity between previous and latest survey is due to super flood in 2010.

Warsak Dam Project

The annual inspection of the project was carried out from 20-24 May, 2013. Principal findings have been issued and sent to project authorities. DSO inspection team emphasized the need to implement the recommendations. Analysis and evaluation of project remained in progress.

Simly Dam Project

2013-Annual inspection which is follow up of the 4th Periodic inspection of the project was conducted from 10-13 June, 2013 by DSO. Implementation status was reviewed in the light of principal findings and recommendations of 4th Periodic Inspection. DSO inspection team discussed in detail different issues in the presence of RE (Simly Dam Project, WAPDA) and Director (BWM), CDA for the safe operation of project.

Simly Dam project is playing vital role in supplying drinking water to Islamabad and Rawalpindi. The project had been designed to supply 42 MGD as safe yield.

Hub Dam Project

Hub Dam Project provides water supply for both irrigation and municipal use. Karachi is getting 100 MGD whereas 15 MGD is supplied to Baluchistan for its Municipal, industrial and agricultural use. Annual inspection for year 2013 of Hub Dam will be carried out shortly. DSO emphasized the need to implement the recommendations of fourth periodic inspection and early release of funds to complete the requisite works. As per hydrographic survey conducted in year 2009, the sediments have reduced the original gross reservoir capacity from 857,000 AF to 687,000 AF (19.8% loss). Analysis and evaluation of project structure remained in progress with the help of data. Bi-annual performance reports have been issued.

Ghazi Barotha Hydropower Project

Annual inspection 2013 was also carried out by DSO team from 6-15 February, 2013. The status was reviewed in the light of findings and recommendations of first Annual Inspection. Principal findings and recommendations have been issued.

Gomal Zam Dam Project

A special inspection was carried out during 2012-13. Inspection of seepage emerging from lift joints above El. 710 m and status of gallery at El. 634 m was carried out. To study the performance of foundation and abutment rock seepage uplift pressure data is regularly evaluated and analysed. Performance of additional grouting is also monitored.

PERIODIC AND ANNUAL INSPECTION CARRIED OUT BY DAMS SAFETY ORGANIZATION UPTO 30-06-2013

Project	Annual	Periodic/Base Line
Tarbela Dam * High/Low	20/2	5
Mangla Dam	30	6/1
Khanpur Dam	23	4
Warsak Dam	26	3
Chashma Barrage	26	5
Simly Dam	22	4
Hub Dam	23	4
Mirani Dam	4	1
Sabakzai Dam	-	1
Ghazi Barotha Hydropower Project	2	1
Three High Head Hydropower Projects *	5	-
Gomal Zam Dam Project**	6	-

* Two inspections were carried out in 2011-12, one at high level and other at low level.

** Special inspections were done as per instructions by higher authorities.

Gomal Zam Dam

WAPDA Environmental Cell (WEC)

Background & Charter of Duty

WAPDA Environment Cell (WEC) was created in 1987 to take care of environmental aspects of WAPDA's Water Sector Development Projects.

WAPDA Environment Cell (WEC) has been created basically for establishment of appropriate Environmental Quality Standards (EMP) and then enforce and monitor to ensure compliance. Moreover, presently WEC is also performing following works in its charter of duties:-

- To carry out various environmental impact assessments (EIA) and initial environmental examinations (IEE) of hydropower projects.
- To implement environmental management plans (EMP) according to EIA.
- To monitor the environmental & social parameters during feasibility design, construction and operation phase of the projects.
- To help WAPDA Authorities to facilitate in environmental auditing.
- To evaluate and comment on the environmental reports prepared by consultants and other agencies.

WEC Progress during 2012-13

(i) Environment Studies

- WEC is maintaining top supervision/advisory services to implement Environmental Mitigation and Monitoring Plan (EMMP) of Gomal Zam Dam Project. WEC team visited the project on monthly basis for providing guidelines to field staff and assisted them in preparation of quarterly progress report for implementation of Environmental mitigation and Monitoring plan (EMMP) at site. Report is being transmitted to World Bank on trimester basis.
- WEC is providing advisory services and training to Environment Unit (EU) & Environment Monitoring Committee (EMC) and top supervision services for the implementation of Environmental Mitigation & Monitoring plan (EMMP) of Neelum Jhelum Hydroelectric Power Project.

(ii) Tarbela 4th Extension Hydropower Project

In compliance of directives of the World Bank and Aide memoire on First Implementation Review Mission on Tarbela 4th Extension Hydropower Project dated 30th November , 2012, WEC has prepared the following implementation plans as per Aide

memoire and submitted to the project authority for onward transmission to World Bank.

- WAPDA Environment Cell (WEC) Action Plan for Strengthening, Capacity Building and Support Programme for Tarbela 4th Extension & Future Hydropower projects.
- Environmental & Social Action Plan for pre-Construction Stage activities of Tarbela 4th Extension Project.
- Preparation of 1st Draft Performa on Quarterly Monitoring Report on Social & Environmental Programme during the implementation stage by monitoring staff of WAPDA.

(iii) Review of EIA Reports / Documents

WAPDA Environmental Cell reviewed and evaluated the following reports of Dasu Hydropower Project:-

a) Environmental Management Action Plan

- Environmental impact assessment (EIA)
- Terrestrial Ecology
- Aquatic Ecology
- Physical & Cultural Resource
- Cumulative & Induced Impact Assessment
- Environmental Baseline Quality
- Environmental Management Plan

b) Social & Resettlement Management Plan

- Socio-economic Baseline & Impact Assessment
- Public Consultation & Participation Plan
- Resettlement Frame-work
- Resettlement Action Plan (Dam & Reservoir)
- Grievance Redressal Plan
- Gender Action Plan
- Public Health Action Plan
- Communication Strategy
- Management Plan for In-Migrants & Construction workers
- Cost & Budgetary Plan
- Social Resettlement Management Integrated and Monitoring Plan

(iv) Misc. Assignments Completed

- WAPDA Environment Cell has facilitated JICA in environment considerations raised during rehabilitation of Mangla Powerhouse.
- WEC has coordinated with the Project Authority of Tarbela Power Station for the implementation of Environmental Mitigation and Monitoring Plan (EMMP) for repair and rehabilitation works at Tarbela Hydroelectric Power Station.
- Stakeholder Consultation workshops on environmental assessment of Dasu Hydropower Project were held in Peshawar, Lahore & Islamabad. WEC attended these workshops and discussed study objectives, environment issues and their mitigation measures with stakeholders in order to make the project environmentally sustainable.
- WEC is providing support to finalize all the environmental and social aspects (EMMP) raised during the detailed engineering design studies of Dasu Hydropower Project.
- WEC is coordinating with project authorities of Tarbela 4th Extension and Director (Admn) Water Lahore for the recruitment of environmental & social staff to establish Environmental & Social Monitoring unit (ESMU) at Tarbela under Project Management Unit (PMU) for implementation of EMP – component C-2 of the project.
- WEC is providing support in establishing Environmental Monitoring Unit (EMU) of Tarbela 4th Extension Hydropower Project. As this is a continuous process, so WEC will supervise and monitor the activities of the proposed WAPDA-EMU at site.
- Comprehensive brief regarding the strengthening & capacity building option of WAPDA Environment Cell (WEC) under Water Sector Capacity Building & Advisory Services Project (WCAP) has been prepared in light of World Bank Mission meeting with Chairman WAPDA.
- Terms of Reference (TOR) for the hiring of Environmental Specialist and Terrestrial Ecologist to provide consultancy services on Tarbela 4th Extension, Dasu and other future WAPDA hydropower projects has been prepared and transmitted to World Bank for comments and review.
- For establishing recreational facility at Khanpur Dam Project, a draft Memorandum of Understanding (MoU) between WAPDA and Tourism Corporation Khyber Pakhtunkhwa (TCKP) has been forwarded to WEC by General Manager (C&M) for vetting. The contents of draft MoU has been critically reviewed, certain environmental concerns are pointed out and requested to include them in the MoU.

Central Material Testing Laboratory (CMTL)

Central Material Testing Laboratory (CMTL) is working under WAPDA for material investigation, field and laboratory testing of construction materials. This UNDP funded project amounting to US $ 4.3 million, was commissioned in early nineties to give WAPDA an in-house capability for testing materials like Rock, Soil, Cement, Concrete, Steel, Water etc. WAPDA had contributed Rs.28.6 million for construction of building and laboratory staffing. CMTL is the only laboratory in Pakistan which provides state of the art testing facilities at commercial level. The effective functioning of CMTL is quite vital as WAPDA is continuously pursuing the water and power resources development in Pakistan. WAPDA intends to build number of new dams, hydroelectric plants and thermal power stations in near future. Presently, investigations and testing of various fast track projects are underway at CMTL. The need to strengthen the laboratory arises in the above mentioned scenario. The latest equipment will reinforce the output and working of CMTL. The CMTL staff will also be trained to use this laboratory equipment by the suppliers/manufacturers. CMTL is being run on self-finance basis.

Though CMTL is having a comprehensive set of equipment and laboratory staff for performing different tests but new equipments are still necessary in order to meet with challenges and advancement in technology. In this regard with the support of World Bank, Project of Water Sector Capacity Building And Advisory Services Project (WCAP) under Sub Component B-3 CMTL is under process of up-gradation of Laboratory Equipment.

The original plan consists of up-gradation of existing equipment including procurement of new equipment, required for regular tests and special tests for Roller Compacted Concrete (RCC). The detail of procurement is as follows:-

Phase - I

CMTL procured new equipment for Rock Mechanics through International Competitive Bidding (ICB) in order to enhance its capabilities in Geotechnical Investigations required for mega Dams and Hydropower Projects. The Contract includes the procurement of following equipment:-

- Hydro-Fracture Testing Equipment complete along with all accessories including Inflatable Packers for borehole, to access the state of in-situ stresses in the earth crust.
- Dilatometer along with all accessories to measure the short term deformability of rocks.
- 3000 KN Automatic Compression Machine along with all required accessories to carry out Uniaxial and Triaxial tests on rock samples to find compressive strength, modulus of elasticity and poison ratio of rock samples.
- Coring Machine along with following accessories:-
  a) Core Barrels of BX core drill bit 42.01 mm dia.
  b) Core Barrels of NX core drill bit 54.74 mm dia.
- Digital Dial Gauges for measuring strain/ deformation in Plate Load Tests/Flat jack Tests complete with all accessories.

The contract was completed on 19th September, 2012 in all respects.

Phase – II

The equipments for carrying out following special tests for Roller Compacted Concrete (RCC) shall be procured in.

- Creep test for various mixes and ages of loading
- Autogenously Volume Change
- Adiabatic Temperature rise for various mixes, retraders and start temperatures
- Specific Heat, Diffusivity or Conductivity
- Direct Tensile Stress – Strain Curves and modulus of Cores taken from adiabatic temperature rise samples after testing

Dr. Earnest Schrader (RCC Specialist)

RCC Specialist, Dr. Earnest Schrader has been engaged by WAPDA for up-gradation of Roller Compacted Concrete of CMTL for carrying special tests of RCC. Infrastructure and new equipment are being arranged under WCAP-B3 Component.

Contract for Procurement of Roller Compacted Concrete Equipment (Lot-2) under WCAP Component B-3 amounting to USD 144,900/-

This contract was awarded to M/s National Scientific Corporation being lowest bidder on 18th February, 2013. LC for 80% of contract amount has been

opened in National Bank of Pakistan WAPDA House Lahore in favour of supplier.

Contract for Procurement of Roller Compacted Concrete Equipment (Lot-1) under WCAP Component B-3 Contract No.WCAP-B3/CMTL-C2(A) amounting to USD 236,190/-

This contract was awarded to M/s Controls Testing Equipment Ltd. on 2nd May, 2013. Opening of LC with CRRK is in process.

Funds generated by CMTL

CMTL is a self-financing department that generates funds from laboratory testing. Total income in year 2012-13 is as under: -

Income through Deposit Works	= Rs. 39.396 Million
Income through Laboratory Testing	= Rs. 15.992 Million
Total Income	= Rs. 55.388 Million

The detail of laboratory testing for the year 2012-13 is given below:-

NO. OF LABORATORY TESTS PERFORMED AT CENTRAL MATERIAL TESTING LABORATORY, LAHORE (JULY 2012 TO MAY 2013)

Sr. No.	Month	Concrete Section	Rock Mechanics	Chemical Environment	Soil Mechanics Section	Total No. of Tests	Deposit Works
1	July 2012	565	202	441	812	2020	3 SSI Work, plate Load at Bunji, Shear Test at Darwat Dam
2	August	384	375	235	255	1249	Lahore Ring Road
3	September	507	185	140	177	1009	2 SSI Work, Core Drilling & Surface Preparation at Bunji HPP Afit GR-01
4	October	615	158	247	484	1504	2 SSI Work, Core Drilling & Surface Preparation at Bunji HPP Afit GR-01
5	November	600	345	233	229	1407	Core extraction and testing at Sukkur, 4 Plate load tests at Bunji
6	December	714	308	264	345	1631	Field Testing at 220 kv Grid Station near Murad Jamali, Direct Shear Test at Bunji HPP site
7	January 2013	495	337	373	403	1608	SSI Work at 220 KVs Grid station Dera Murad Jamali
8	February	567	90	159	403	1219	Insitu Direct Shear Test at Dasu HPP
9	March	580	148	316	384	1428	Core Extraction at Surgical hospital Sukkur
10	April	603	170	201	533	1507	2 SSI Work at Sukkur
11	May	463	164	169	135	931	SSi Work at 132 KVs at LDA Avenue-I Lahore
12	June	566	184	195	721	1666	4 No. SSI Works at Mangla Dam (3) and Jinnah HPP (1 No.)
	July to June 2013	6659	2666	2973	4881	17179	

Brief description of other prominent projects on which CMTL has carried out field investigations & testing works are as under:-

Sr. No.	Project Site	Tests
1	Dasu HPP	RCC Mix Designs (TMP 1) RCC Mix Designs (TMP 2) Geo-Physical Survey Field Direct Shear Tests
2	Bunji HPP	Plate Load Tests
3	3.6 MW HPP at Thor Valley	Sub Soil Investigation
4	2 MW HPP at Thak Nullah	
5	Tarbela 4th Extension HPP	

Wheat Crop

Planning and Design (Water)

Planning and Design Division consists of the following formations:-

- Water Resources Planning Organization (WRPO)
- Planning and Investigation Organization (P&I)
- Hydrology and Water Management (H&WM)
- Dams Organization

A brief description regarding achievements of these formations is as under:-

Water Resources Planning Organization (WRPO)

Water Resources Planning Organization (WRPO) is responsible for preparing, reviewing and updating water sector development plans, economic, analysis of various irrigation and drainage projects, undertaking perspective water resources planning and policy studies, furnishing briefs, comments and technical notes for WAPDA and Federal Ministry of Water and Power. This organization comprises of the following:-

a) Computer Application Directorate
b) Agriculture Directorate
c) Irrigation and Drainage Directorate
d) Economics Directorate

a. Computer Application Directorate

The Computer Application Directorate (CAD) manages application of Computer Programmes and Indus Basin Model Revised (IBMR) for analyzing field survey data, planning and evaluation of water resources projects through application of IBMR. The following studies/assignments were carried out during the year under report: -

Upgrading of Tools, Water Resources Database, Management Systems and Models under B1- WCAP.

The specific objectives of the study are as under:-

i) Update the existing Water Resource database storage, retrieval and processing system.
ii) Establish a GIS/RS Centre and develop linkage of IBMR model with Oracle Database and GIS layers and publish it online through Web GIS/Mapping Server.
iii) Modification of existsing IBMR from monthly mode to 10-daily for its application in studies relating to management and operation of Indus River System.
iv) Up-gradation of IBMR to include hydropower generation component for estimation of hydropower from the storage projects in

conjunction with downstream irrigation water requirements.
v) Development of Additional System-Client interfaces.
vi) Operationalization of these tools for Water/Power Planning and their online availability to stakeholders.

The part-A of study is being conducted by Water Resources Planning organization (WRPO) with M/s NESPAK-JV Consultants which will be completed in August, 2013.

Strengthening Flow Forecasting System

The specific objectives of the study are as under:-
i) Development of forecast procedures for hydrological Modeling of upper catchment.
ii) Strengthening the River Flow Forecasting System of WAPDA to study the change in River Inflows due to global warming or climate change impacts on the upper catchments, particularly, the Mangla catchment.

The part-B of the study was conducted by hydrology and Water Management Organization (H&WM), WAPDA. Work on the study was successfully completed in September, 2012.

The activities carried out so far are as under:-
i) Indus Basin Model Revised (IBMR) code improvement, addition of hydropower component in the model.
ii) Developed a model for determining loss/gain coefficients and lag time of river reaches. Testing of model is underway.
iii) A detailed requirement specifications (DRS functional & non-functional) document was prepared and database design finalized.
iv) Satellite imagery (Landsat) was downloaded from free domain and different image processing steps was applied on these images.
v) Digitization of main canals, distributaries, minors, sub-minors and drainage network was completed.
vi) Water quality and depth to watertable maps were prepared for 2011 data.
vii) A geometric network of entire irrigation system was developed to connect child stream such as sub-minor with its parent feeding canal or river.
viii) 85% physical progress and 70% financial progress of the study was achieved during the reporting period.
ix) An established Water Resource Database in CAD was maintained and data related to the river/tributary flows, canal diversions, different meteorological parameters and environmental data are being updated periodically for planning of water resources development and management of water resources. Few of the data sets mentioned above will use for calibration and validation of IBMR.

b. Irrigation & Drainage Directorate (I&D)

The primary function of I&D Directorate, WRPO is planning and review of Water Resources projects, Flood Protection and Management Schemes, Hydropower Planning and Irrigation & Drainage Schemes pertaining to entire country.

During the year 2012-13, the Directorate reviewed 15 No. PC-I & PC-II of different Hydropower/ Water resources Projects, 58 No. Flood Protection & Management Schemes, 2 No. Feasibility Study Reports, 22 No. Hydropower/Water Sector Project Reports, Reviewed 16 estimates received from various organizations under office of GM (P&D) and 46 miscellaneous works. Three syllabuses of different categories for DPE were prepared. Two technical papers were also prepared and presented at respective forums.

c. Agriculture Directorate

Agriculture Directorate prepares water sector development plans for agriculture development, food security plans, examine agriculture issues and threats in the wake of climate change, review policies and programmes laid down for agriculture development, comments on technical reports/ PC-1s and prepares research papers, briefs etc.

Agro-Economic Farm Survey of Indus Basin under Sub Component “B1” of WCAP

The final report was submitted by consultants during November, 2011. The findings of this report and Farm survey data is now being used for IBMR model under WCAP. Agriculture Directorate is also a part of this crucial model being developed under the auspices of World Bank.

The broad based data collected through Farm Survey is also being analyzed for undertaking Policy studies such as irrigation and fertilizer interaction effect on yield as regular WRPO assignment. Another on-going study entitled "Changing trends in Agriculture Economy" also uses a major portion of data collected on different agro/socio-economic parameters during this Farm survey.

Technical Drafts/Review/Comments

- Technical paper on "Changing Trends in Agriculture Economy of Pakistan" was prepared and presented on Water Day dated 22nd March, 2013 Gulberg, Lahore. This paper measures changing trends occurred in land utilization, cropped area, fruit production & Export, Livestock & Aquaculture, Crop-Input & output etc., since 1947-48.
- Ready Reckoner 2012 was completed. The Reckoner contains valuable latest information related to Indus Basin Irrigation System, dams/head works/barrages, river flows, canals withdrawals, SCARP tubewells, water courses, drainage basins, land utilization, soil salinity, water logging, cropping mix, crop water requirements, water saving irrigation techniques, crop yield levels, climatic change vulnerability index etc.
- Research study entitled "changing trends in agriculture economy of Pakistan" remained under preparation.
- Preliminary data collection for "Ready Recknor 2013" remained in process.
- The research paper "Changes of monosoonic pattern – Its impact on water availability & cropping pattern – A regional perspective" remained uner preparation.

Miscellaneous

Followng data was provided to tabular form for updating Ready Reckoner for water projects:-

a) Per capita water availability overtime.
b) River flows and so storage potential.
c) New storages currently being developed / examined.
d) Average annual flow and storage capacity of Dams of some major river basins.
e) Area, production and yield of major crops.
f) Crop water requirements and supplies at Farm gate.
g) Historic land use and crop production
h) Zone wise yield and input data was analyzed and presented in tabular form for the study "Impact of irrigation fertilizer on major crop yields".
i) Land use intensity, cropping intensity and cropped area for major crops using latest data from agriculture census of Pakistan.
    - Comments were offered on proposal regarding "Changes in prices of agriculture inputs" submitted by Federal Minister for Kashmir Affairs & Gilgit-Baltistan through Prime Minister's Secretariat and subsequently forwarded by Ministry of Water and Power vide letter No.1/5/2013-W dated 18th February, 2013.

The requisite data information in respect of "National Assembly Starred Question Diary No. 11 moved by Shirin Arshad Khan was submitted to the quarter concerned.

d. Economics Directorate

The Economics Directorate has very vital role in WRPO as Economics is an integral part of project planning. This section deals mainly with economics and financial aspects pertaining to development of water sector Projects/Programmes. Economic and financial analysis of projects is main responsibility of this directorate. Economic indicators (B.C. Ratio, NVP and EIRR) and unit costs are worked out for possible project benefits.

Comments and suggestions were offered pertaining to 6 No. PC-I/PC-II Performae of different development projects. Economic & Financial Analysis was checked and necessary corrections were made pertaining to 10 No. of PC-I/PC-II Performae and other projects. Standing Review Committee meetings were attended as and when required.

The achievements of this directorarte for the fiscal year 2012-13 are given in brief as under:-

Comments/Economic and Financial Appraisal

- PC-II Performa for detailed engineering design at tender document of Hingol Dam Project (New Dam Site), September, 2012.

- 2nd Revised PC-II Performa for detailed engineering design at tender document of Hingol Dam Project (New site).
- PC-I Performa of Phandar Hydro Power Project (Economic and Financial report).
- PC-I Development of Sunny View Complex Project (Economic and Financial report) March, 2012.
- PC-I second revision (February, 2012) Performa for Construction of Satpara Dam Hydropower Project.
- Detailed engineering design report of Dasu Hydropower Project, D-2, Vol-II, Economic & Financial Analysis December, 2012.
- Satpara Dam Hydropower Project.
- Dasu Hydropower Project.
- Computed SCF of detailed engineering design report of Dasu Hydropower Project, D-2, Vol-II.
- Technical specification of fuel cost by thermal alternative regarding Dasu Hydropower Project (Vol.II).
- Gomal Zam Dam Multipurpose Project, Revised PC-I (February, 2012).
- PC-I of Mangla Watershed.
- PC-I of Winder Dam Project was checked.
- Agriculture and power benefits of PC-I Winder Dam Project were updated.

Preparation of Briefs and Report Writing

Briefs and reports were made regarding IBMR with Agro farm Survey, crop calendar and seed inputs, fertilizer dosage, description of sets, range of sets, parameters and other allied information of IBMR file in GAMS software, presentation regarding the Indus Basin Revised Model (IBMR) introduction and key elements in IBMR.

Data Collection & other Activities

- Zone wise Farm inputs rate data was collected and compiled.
- Agriculture data collected from Agriculture Department Punjab Lahore was processed and zone wise tables were prepared regarding crop calendar, seed application rate, dosage of fertilizer and yields of different Kharif and Rabi crops.
- Agro-climatic data regarding planting and harvesting period of major crops in different agro-climatic zones was prepared.
- Compilation of monthly progress reports for inclusion in Annual Progress Report for 2012-13.
- Information regarding water resources and usage, dams and economic value of water for inclusion in framework of plans of Pakistan economic growth for 2011-15.
- Agriculture commodities price data was collected for updation of PC-I Winder Dam Project.
- Compiled achievements of Economics Directorate for 2012-13 and prepared targets and staff requirements for 2013-14.
- Miscellaneous office work was carried out along with day to day activities.

Planning and Investigation Organization WAPDA

The Planning & Investigation Organization has been entrusted with planning of water resources projects in Pakistan, which includes preparation of reconnaissance, appraisal, feasibility studies and detailed engineering design for development of water resources schemes in Pakistan. The survey works are carried out by Survey Divisions located in Peshawar, Faisalabad and Dadu while geo-tech and geological investigation works are carried out by Geo-Tech Section and Geological Investigation Section, Lahore. Agriculture and economic studies are carried out by Economic Section.

Planning activities carried out during the year 2012-13 are briefly described below:-

Mohmand Dam Hydropower Project

Location

This project is proposed to be constructed on Swat River about 5 Km upstream of existing Munda Head works and 37 Km North of Peshawar in Mohmand Agency, Khyber Pakhtunkhwa.

Objectives

- Hydropower generation
- Irrigated agriculture development
- Flood mitigation
- Socio-economic uplift of people of the area

Salient Features

Type of Dam	Concrete Faced Rock Fill Dam

Site of Kurram Tangi Dam

Height of Dam	699 ft.
Mean Annual Flow	5.27 MAF
Gross Storage	1.293 MAF
Live Storage	0.676 MAF
Dead Storage	0.614 MAF
Flood Discharge	684,750 Cusecs
Flood Storage	0.243 MAF
Power Generation	
Installed Capacity	740 MW
Annual Generation	2,407 GWh
Gross Command Area	16,926 Acres
Left Bank Command Area	5,708 Acres
Right Bank Command Area	11,218 Acres
Project Cost (Year 2000)	US $ 1,149 Million
Construction Period	9 Years
EIRR	13.2%

Current Status

- Feasibility studies completed by JICA in March, 2000.
- The consultancy agreement for carrying out detailed engineering design and tender documents was signed with Joint Venture comprising of M/s SMEC – NK – NESPAK – ACE on 16th February, 2012.
- Agence Francaise de Developpement (AFD) has indicated to provide 10 million Euro and 100 million Euros for detailed engineering design and construction respectively.
- Revised PC-II amounting to Rs. 1,246 cleared by CDWP in its meeting held on 21st March, 2012.
- The Consultants have commenced their services w.e.f. 1st June, 2012.
- Survey for Preparatory Works like Access Road, field office and construction of security pickets has been initiated by P&I Organization.
- Survey and geo-tech investigation works are in progress. Detail is as follows:-

- Exploratory drilling	28.5%
- Seismic refraction survey	16%
- Surface geological mapping of dam site structures	100%
- Test pits	60%
- Exploratory adits	05%
- Bathymetric/hydrographic survey	100%
- Topographic survey of:-	
- Main dam and appurtenant structures	100%
- Irrigation canal	16%
- Borrow area	55%
- Command area	97%

Kurram Tangi Dam Multipurpose Project

Location

The proposed project site is located at Kurram River

about 9 Miles upstream of Kurram Garhi Head Works and 19 Miles North of Bannu City in North Waziristan Agency of Khyber Pakhtunkhwa.

Salient Features

Dam height	322 ft.
Gross storage	1.20 MAF
Live storage	0.90 MAF
Power house	
Power house No.1	36.50 MW
Power house No.2	11.00 MW
Power house No.3	17.00 MW
Power house No.4	18.50 MW (Kaitu-Kurram Feeder Channel)
Power house No.5	0.40 MW (Sheratala Canal)
Total:	83.40 MW

Command Area

New Areas:	
Sheratalla Plain	12,300 Acres
Spaira Ragha Plain	4,080 Acres
Thal Plain	68,000 Acres
Total:	84,380 Acres
Supplementing existing system of Civil and Marwat Canals	278,000 Acres
Project cost	Rs. 59.561 Billion (US $ 699 Million)
Civil works	US $ 543 Million
E&M works	US $ 156 Million
Construction period	4 Years

Current Status

- M/s. PES Joint Venture completed feasibility study, detailed engineering design and tender documents in March, 2005 and redesigned the project in July, 2007 with an elevated height to enhance the storage capacity.
- Project Director has been appointed under General Manager (North) for construction of the Project.
- 210 Acres lands have been acquired and Rs.17 million has been paid to DCO/DOR Bannu.
- Government of KPK assured total support along with security arrangements with the desire to take care of the entire stakeholder during construction of the project.
- EOI for pre-qualification of Contractors received on 28th February, 2011. Five firms/Joint Ventures submitted the EOI documents. Three firms pre-qualified (M/s DESCON, M/s SAMBU-SARCO JV and M/s FWO-LIMAK JV) for participation in the tendering process.
- M/s Mot MacDonalds JV (MMP in association with PES, MML UK, Creative Engineering Consultants & DMC) appointed as project review & supervision consultants at a consultancy cost of Rs.484 million. Contract agreement for supervision consultancy signed on 17th November, 2011 at Governor House, Peshawar.
- Revised PC-I amounting to Rs. 59.561 billion submitted to Ministry of Water and Power on 16th December, 2011for arranging approval of ECNEC.
- Letter of commencement issued to the consultants on 12th December, 2011. Mobilization advance amounting to Rs.48 million paid to the consultants on 27th January, 2012.
- Consultants fielded their design team to undertake review of design and tender documents and submitted tender documents of Component – 1 (Kaitu Weir & affiliated structures).
- Tender/bids for construction will be invited by June, 2013 subject to availability of required funds and approval of revised PC-I of the project.
- WAPDA is also interacting with USAID for possible financing with initial investment of US $ 93 million during 2012-14.

Bhimber Dam Project

Location

Bhimber Dam site is located in Bhimber district of Azad Jammu and Kashmir across Bhimber Nullah.

Objectives

- Irrigation
- Water supply to nearby community
- Recharging of ground water aquifer
- Power generation

Salient Features

Dam type	Earth and Rock Fill
Height	190 ft.
Gross Storage	40,000 AF
Live Storage	28700 AF

Dead Storage	11300 AF
Useful Life	20 years
Hydel Power Potential	2 MW

Current Status

- PC-II for feasibility study amounting to Rs. 86.089 million submitted in October, 2011 has been cleared by Ministryof Water & Power and forwarded to Planning Commission on 25th November, 2011 for arranging approval.

Shyok Dam Multipurpose Project

Location

Shyok Dam site is located on Shyok River about 3 Km upstream of Khapalu Town which is under the administration of Baltistan Division of Gilgit Baltistan.

Objectives

- Hydropower generation
- Water storage
- Flood mitigation / to regulate flows in the Indus River

Salient Features

Dam type	R.C.C. Gravity Dam
Catchment Area	12850 Sq. miles
Height of Dam	699 ft.
Average Annual Flow	10.5 MAF
Gross Storage	10.7 MAF
Live Storage	5.4 MAF
Reservoir Area	28910 Acres
Installed Capacity	690 MW

Current Status

- PC-II Performa for Feasibility Study of Shyok Dam amounting to Rs. 285.292 million was submitted to Ministry of Water & Power on 3rd November, 2011 for clearance. The same has been forwarded to Planning Commission on 17th April, 2012 for arranging approval.
- Pre-qualification of consultants for feasibility study has been completed.
- Request for proposal (RFP) has been issued to pre-qualified consultants.
- Technical and Financial Proposals from pre-qualified consultants i.e. NESPAK, MM Pakistan and NDC-PES-BAK-KEC Joint venture received technical proposals opened on 21st May, 2013 and are under evaluation.

Kaha Dam Project

Location

Dam site is located 33 Km west from Dajal Town of district Rajanpur, Punjab.

Objectives

- Irrigation
- Flood mitigation
- Recharge of groundwater aquifer
- Water supply
- Hydel Power generation

Salient Features

Type of Dam	Earth/Rock Fill Dam
Height of Dam	285 ft.
Gross Storage	0.31 MAF
Catchment Area	2050 Sq. Miles
Average Annual Run off	0.63 MAF
Perennial Discharge	30 Cusecs
Command Area	89581 Acres
Cost of PC-II	Rs. 136.876 Million

Current Status

- PC-II for feasibility study cleared by Standing Review Committee (WAPDA) on 18th October, 2012 and submitted to government of Punjab for comments.
- Comments received from Government of Pakistan were incorporated.
- PC-II for feasibility study amounting to Rs.138.676 million has been submitted to Ministry of Water & Power for arranging approval from competent authority.

Chiniot Dam Project

Location

The dam site is located about 176 Km downstream of Marala and about 5 Km upstream of Chiniot city on River Chenab.

Objectives

- Water storage
- To regulate existing downstream canal network
- Conservation of flood water
- Power generation
- Flood mitigation

Salient Features

Type of Dam	Homogenous Earth-Fill Dam

Reservoir Area	78,840 Acres
Live Storage	1.0 MAF
Normal Conservation Level	623 ft.

Current Status
- Appraisal study report has been prepared by M/s Barqaab in 2002.
- PC-II for feasibility study amounting to Rs. 145.440 million submitted in October, 2011 has been cleared by Ministry of Water & Power and forwarded to Planning Commission on 28th November, 2011 for arranging approval.

Sangarh Dam Project
Location
Dam site is located 116 Km North of D.G. Khan and 20 Km from Taunsa City.

Objectives
- Irrigation
- Flood mitigation
- Recharge of ground water aquifer
- Water supply to nearby community

Salient Features
Type of Dam	Earth-Rock-Fill Dam
Height of Dam	362 ft.
Catchment Area	1856 Sq. Miles
Average Annual Run-off	3.2 MAF
Perennial Discharge	25 Cusecs
Gross Storage	1.1 MAF
Command Area	63678 Acres
Cost of PC-II (Tentative)	Rs.154.674 Million

Current Status
- PC-II for feasibility study of Sangarh Dam Project was cleared by Standing Review Committee (WAPDA) on 18th October, 2012 and submitted to government of Punjab for comments.
- Comments received from government of Punjab were incorporated.
- PC-II for feasibility study amounting to Rs.154.674 million approved by WAPDA is under submission to Ministry of Water & Power for arranging approval

Mangla Marala Link Canal Project
Location
The proposed Mangla Marala Link Canal will off-take from the existing Bong Canal Head Regulator and transfer water to Marala Barrage. Out of 100 Km Canal length, about 19 Km involve tunnel construction to cross the Pabbi Hills. The command area lies in the territory of district Gujrat.

Objectives
- Defense requirement
- Irrigated agriculture development of 115,000 acres of new fertile land of district Gujrat of Punjab province.

Salient Features
Gross Command Area	100,000 Acres as per PC-II 115,000 Acres as proposed by Consultants
Culturable Command Area	90,000 Acres
Canal Length	62 Miles
Canal Capacity	10,000 Cusecs
Length of Main Irrigation Canal	11.5 Miles
Design Discharge of Main	430 Cusecs
Irrigation Intensity	55%

Current Status
- PC-II amounting to Rs.120.819 million for undertaking feasibility studies has been approved by CDWP in its meeting held on 19th January, 2009.
- Authority accorded approval of Rs.30.461 million for Consultants and Rs.41.810 million for survey & investigation from Authority's Overhead in its meeting held on 25th August, 2010.
- Draft feasibility study report and draft PC-I Performa amounting to Rs.195.156 billion have been submitted by Consultants and is under review for finalization.

Chashma Right Bank Canal Project (Lift-Cum-Gravity)
Location
The proposed project is located on the right bank of Indus River in D.I. Khan district of Khyber Pakhtunkhwa.

Chashma Right Bank Canal

Salient Features	
Intake	Off takes from Head Race Channel of Chashma Hydropower Plant
Feeder Canal	
Capacity	2613 Cusecs
Length	39 Miles
F.S.L (at RD 04+000)	638.64 ft.
Bed level (at RD 404+000)	624.03 ft.
Pumping Station	
Capacity	2533 Cusecs
Lift	64 ft.
Pumping units	8 Units
Capacity	6 No. of 353 Cusecs each 2 No. of 212 Cusecs each
Type	Vertical mixed flow pump
Main Canal (Gravity)	
Capacity	2533 Cusecs
Length	73 Miles
Command Area	286100 Acres
F.S.L (at RD 0+000)	685.75 ft.
Bed Level (at RD 0+000)	670.46 ft.
Distributaries	
No. of Distributaries	25
Length	167 Miles
Length of Minors	102 Miles
Project Cost	Rs. 61.067 Billion

Current Status

- Detailed engineering & tender documents completed on 29th February, 2004 by M/s. NDC Joint Venture.
- PC-I (Rs.25.399 Billion) submitted to Government of Pakistan/government of Khyber Pakhtunkhwa for approval on 31st July, 2004. Discussed in CDWP meeting held on 7th March, 2005.
- PC-I amounting to Rs. 61.087 billion cleared in principle by CDWP in its meeting held on 18th March, 2010 for approval of ECNEC.
- A committee under Chairmanship of Deputy Chairman, Planning Commission was constituted to deliberate on the issues relating to financing, engineering and economics of the Project.
- PSDP approved allocation for CRBC 1st Lift Cum Gravity Project amounting to Rs. 411.555 million for the fiscal year 2010-11.

Dotara Carryover Dam Project

Location

Dotara Dam site is located 41 Km upstream of

Khanpur Dam and 2.5 Km downstream from the junction of Haro and Dhund Haro on Haro River near Dotara village, district Abbottabad.

Objectives

- Municipal water supply by gravity flow to Islamabad & Rawalpindi.
- Hydropower potential
  - Margala Pumped Storage Scheme (122 m^3/sec for 5 hours/day) — 200 MW
  - Water Supply Scheme for Islamabad & Rawalpindi (6.5 m^3/sec for 14 hours/day) — 10 MW

Salient Features

Dam Height	400 ft.
River Bed Level	2632 ft.
Live Storage Capacity	101,00 AF
Dotara-Shahdara Gravity Tunnel	
Length of Tunnel	8.4 Km
Diameter of Tunnel	8.20 ft.
Flow Rate	194.25 Cusecs
Shahdara Upper Reservoir	
Dam Height	250 ft.
Length of Embankment	1850 ft.
Storage Capacity	27550 AF
Surface Area	218 Acres
Length of Pressure Tunnel	4.06 Km
Diameter of Pressure Tunnel	18.50 ft.
Discharge of Pressure Tunnel	4310 Cusecs
Gross Head Available	640 ft.
Kot Hathial Lower Reservoir	
Storage Capacity	3243 AF
Surface Area	66 Acres

Current Status

- PC-II Performa for feasibility study amounting to Rs. 236.278 million has been submitted to Ministry of Water & Power in February, 2012.

Small/Medium Dams Directorate

The Government of Pakistan entrusted upon WAPDA to construct 32 Small/Medium Dams (Water Reservoirs) across the country.

In Phase-I construction of 12-small/medium dams including Hingol, Naulong, Winder, Garuk & Pelar in Balochistan, Daraban Zam, Bara & Tank Zam in Khyber Pakhtunkhwa, Darawat & Nai Gaj in Sindh and Papin & Ghabir Dam in Punjab is being carried out. To accomplish the task of construction of Small/Medium Dams expeditiously, WAPDA has created a Small/Medium Dams Directorate, which is providing technical, contractual and coordination support to all Projects. The achievements of Phase-I Projects are as under:-

Hingol Dam Project

Location

The proposed Hingol Dam is located on Hingol River at a distance of 19 Km on North of the Makran Coastal Highway and about 248 Km from North-West of Karachi in Lasbela district of Balochistan.

Objectives

- Irrigation of culturable command area of 65,000 Acres
- Hydropower generation
- Flood control
- Socio-Economic uplift of remote areas of Balochistan.
- Women emancipation by allotment of state land at the time of first harvest
- Employment generation of 8,950 (skilled and unskilled) jobs

Salient Features

Type of Dam	Earth & Rock-Fill (Central Core Zoned Dam)
Maximum Height	176 ft.
Length of Dam	2181 ft.
Spillway Type	Un-gated Overflow Ogee Crest
Clear Width of Spillway	1200 ft.
Design Capacity of Spillway	560,000 Cusecs
Total Catchment Area	10,420 Sq. Miles
Average Annual Inflow	537,227 AF
Maximum Probable Flood (PMF)	769,958 Cusecs
Reservoir Area	21,821 Acres
Gross Storage	1,205,752 AF
Culturable Command Area	65,000 Acres
Power Generation	1.37 MW
Annual Energy	5.6 GWh
Project Cost	Rs. 41.122 Billion

Current Status

- Feasibility study completed by M/s NESPAK in 1992 - 93.
- Detailed engineering design and tender documents of Hingol Dam Project with Dam Site at Aghor, 1 Km upstream of Coastal Highway completed by the Consultants M/s NDC JV in 2009.
- Hindu community raised objections due to submergence of their holy places. On the directives of Minister for Water & Power, WAPDA identified new site for construction of Hingol Dam across Hingol River at a distance of 18 Km from Coastal Highway.
- WAPDA appointed consultants for preparation of project planning report and tender documents based on detailed engineering design of the project for new identified site.
- Abu Dhabi Fund may partially finance the Project, terms and conditions to be finalized. Government of Balochistan agrees to participation of Abu Dhabi fund.
- PC-II Performa for detailed engineering design and tender documents of new dam site amounting to Rs. 277.791 million was submitted to Ministry of Water & Power on 17th December, 2012 for arranging approval from competent forum.
- Project planning report prepared by consultants and under finalization with additional survey and investigation works.
- Consultants have submitted bid documents of new site on 31st October, 2012.
- Tenders for construction will be invited subject to availability/release of funds and approval of PC-I of the Project.

Naulong Dam Project

Location

The proposed Naulong Storage Dam Project is located on Mula River at Sunt about 30 Km from Gandawa City in Tehsil and District Jhal Magsi of Balochistan.

Objectives

- Irrigated agriculture development
- Hydropower generation
- Flood mitigation
- Socio-Economic uplift and poverty reduction

Salient Features

Dam Type	Earth Fill
Dam Height	186 ft.
Gross Storage	242,452 AF
Live Storage	200,244 AF
Spillway Design Discharge	438,905 Cusecs
Fuse Plug Capacity	200,000 Cusecs
Culturable Command Area	47,000 Acres
Power Generation	4.4 MW
Project Cost	Rs. 15.973 Billion

Current Status

- Feasibility study and detailed engineering design of the Project was completed in 2009.
- Tenders for construction were invited and received on 17th April, 2010. Letter of Intent issued to the lowest bidder M/s Descon – Zargoon JV on 12th April, 2011. Letter of Acceptance issued on 10th May, 2012.
- Memorandum of Understanding (MoU) for security arrangement for contractor concurred by government of Balochistan.
- Contractor intimated that the project could not be completed within the bid cost with available escalations in the contract and not submitted the performance guarantee.
- Fresh bids will be invited to avoid violation of PPRA rules.
- Revised PC-I amounting to Rs.18.028 billion approved by ECNEC in its meeting held on 16th August, 2012.

Winder Dam Project

Location

The Winder Dam is proposed across Winder River about 100 Km from Karachi about 66 Km from Uthal, district Lasbela of Balochistan Province.

Objectives

- Irrigated agriculture development
- Hydropower generation
- Socio-economic uplift and poverty reduction

Salient Features

Type	Earth Core Rock-Fill Dam (ECRD)
Height	31 M
Length	517 M
Catchment Area	355 Sq. Miles

Estimated Mean Annual Run off	40.365 AF
Gross Storage Capacity	36,484 AF
Live Storage Capacity	36,167 AF
Life of Reservoir	32 years
Water regulated from the Dam	28,000 AF/year
Width	155.5 M
No. of Gates	11 Nos. of 40 ft. width x 21 ft. height
Spillway Design Flood	152,000 Cusecs (500 years Frequency Flood)
Culturable Command Area	10,000 Acres
Power Generation	300 KW
Project Cost	Rs. 8.324 Billion

Current Status

- Ground-breaking Ceremony was graced by the President of Pakistan on 1st January, 2010.
- Tenders for construction on EPC basis opened on 28th September, 2009.
- Letter of Acceptance issued to M/s Techno Engineering – RSWI JV on 15th February, 2010 based on Contractor's bid amounting to Rs. 7.735 billion.
- Unsuccessful bidders submitted writ petition in Lahore High Court against award of the project.
- Lahore High Court settled the petition in favour of the petitioner.
- Chief Secretary government of Balochistan has given formal concurrence of government of Balochistan to implement Winder Dam Project through WAPDA.
- Project will be re-tendered on EPC after undertaking detailed engineering design and tender documents of the project.
- Revised PC-I amounting to Rs. 8.324 billion submitted to Ministry of Water & Power for arranging approval of ECNEC.
- Funds amounting to Rs. 300 million allocated in PSDP 2012-13 against a demand of Rs. 1,000 million.

Garuk Dam Project

Location

The proposed dam site is located across Garuk River at about 47 Km South East of Kharan district of Balochistan.

Objectives

- Storage of flood water
- Conservation of flood water resources for irrigation, drinking and recharge
- Development of new irrigated agricultural area

Salient Features

Type of Dam	Earth Core Rock Fill.
Height of Dam	184 ft.
Gross Storage	50,695 AF
Proposed length of dam	2323 ft.
Culturable Command Area	12,500 Acres
Power Generation	300 KW
Project Cost	Rs.7.921 Billion

Current Status

- PC-I approved by ECNEC in its meeting held on 3rd September, 2009.
- WAPDA proposed the project through local district contractors by subletting the various components to increase participation of the local community.
- Government of Balochistan suggested transferring the project to Irrigation and Power Department of Balochistan for execution.
- Revised PC-I amounting to Rs. 7.921 billion is under preparation.
- No funds allocated in PSDP 2012-13 for construction of the project.

Pelar Dam Project

Location

The proposed dam site is located across Nal River about 30 Km upstream from Korek Pelar Village about 100 Km from district Awaran of Balochistan.

Objectives

- Storage of flood water
- Development of new irrigated agricultural area
- Socio-economic uplift and poverty reduction.

Salient Features

Type of Dam	Concrete Gravity
Height of Dam	60 ft.
Gross Storage	99,175 AF
Culturable Command Area	25,650 Acres
Power Generation	300 KW
Project Cost	Rs. 8.740 Billion

Site of Daraban Zam Dam

Current Status

- PC-I amounting to Rs. 1.692 billion approved by ECNEC in its meeting held on 3rd September, 2009.
- WAPDA proposed the project through local district contractors by subletting the various components to increase participation of the local community, local monetary benefits.
- Government of Balochistan suggested transferring the project to Irrigation and Power Department of Balochistan for execution.
- Funds amounting to Rs. 50 million allocated in PSDP 2012-13 against a demand of Rs. 1,000 million.

Daraban Zam Dam

Location

The dam is located on Khora River near existing Zam Burg Tower, 69 Km South West of D.I Khan, Khyber Pakhtunkhwa province.

Objectives

- Irrigated agriculture development
- Hydropower generation
- Socio-economic uplift of the remote areas of Khyber Pakhtunkhwa.

Salient Features

Type of Dam Asphalt	Concrete Faced Rock-Fill
Height of Dam	154 ft.
Catchment Area	410 Sq. Miles
Gross Storage	69,739 AF
Live Storage	40,662 AF
Spillway Design Flood	104,000 Cusecs
Culturable Command Area	16,000 Acres
Power Generation	750 KW
Project Cost	Rs.5.828 Billion

Current Status

- PC-I amounting to Rs. 2.751 billion approved by ECNEC on 3rd September, 2009.
- Tenders for construction on EPC basis invited/ received on 20th July, 2010. M/s DESCON submitted bid, evaluated and post-qualified.
- Construction of the project deferred, keeping in view of non allocation of funds in PSDP for the project and inauspicious security situation in the project area.
- Tenders will be re-invited on BOQ basis after detailed engineering design of the project.
- Funds amounting to Rs. 50 million allocated in PSDP 2012-13 against a demand of Rs.700 million.
- Revised PC-I is under preparation.

Bara Dam Project

Location

The proposed dam is located across Bara River at the confluence of Mastura River in Khyber Agency, FATA and Khyber Pakhtunkhwa Province.

Objectives

- Assured irrigation supplies to the existing irrigation schemes
- Hydropower generation
- Water supply

Salient Features

Main Dam

Type	Earth Core Rock Fill Dam
Height	302 ft.
Length	1477 ft.
Gross Storage Capacity	85,363 AF
Dead Storage	22,929 AF
Power Houses Installed Capacity	5.8 MW 38.1 GWh)

Dyke

Height	9 M
Crest length	320 M

Spillway

Type	Overflow Ogee
Capacity	284,670 Cusecs (PMF)

Intake

Capacity	330 Cusecs
Culturable Command Area	41,729 Acres
Project Cost	Rs.14.208 Billion

Current Status

- Feasibility study completed in 2008.
- PC-I amounting to Rs.14.208 billion approved by ECNEC on 3rd September, 2009.
- WAPDA appointed consultants for preparation of project planning report and tender documents based on detailed engineering design to invite tenders on measurement (BOQ) basis.
- Detailed engineering design, EIA & RAP studies of the project are in progress.
- Funds amounting to Rs. 50 million allocated in PSDP 2012-13 against a demand of Rs. 500 million.
- Tenders for construction will be invited on finalization of project planning report and tender documents and on availability of funds for the project.

Tank Zam Dam Project

Location

Tank Zam Dam project is proposed across River Tank Zam near Hinis Tangi, at about 30 Miles from D.I. Khan in Khyber Pakhtunkhwa Province.

Objectives

- Socio-economic uplift of the remote areas of Khyber Pakhtunkhwa
- Storage of flood water
- Irrigated agriculture development
- Hydropower generation

Salient Features

Type of Dam	Earth Fill Dam
Height of Dam	292 ft.
Length of Dam	1285 ft.
CatchmentAarea	840 Sq. Miles
Mean Annual Flow	260,630 AF
Gross Storage	345,000 AF
Live Storage	289,000 AF
Spillway Design Flood	177,238 Cusecs
Culturable Command Area	35,000 Acres
Power Generation	25.5 MW
Life of Dam	50 years
Project Cost	Rs. 59.426 Billion

Current Status

- Feasibility studies completed in 1988.
- WAPDA appointed consultants for preparation of project planning report and tender documents based on detailed engineering design to invite tenders.
- Draft project planning report prepared by consultants and under review for finalization.
- PC-I for the project prepared and is under submission to Ministry of Water & Power for arranging approval of ECNEC.
- Tenders for construction will be invited on finalization of project planning report and tender documents, approval of PC-I of the project.

Darawat Dam Project

Location

The proposed site for Darawat Storage Dam is located at about 70 Km West of Hyderabad and 135 Km North East of Karachi across Nai Baran River in Thata/Jamshoro districts of Sindh province.

Objectives

- Irrigated agriculture development
- Hydropower generation
- Socio-economic uplift and poverty reduction

Salient Features

Dam Type	Concrete Faced Rockfill Dam
Length of Dam	820 ft.
Maximum Height of Dam	141 ft.
Gross Storage	119,546 AF
Live Storage	87,264 AF
Life of the Dam	100 years
Type of Spillway Broad	Crested Weir With Flip Bucket
Width of Spillway	152.50 M (500 ft.)
Design Flood	5918.05 Cumec (208,990 Cusecs)
Culturable Command Area	25,000 Acres
Power Generation	0.45 MW (will be developed under public private partnership)
Project Cost	Rs.9.39 Billion

Current Status

- PC-I amounting to Rs. 3.175 billion approved by ECNEC in its meeting held on 3rd September, 2009.
- Ground Breaking ceremony was graced by the President of Pakistan on 2nd January, 2010.
- Project awarded to M/s. Sinohydro-MAJ JV. (Bid Price = Rs. 7.555 Billion). The contractor mobilized to site on 30th June, 2010.
- Construction of dam completed. Construction of irrigation network is in progress. Total physical progress up to date is 76%.
- EXIM Bank agrees to provide 90% of the contract price and remaining 10% will be out of PSDP allocations.
- Revised PC-I amounting to Rs. 9.300 billion approved by ECNEC in its meeting held on 16th August, 2012.
- Funds amounting to Rs. 2,000 million allocated in PSDP 2012-13 against a demand of Rs. 8,000 million.
- President of Pakistan inaugurated the Project on 9th March, 2013.

Nai Gaj Dam Project

Location

The Nai Gaj Dam Project is envisaged to be located on Gaj River about 0.5 Miles West of Gaj Inspection Bungalow in district Dadu of Sindh province.

Objectives

- Irrigated agriculture development
- Hydropower generation
- Flood control
- Socio-economic uplift and poverty reduction

Salient Features

Type of Dam	Earth Core Rock Fill Dam
Height of Dam	194 ft.
Live Storage	160,000 AF
Gross Storage	300,000 AF
Dead Storage	140,000 AF
Culturable Command Area	28,800 Acres
Lower Riparian Area	18,000 Acres
Power Generation	4.2 MW (will be developed under public private partnership)
Project Cost (Rationalized)	26.240 Billion

Current Status

- Tenders for construction opened on 16th July, 2010. Letter of Acceptance issued to M/s CHEC-SMADB JV on 13th January, 2011. Contract agreement has been signed on 12th April, 2011. Letter of commencement issued on 4th May, 2012.
- The contractor M/s SMADB – CHEC JV mobilized to site and work at dam site and irrigation canals are in progress.
- M/s Techno Consult International approved as supervision consultant.
- Revised PC-I amounting to Rs.26.236 billion approved by ECNEC in its meeting held on 16th August, 2012.
- Funds amounting to Rs. 2,000 million allocated in PSDP 2012-13 against a demand of Rs.16,000 million required for implementation of the project. Rs.400 million released this year.
- Arrangement of concessional loan from Exim Bank of China is in progress.

Papin Dam Project

Location

The dam site is located at a distance of about 2 Km from East side of Papin village and 50 Km south West of Rawat Town, tehsil & district Rawalpindi on Wadala Kas, a tributary of Soan River.

Objectives

- Storage of flood water
- Irrigated agriculture development
- Socio-economic uplift of the area

Salient Features

Type of Dam	Concrete Gravity
Height of Dam	111 ft.
Catchment Area	417 Sq. Km
Mean Annual Flow	136,426 AF
Gross Storage Capacity	89,600 AF
Live Storage	48,600 AF
Culturable Command Area	18,000 acres
Installed Capacity	300 KW
Project Cost	Rs.8.609 Billion

Current Status

- PC-I amounting to Rs.1.136 billion approved by ECNEC in its meeting held on 3rd September, 2009.
- Revised PC-1 amounting to Rs.8.609 billion submitted to Ministry of Water & Power for arranging approval of ECNEC.
- No funds allocated in PSDP 2012-13 for construction of the project.
- Tenders for construction will be invited on allocation/release of funds and approval of PC-I of the project.

Ghabir Dam Project

Location

The Ghabir Dam Project is proposed across the Ghabir River. It is located 9 Km from Village Danda Shah Bilawal and about 60 Km from Talagang on Talagang Mianwali Road.

Objectives

- Irrigated agriculture development
- Storage of flood water
- Socio-economic uplift and poverty reduction

Salient Features

Type of Dam	Earth Core Rock Fill Dam
Height of Dam	138 ft.
Catchment Area	161 Sq. Miles
Mean Annual Flow	38,428 AF
Length of Dam	3,117 ft.
Gross Storage	66,203 AF
Live Storage Capacity	26,000 AF
Reservoir Area	1,544 Acres
Spillway Design Flood	47,675 Cusecs
Culturable Command Area	15,000 Acres
Project Cost	Rs.11.679 Billion

Current Status

- PC-I amounting to Rs. 2.111 billion approved by ECNEC on 3rd September, 2009.
- Authority decided to retender being priority project.
- Acquisition Land for dam body completed and amount of Rs. 9.248 million transferred on a/c of Assitant Commissioner Talagang, Chakwal. Land acquisition for Access Road, Colony and Contractor's camp are in progress.
- Revised PC-I amounting to Rs. 11.679 billion submitted to Ministry of Water & Power for arranging approval of ECNEC.
- Funds amounting to Rs. 500 million allocated in PSDP 2012-13 against a demand of Rs. 300 million.

Hydrogeology Section WAPDA

Hydrogeology Section is responsible for collection, evaluation and compilation of ground water data which provides a dependable basis for planning and development of ground water resources throughout Pakistan.

During the year 2012-13 no ground water project under PSDP was awarded to this office. However, deposit works for different Government/semi Government and different WAPDA formations were carried out during the fiscal year 2012-13.

Under deposit works amounting to Rs. 40 million for different Government/Semi Government and different WAPDA formations, 3 test holes were drilled and 8 tubewells along with their development and testing are completed while 6 tubewells are under

progress (status given below). A total of 76 electrical resistivity probes were conducted for a number of water supply schemes for different Government/ Semi Government departments and different WAPDA formations during the fiscal year 2012-13.

Sr. No.	Name of work	Name of agency	Current status
1	Installation of Tubewell at Kakra Potha, Distt. Mirpur, AJK	Mangla Dam Raising Project	Completed
2	Installation of Tubewell at Ghazi Barotha Hydropower Complex Colony	GM Ghazi Barotha	Completed
3	Installation of Tubewell at Ghazi Barotha Hydropower Project at Spoil Banks	GM Ghazi Barotha	Completed
4	Installation of Tubewell at Warsak Dam	Hydropower Station, Warsak	Completed
5	Installation of Tubewell at 500 KV Grid Station, Multan	NTDC, Multan	Completed
6	Installation of Tubewell at Chashma Power Station Colony	Chashma Power Station	Completed
7	Installation of Tubewlls at Guddon Amazai	PESCO	Completed
8	Installation of Tubewell Ghazi Barotha at Power Channel Spoil Bank No.28	GM Ghazi Barotha	Completed
9	Installation of Tubewells at Warsak Dam Hydropower Station	Hydropower Station, Warsak	Work in progress
10	Installation of Tubewell	PESCO	Work in progress
11	Installation of 2 Tubewells Mangla Dam Project (Baral & Bruti Colony)	Mangla Dam Raising Project	Work in progress
12	Installation of Tubewell Ghazi Barotha at Power Channel Spoil Bank No.29	GM Ghazi Barotha	Work in progress
13	Installation of pumps for 3 Tubewells at spoil bank of Ghazi Barotha Project	GM Ghazi Barotha	Work in progress
14	Testing boring of Tubewell at Mardan	PESCO	Completed
15	Hydroelectric Power Station, Jabban	Power Station, Jabban	Completed
16	Testing boring of Tubewell at Ghazi Barotha at Power Channel Spoil Bank No.29	GM Ghazi Barotha	Completed

WAPDA Model Studies Cell

WAPDA Model Studies Cell was established in late 1983 at Irrigation Research Institute, under a Memorandum of Understanding signed between WAPDA and Irrigation & Power Department, government of Punjab. This research oriented formation of WAPDA is responsible for carrying out hydraulic model studies of Water and Power Projects of WAPDA. Right from 1983 upto the year 2013, this organization has performed a number of model study works of different WAPDA projects. For the last many years Model Cell is conducting the model studies of WAPDA projects which are included in the Vision 2025 Programme.

Proposal for Establishment of New WAPDA Model Studies Cell

On the direction of the Chairman WAPDA, a team from P&I Organization identified and visited the 05 potential sites for establishment of new WAPDA Hydraulics Research Station. These are as under:-

i. Mona Experimental Project Bhalwal
ii. Hydel Power Station, Renala Khurd
iii. Chicho Ki Mallian Hydel Power Station
iv. Chashma Barrage
v. Mangla Dam Project

After reconnaissance and keeping in view the size of land, water availability, accessibility and proper drainage to parent canal, the establishment of the Research Station has been proposed at Korean

Camp Site, Chashma Barrage. The matter is under review with the competent authority.

Model studies for the following projects were conducted during the year 2012-13:-

Diamer-Basha Dam Project

WAPDA Cell entrusted with the model study of the project, in the feasibility stage, comprising the following 2-models:-

Comprehensive Model of the Project	Scale 1:80
Sectional Model of Spillway	Scale 1:50

After accomplishment the model study programme according to the objectives laid by the Design Consultants, the models retained/maintained. The design consultants submitted a detailed TOR for diversion works the model studies for diversion arrangements section model of spillway and comprehensive model of the project have been completed.

Kurram Tangi Dam Project

The model study of the project was entrusted to WAPDA Cell by Planning & Investigation Organization. Following two models were entrusted and rested according to the objectives laid by the design consultants M/s Kurram Tangi Dam Consultants:-

Comprehensive Model of Kurram Tangi Dam Project	Scale 1:40
Model of Kaitu River and Weir	Scale 1:20

Dasu Hydropower Project

Most recently the model study programme of the project comprising the following 2-models has been entrusted to WAPDA Cell by Hydro Planing Organization of WAPDA:-

Comprehensive Model of the project comprising all components	Scale 1:80
Sectional Model of the Spillway	Scale 1:50

Neelum Jhelum Hydroelectric Project

Neelum Jhelum Hydroelectric Project located in the vicinity of Muzaffarabad, Azad Jammu and Kashmir, is an important project of WAPDA. It is high head, run of the river project which will utilize a gross head of about 420 M by diverting the Neelum River Water to the lower limb of the Jhelum River through a 32.5 Km long tunnel system. The optimized maximum capacity of the power station is 969 MW.

On the perception of possible damages to the energy dissipation system by heavy sediment movement through the spillway, additional measures are necessary to improve the energy dissipation downstream of the dam. To serve the purpose, a Sectional Model of spillway 1: 40 geometrical scale was constructed and tested to finalize the most suitable energy dissipation system downstream of the spillway.

Kohala Hydropower Project

The Kohala Hydropower Project is planned on Jhelum River in the area of Azad Jammu and Kashmir. The purpose of the project is to produce electric power of 1100 MW and would be connected to the national grid of Pakistan.

The design consultants of Kohala Hydropower Project proposed the following two models to check the hydraulic performance of the salient features of the project:-

Comprehensive model	Scale 1:40
Sectional model of spillway	Scale 1:36

The above two models were constructed and tested at Hydraulic Research Station Nandipur to achieve the objectives as laid by the design consultants of the project.

Bunji Hydropower Project

Bunji Hydropower Project is proposed on Indus River 83 Km East of Gilgit City and 314 Km upstream of the proposed Diamer Basha Dam Project. By constructing a 200 M high RCC arched gravity dam above the bed rock, a hydraulic head of 440 M will be developed providing an installed capacity of 7100 MW. In view of the project dimensions, Design Consultants M/s Bunji Consultants joint venture (BCJV) proposed Hydraulic Model Studies on the following four models:-

Comprehensive model of the project	Scale1:80
Partial model of spillway	Scale 1:50

Partial model of med and low level outlets	Scale 1:30
Model of tailrace and outfall structure	Scale 1:80

In the first phase, comprehensive model of the project and partial model of spillway were constructed at Hydraulic Research Station Nandipur. Model study on partial model of spillway has now been completed while model testing on comprehensive model is still in progress.

Mohmand Dam Project

A comprehensive model will be constructed comprising all the prominent features of the project and will be tested at Hydraulic Research Station Nandipur to achieve the objectives as laid by the design consultants of the project. The estimate is under preparation with the Model Studies Cell.

Hydrology and Water Management Organization (H&WM)

Hydrology and Water Management Organization (H&WM) is responsible for management of water from the Indus River System, country's richest water and power sources, through its following formations:-

Glacier Monitoring Research Centre, WAPDA

More than seventy percent of River flows in Pakistan are generated from the Glacier and Snow melt. These glaciers and snow fields are located in the Upper Indus Basin. There are reports in the international literature that the glaciers are under threat to considerable reduction during current century. WAPDA fully cognizant of the situation has established Glacier Monitoring Research Centre to carry out monitoring of Upper Indus Basin glaciers for the purpose of water resources management in wake of climate change.

GMRC is also developing and issuing seasonal as well as short-term (10-Daily) flow forecasts for River Indus at Tarbela, River Jhelum at Mangla and River Kabul at Nowshera to the WAPDA and the Indus River System Authority since 2004 for Water Resources Management of the country and optimum management of the reservoirs. It has installed a high altitude automatic weather network, comprising twenty Data Collection Platform stations, in the Upper Indus Basin (UIB) in the elevation range of 2200 – 4700 meters above sea level which collects hourly temperature, precipitation, relative humidity, solar radiation, snow water equivalent and wind data from the remote stations and transmits it directly to the Flow Forecasting Centre located at Lahore through state of the art meteorburst Communication System.

It has also obtained a computer model from the University of British Columbia, Canada and calibrated it to the hydrometeorlogic conditions of Upper Indus Basin to forecast flows into the Upper Indus Basin Rivers.

Recently under World Bank capacity building project, flow forecasting study Remote Sensing, GIS and Snow Runoff model has been concluded by monitoring snow conditions in the upper catchments of River Jhelum above Mangla Reservoir. The results of this one year study were promising. The methodology adopted in the study will be extended to the catchments of River Chenab, River Kabul and River Indus, head waters of these rivers are located outside the borders of Pakistan and physical monitoring of these catchments is not possible.

WAPDA is fully cognizant about the long term water availability from the Upper Indus Basin for its future hydropower projects and water resources management of the country especially under the global warming scenarios, therefore, it has initiated a six year World Bank funded "Monitoring of Upper Indus Basin Glaciers for the Water Resources Management of the country in the wake of Climate Change" study in July, 2012. The Centre will carry out studies of Mass Balance at least five UIB large glaciers, and Snout Movement and Mapping of more than fifty large and medium size glaciers to determine the present status of our glaciers and forecast water availability from them in near and long-term future by using advanced Remote Sensing and GIS techniques along with ground verification.

This will also include capacity building of young and healthy staff in the field of glacier, snow and water resources, strengthening of the present UIB high altitude meteorological network and training of staff

in using advance methods of Remote Sensing, Geographical Information System, Digital Elevation Models, Glacier and Snowmelt models to forecast the future water availability from UIB and to cater for the new challenges posed by the Climate Change to the water resources of the country.

The other feature of the project is the monitoring of potentially dangerous glacial lakes, risk assessment of these lakes and suggestions for possible mitigation measures to reduce the downstream impact of these lakes. These lakes will be identified by using time series of high resolution remote images and observing the changes in the size of the lakes over the time. This is very important for the safety of WAPDA future hydropower projects in Tarbela catchment.

Hydrology and Research Directorate WAPDA

Hydrology and Research Directorate (H&RD) WAPDA is responsible for acquisition of hydro-meteorological data through Telemetric and Hydromet Networks and dissemination of the same to the national institutions such as PMD, FFC, IRSA, Provincial Irrigation Departments and Research Institutions etc. H&RD had been operating and maintaining its following Networks:-

- Telemetric and Hydromet network for Flood Forecasting and Warning System
- Climatological Stations Network
- Hydrological Cycle Observing System (HYCOS)

Telemetric and Hydromet Network for Flood Forecasting and Warning System

A quasi real time data on river level and catchment rainfall from the network of 45 Nos. Flood Telemetric Stations from the upper catchments of River Indus is being collected using Meteor Burst Communication System and transmitted to National Flood Forecasting Division Lahore of Pakistan Meteorological Department for use in computer models to issue timely Flood Warnings.

Climatological Stations Network

Climate data on Temperature (maximum, minimum, dry, wet), rainfall, evaporation, relative humidity and dew point is being recorded by conventional methods through 12 Nos. manual Climatological Stations establilshed in Central Punjab. Reports comprising daily data of climatological network are being published on annual basis.

Hydrological Cycle Observing System (HYCOS)

Having recognized the convergence of the objectives of flood risk reduction in the Hindu Kush Himalayan (HKH) region, WAPDA with the collaboration of ICIMOD, has started a joint HKH – HYCOS project to establish a framework for regional flood information system for access to real time data on River level and catchment Rainfall to all participating countries to support disaster prevention and flood management. Presently, following 3-sites have been made functional for measuring data:-

- Gupis on River Ghizer
- Kalam on River Swat
- Nowshera on River Kabul

The real time data of river water level & precipitation is being received from HYCOS stations and posted on WAPDA as well as on ICIMOD server. This data is being transmitted through internet from the GSM Sim Cards. Iridium has also been installed at the station which serves as stand by communication system that can be used as an alternate communication system in case of failure of GSM communication.

Surface Water Hydrology Project

Surface Water Hydrology Project, WAPDA is responsible for the collection, analysis, processing and publication of the Hydro-meteorological, sediment and chemical data of major rivers and Nullahs of Pakistan on annual basis. This includes discharge, sediment, rainfall, climatological and chemical data collection from a widely scattered network of 86 hydromet stations monitored on regular basis. In addition, 82 No. hydromet sites entrusted to the project by various WAPDA formations working on different Water Resources Projects for specific time period are also being operated and maintained. The hydrological data gathered from a network of hydromet stations is the basic information required for future planning and design of Water Resources Development Schemes, in respective areas.

Moreover, a PC-II for strengthening of hydrological

Control Room of Telemetry System at Chashma

network in the provinces of Balochistan and Khyber Pakhtunkhwa is also being operated under the instructions of Ministry of Water & Power, Government of Pakistan. This includes monitoring of 14 No. hydrological sites on common rivers with Afghanistan along the Durand line. All the sites have been finalized in consultation with Pakistan Commissioner for Indus Waters. However, due to constraints posed by security situation along the Dewarnd line (International Boundary), 11 No. sites, 7 in Balochistan and 4 in Khyber Pakhtunkhwa have so far been activated by engaging daily wages staff. As soon as the security situation improves the activities could be started on the remaining sites.

During the year 2012-13, 4 No. annual publications were completed and hydro-meteorological data from its 178 No. hydromet stations (regular & deposit work both) located in far flung areas throughout the country was collected for Mangla, Tarbela, Gazi Barotha and for other projects entrusted by various WAPDA formations.

Telemetry Project for Indus Basin Irrigation System

Indus Basin Irrigation System

Pakistan has agrarian based economy. It has one of the largest contiguous irrigation systems in the world which is fed by Indus River and its tributes. The Indus Basin Irrigation System comprises of two large reservoirs, 19 barrages for diverting river water into canals, 12 inter river link canals and 46 independent canals command delivering water to farm lands. The WAPDA controls the operation of reservoirs whereas the operation of barrages is controlled by the Provincial Irrigation Department.

A Water Apportionment Accord (WAA-1991) exists for distribution of Indus Basin waters among the provinces. The Indus River System Authority (IRSA) was established for ensuring distribution of Indus water to be in accordance with WAA-1991. IRSA finalizing the apportionment of water to the provinces as per WAA-1991 and passes decision to the regulating authorities for water releases at dams and barrages. Water into irrigation system is regulated as per decisions of IRSA at dams and barrages being operated/controlled by WAPDA and Provincial I&P Department. However, there is no mean of verification of compliance to IRSA decision.

Need for Telemetry System and Approval by ECNEC

There have been growing and repeated complaints by the provinces of misreporting of actual flows/discharges by the local barrage authorities to IRSA. There was no system of verification that

instructions of IRSA regarding water distribution have been compiled correctly by the local barrage operating authorities. Accordingly a project proposal for installation of a telemetry system on IBIS was submitted by IRSA to Government of Pakistan. In May 2002, the PC-I for the Telemetry Project for Indus Basin Irrigation System (TPIBIS) was approved by ECNEC at a cost of Rs. 450 million and also decided that the Project be executed by WAPDA and handed over to IRSA for operation and maintenance (O&M) and that IRSA should build its capacity for O&M.

The Project Features

The Telemetry System has been installed at 24 locations of the Indus Basin Irrigation System for providing real time (on line) information of flows at the dams and barrages minimizing the human interference in data acquisition, its processing and transmission for monitoring at 9 locations by the stakeholders i.e. Ministry of Water & Power. IRSA, Press Information Department and WAPDA.

The amount of flow/discharge through a dam/ barrage is calculated at the respective dam or barrage site by reading the essential parameters of flow equations through electronic sensors. The telemetry system/network comprises about 2600 electronic sensors for measuring water levels and gate positions at the remote sites that provide the information instantly through programmable logic controllers to the computers for processing and transmission to the main and other monitoring sites (stakeholders) in real time round the clock. The discharge data of the IBIS from the telemetry system is also available on the internet at the web site

Project Execution and Operation & Maintenance

The TPIBIS was executed by WAPDA through a contract with M/s Siemens Pak Engineering Ltd. at a cost of Rs. 285 million. The project on completion and testing was handed over to IRSA for O&M in September, 2004. However, IRSA could not build required capacity for the O&M of the system. Therefore due to improper O&M, the telemetry system did not perform to executions and various problems cropped up. After the inspection of the system by the Chairman, Prime Minister Inspection Commission (PMIC) the O&M in consultation with the IRSA, entrusted the O&M of the telemetry system to WAPDA. Accordingly, a new organizational set-up has been established by WAPDA under the Superintending Engineer TPIBIS. The main monitoring site of the telemetry system is located at the premises of CMTL, WAPDA, Raiwind Road, Lahore.

Appraisal by International Consultant

For checking the authenticity of telemetry data, IRSA started comparing it with data of the existing manual system. As per PC-I, the manual data was declared unreliable in the first instant on numerous counts. To resolve the issue, the Ministry of Water & Power appointed an international consultant of World Bank for appraisal of the system and suggesting measures for making the data acceptable by stakeholders. The International Consultant inspected the system in June, 2007 and observed that the equipment, technology and system are adequate to the task and suggested certain improvements in telemetry system to make the data useable to IRSA, part of which related to WAPDA has been implemented. The international consultant also declared that the Telemetry System was delivered as requested in IRSA's PC-I and is respond to the issues that initiated it.

Present Status

Presently, 20 no. Telemetry data acquisition sites are being kept operational by using spares from other non-priority sites because of budget constraints. Nowshera (on Kabul river), and Sulemanki HeadworksTelemetry sites will be made operational after availability of funds and Pat Feeder RD-109 and Balloki Headworks Telemetry sites will be made operational after completion of remodeling work being carried out by respective Irrigation department.

Water Resources Management Directorate (WRMD)

The co-ordination WAPDA, Indus River System Authority (IRSA), Federal and Provicial Governments for release of water to meet the irrigation and power needs from the existing Indus Basin Project reservoirs, operation and maintenance of WAPDA's manual telecommunication network (HF Radio Communication System) for communicating

hydrological data of rivers catchments of Tarbela and Mangla and administrative needs of these projects through water management covering Indus Basin Irrigation System and flood management etc. are basic functions of WRMD. Flood Warning Stations established at specified sites on main rivers and its tributaries. WAPDA has constructed its own huts for accommodating staff and sensitive electronic equipment at all sites with the provision of at least three wireless Operators at each station to keep the HF Radio communication system in operation round the clock to provide the river inflow and reservoir data on hourly basis especially during the flood season. Moreover, this directorate also deals with systematic collection, compilation & publication of the historic rivers & canal discharge data of the Indus Basin. The Directorate also helps IRSA in preparation of seasonal reservoir operation criteria for the existing reservoirs of Chashma, Mangla and Tarbela. A flood information center also works round the clock in WAPDA House under WRMD during flood season (15th June to 15th October).

According to salient operational features, annual canal head diversion of Indus Basin System in Post-Tarbela period increased by about 17 percent and 9 percent compared to average to Pre-Mangla (1960-61 to 1966-67) and Post-Mangla (1966-67 to 1975-76) periods respectively. Corresponding increase in Rabi period was of the order of about 29 percent and 17 percent respectively.

Significant assignments accomplished for the year 2012-13 are as under:-

- River discharge and rain data observed/collected on hourly basis was transmitted not only to reservoir operating authorities but also provided to FFC, IRSA, PMD, Army, PCIW, PID and Flood related agencies.
- Performance during the Flood Season 2012 of HF Radio Communication System remained satisfactorily. Transmission of data remained effective round the clock and not a single observation of any site was missed.
- Canal withdrawals, Rim stations inflows and reservoir operation data was provided to government & semi government agencies and consultants.
- Following annual reports of operational data used for different research & planning organizations were published:-
  - Indus Basin Irrigation System historic rivers and canals discharge data.
  - Indus Basin Irrigation System abstract of operational data
  - Statistics at a glance
  - Historic and probable Western River Rim-Station inflow on 10-Daily Basis from 1922-23 and to-date.
  - Zone-wise canal withdrawals from 1967-68 to-date.
- Publications for the year 2012-13 are in hand and expected to be completed by the end of December, 2013.

Dams Organization

Besides processing technical matters and coordination of activities on dams, this organization is also responsible for supervision of the execution of Mangla Watershed Management Project through Project Director. This organization assists the Technical and Financial evaluation of Proposal submitted by Consultants for water sector and hydropower projects as Member of Standing Review Committee (SRC).

Mangla Watershed Management Project WAPDA

Mangla Watershed Management Project started functioning in 1959-60. The primary objective of the Project is to reduce the sediment load flowing into Mangla Reservoir so as to prolong its useful life through improved methods of land use techniques and implementation of Watershed Management practices in the catchment area above Mangla Dam.

The objectives are being achieved through vigorous applications of the conservation practices at a faster rate to reduce the rapid deterioration of the catchment areas. The scheme provides the solution for the problem through integrated and coordinated implementation of the various conservation measures i.e. afforestation of bare and denudeds lands/hill slops, construction of soil conservation structures, improvement of cultivated fields, construction of silt trap storages, spillways, wire crate spurs/gabbions etc. and training to motivate and to aware the land

owners regarding the importance and benefits of the programme for devotion of their cooperation and active participation in the Watershed Management activities.

The project besides reducing silt entry into Mangla Reservoir has also improved the socio-economic conditions of the people living in the area through improvement of land with consequent increase in agriculture, forest and range land produce, increase in sub-soil water resources and perennial stream flow, minimizing the run-off with consequent reduction in flood hazards and environmental protection of the area.

The total catchment area of the River Jhelum above Mangla is 12870 Sq. Miles, of which 56 percent lies in the India held territories of Kashmir and the remaining 44 percent within Pakistan and Azad Jammu & Kashmir. Out of the total area in Pakistan and Azad Jammu & Kashmir, only 3433 Sq. Miles is covered under this scheme which also includes critical sediment source areas.

Since initiation, 8 phases of the project have been completed successfully, presently 9th phase of the project is in progress. Due to financial crisis/ rationalization of the budget allocations, the progress of the works during 2012-13 remained dismal.

Golan GoI Project Offices

Central Design Office (Water)

History/Background

After the completion of Indus Basin Project a large pool of engineers (Civil, Electrical and Mechanical) and other technical staff were rendered surplus. It was an asset having a vast experience of planning, design and construction. WAPDA, realizing the future needs of development and to minimize its dependence on foreign consultants, utilized the expertise of this large pool of technical staff in the form of establishing different planning and design formations in its set up. In this process of self reliance, Central Design Office (Water) was established in August, 1961.

Central Design Office (Water) started its long journey with a small organizational set-up which with the passage of time grew up into a full fledged Civil Engineering Design Office headed by a General Manager with the reputation of the best in the field in public sector, ensuring the deliverance of following objectives:-

Objectives

- Provide one window design services for projects such as dams, power houses, irrigation and drainage networks, flood protection, roads and buildings.
- Provide technical support to the field formations during the implementation / construction of the new projects and remedial measures / trouble shooting for already completed projects.
- Review of designs / drawings and calculation alongwith technical specifications implied / used by Consultants appointed for study of WAPDA Projects.
- Impart training to water wing drafting staff required for the departmental promotion.
- Establishing drafting standards, schedule of rates and verification of non-scheduled rates etc.
- In late 90's Dams Review Cell (DRC), which was headed by a General Manager, was cut down to Directorate level and renamed as "Project Review Cell (PRC), was attached with CDO(W). The TOR of PRC is to review all the reports prepared by WAPDA formations / Consultants (Pre-feasibility, feasibility detailed engineering design, PC-I's and PC-II's).

Technical Expertise

The Central Design Office offers a full range of consultancy services in various fields of Civil Engineering.

The principal technical fields of expertise available with CDO(W) are as under:-

a) Dam Engineering
b) Irrigation systems
c) Barrages
d) Bridges
e) Multi-Storeyed Buildings
f) Power Houses Civil Infrastructure
g) Architectural and Town Planning
h) Water Supply and Sewerage
i) Soil Investigation and Foundation Design
j) Technical Review of Design / Drawings

Achievements Record

Central Design Office (Water) has an unmatched record of achievement and delivery. CDO (W) is proud of its services rendered not only to various WAPDA formations but also to many Government/Semi government and autonomous bodies of the country. As far as fields of specializations are concerned it is still comparable with any consulting firm of the country. CDO (W) constitutes an eminent body of qualified and experienced technical personnel which had always come up to the expectations and enjoyed the full confidence of WAPDA formations which is reflected by the record of important assignments entrusted and handled by CDO(W). Few prestigious projects out of a long list are given below:-

a) Tanda Dam Project
b) Khanpur Dam Project
c) Hub Dam Project
d) Gomal Zam Dam Multipurpose Project
e) Various Bridges
f) Multi-Storeyed Buildings etc.

CDO (W) did not only accomplish prestigious assignments for WAPDA formations but also had enjoyed the confidence of other Government / Semi-government and even private bodies. Numbers of important assignments were successfully handled/ delivered by CDO(W) for the following organizations:-

a) Railways, Waterways and Road Transport Department Government of Pakistan.
b) Capital Development Authority.
c) West Pakistan Building Department, Government of West Pakistan.
d) West Pakistan University of Engineering and Technology.
e) Pakistan Red Crescent Society, Lahore.
f) University of the Punjab.
g) Kinnaird College Association.

During the last 10 years, more than 1000 assignments were completed and 6539 drawings were prepared by the CDO Staff. The important assignments completed pertaining to Satpara Dam, Gomal Zam Dam, Allai Khwar Hydropower Project, Khan Khwar Hydropower Project, Dubair Khwar Hydropower Project, Sabakzai Dam, Rasul Hydel Power Station, Dargai Hydel Power Station, Diamer Basha Dam, Chichoki Mallian Thermal Power Project, Warsak Dam, Thermal & Hydel Power Station Nandipur and Jinnah Hydropower Project.

Publications

Following design guides / publications have been prepared which are in great demand among various Engineering Departments:-

a) Standard Design of Residences for WAPDA Employees
b) Drafting Standards
c) Design Guides for Irrigation Channels
d) Design Guides for Irrigation Outlets
e) Design Guides for Barrages
f) Standard Design of slabs, beams and lintels
g) Computer Softwares for design of building

Organization Set Up

The Central Design Office (Water) is headed by the General Manager supported by 01 Chief Engineer, 04 Directors, 12 Deputy Directors,10 Assistant Design Engineers, 01 Assistant Director (Geology) and 71 technical and non-technical supporting staff.

ASSIGNMENTS ACCOMPLISHED DURING 2012-2013

Brief description of major design jobs under taken and completed during the year 2012-2013 are listed below:-

WAPDA Projects

Jinnah Hydropower Project

Architectural design of 4 bed rest house. Structural and foundation drawings of cross-drainage slab-

culvert, 20 bed hostel, driver and servants rooms, mosque for 150 persons, overhead water tank and high school (double storey) at Kot Chandan, Mianwali, drawings of water supply and sewerage drainage and kitchen details for 20 bed hostel.

Ghazi Barotha Hydropower Project

Structural and foundation drawings of additional class rooms in girls and boys high school, 20 bed officer's hostel and RC curb and gradient for inlet structure.

Miscellaneous Design Assignments

Architectural design of colonies, office buildings, residences alongwith structural, foundation, public health design, design of internal colony roads, access roads to dam/weir sites, cross drainage structures, over head water tanks, water supply & sewerages systems, cableways, watch towers, schools, dispensaries, shops and many other small assignments were carried out for the following Water and Power Wing Projects:-

i) Hydel Power Station, Dargai
ii) Golen Gol Hydropower Project
iii) 425 MW CCPP Nandipur
iv) Tunnel Boring Machine Model Display Arrangements at WAPDA House, Lahore
v) Warsak Dam Project
vi) Munda (Mohmand) Dam Project
vii) Pakistan WAPDA Foundation
viii) Ghazi Barotha Hydropower Project
ix) C.J. Link Canal Project
x) Hydel Power Station, Rasul
xi) WAPDA Sports Complex, Lahore
xii) Sukkur Electric Power Company (SEPCO)
xiii) Keyal Khwar Hydropower Project
xiv) Tarbela Dam Project
xv) Hydel Power Station, Chitral
xvi) Quetta Electric Supply Company (QESCO)
xvii) Islamabad Electric Supply Company (IESCO)
xviii) Mangla Dam Project
xix) Chashma Right Bank Canal
xx) Peshawar Electricity Supply Company (PESCO)
xxi) Surface Water Hydrology Project
xxii) Hydropower Training Institute Mangla
xxiii) Chashma Hydel Power Station
xxiv) Steam Power Station (GENCO-III) Faisalabad
xxv) WAPDA Hospital, Gujranwala
xxvi) Nandipur Hydel Power Station, Gujranwala
xxvii) Brief for the D-8 Water Cooperative Meeting to be held in Istanbul with effect from 20-24 February, 2013
xxviii) Chichoki Hydel Power Station
xxix) WAPDA Administrative Staff College, Islamabad
xxx) WAPDA Hospital, Peshawar
xxxi) Tarbela 4th Extension
xxxii) WAPDA Teaching Hospital Complex, Lahore
xxxiii) RBOD Project (New Colony at Dadu)
xxxiv) Gomal Zam Dam Project
xxxv) GEPCO, LESCO AND GENCO

PEPCO Projects

Ten design assignments with respect to infrastructure development for distribution companies (DISCOS), Steam and Thermal Power Stations, Grid Stations, and NTDC were carried out for their residential, non-residential buildings, colonies, flexible and rigid pavement, oil tankers, walls, mosques, hostels, flats, schools, rest houses and hospitals etc.

Review/Technical Appraisals

Review & Technical comments on feasibility reports, technical proposals, planning reports and tender documents were carried out by CDO(W) during the last 12 months for the following Projects:-

i. Development of Sunny View Complex (Phase-I) Lahore
ii. Amri Qazi Bridge at River Indus
iii. Monthly Progress Report of P&I
iv. Mangla Marala Link Canal (MMLC) Project
v. Kurram Tangi Dam Project
vi. Dasu Hydropower Project
vii. Phandar Hydropower Project
viii. Darawat Dam Project
ix. Neelum Jhelum Hydropower Project
x. Hingol Dam Project
xi. Kachhi Canal Project
xii. Installation of Lift in Egerton Road Building
xiii. Diamer Basha Dam Project
xiv. Satpara Dam Project
xv. Ratle (850-MW) Hydroelectric Plant
xvi. Muzaffargarh Canal & T.P Link Canal
xvii. Simly Dam Project
xviii. Jari Tunnel Feasibility Study Report

xix. Thermal Power Station, Guddu
xx. Mangla Dam Raising Project

Review & Technical comments on architectural and structural drawings of buildings, water supply & sewerage system and internal roads of Sunny View Complex (Phase-I) Lahore.

In addition to all above, the following activities also accomplished:-

a) Mandatory training of the tracers required for promotion.
b) Internship training of students of U.E.T. Lahore.

A total of 889 drawings were prepared and issued against the works described above to different WAPDA/PEPCO formations during the year 2012-13.

Project Review Directorate

Project Review Cell, CDW (W) acts as Secretariat of the Standing Review Committees (SRCs) constituted for the scrutiny and review of the PC-I's and PC-II's prepared by WAPDA Formations.

During the last 12 months this Directorate along with its all other Secretariat duties coordinated, processed, scrutinized, reviewed and cleared:-

- 11 PC-I's
- 3 PC-II's

Up Stream view of Jinnah Hydropower Project

Hydro Planning Organization, WAPDA

Hydro Planning Organization (HPO) is responsible for Planning and Design of Hydropower Projects in the country. Pakistan has about 60,000 MW identified hydropower potential and water resources of an annual average of 175 billion m^3, out of which 6733 MW of hydel potential and live storage capacity of 22 billion m^3 have been harnessed which are about 11% of total hydropower potential and 13% of annual flows respectively.

Hydropower is an inexpensive, dependable, indigenous and environment friendly source of electricity, therefore, it is desired to increase hydropower share in overall electricity generation for sustainable economic development of Pakistan.

HPO at present has taken up Hydropower Projects at various stages of study having a total capacity of over 20,000 MW. Jinnah Hydropower Project already under construction has been commissioned partially in March, 2012 and would be fully operative by the end of October, 2013. Feasibility Study, Detailed Engineering Design & Tender Documents of Kohala & Keyal Hydropower Projects have been completed, while Detailed Engineering Design of Bunji Hydropower Project has been completed in March, 2013. PC-I of Harpo Hydropower Project is submitted to Planning Commission for approval in June, 2013. Detailed Engineering Design and Tender Documents of Dasu Hydropower Project, Harpo Hydropower Project, & Basho Hydropower Project are under process. Feasibility Studies of Palas Valley & Spat Gah were finalized in 2010. The study of enhancement of existing Chitral Hydropower Project was taken up and its Tender Design Report has been prepared. Feasibility Studies of Patan, Thakot, Dudhnial, Trappi & Tangir Hydropower Projects are being planned to be taken-up.

The following Projects are being undertaken by Hydro Planning:-

Under Construction

i. Jinnah Hydropower Project 96 MW

PC-I Submitted

i. Harpo Hydropower Project 34.5 MW

Feasibility Study (Completed During 2009-10)

i. Lawi Hydropower Project 69 MW

4) Detailed Engineering Design & Tender Documents (Completed During 2009-10)

i. Kohala Hydropower Project 1100 MW

5) Feasibility Study (Completed During 2010-11)

i. Lower Palas Valley Hydropower Project 665 MW
ii. Lower Spat Gah Hydropower Project 496 MW

6) Detailed Engineering Design & Tender Documents (Completed During 2011-12)

i. Keyal Khwar Hydropower Project 128 MW
ii. Chitral Existing Power Station (Enhancement of capacity) 5 MW

7) Detailed Engineering Design & Tender Documents (Completed During 2012-13)

i. Bunji Hydropower Project 7100 MW

8) Detailed Engineering Design & Tender Documents (On Going)

i. Dasu Hydropower Project 4320 MW
ii. Phandar Hydropower Project 80 MW
iii. Basho Hydropower Project 40 MW

9) Feasibility Study to be Undertaken

i. Pattan Hydropower Project 2800 MW
ii. Thakot Hydropower Project 2800 MW
iii. Dudhnial Multi-Purpose Dam Project 960 MW
iv. Trappi Multi-Purpose Dam Project 30 MW
v. Tangir Hydropower Project 20 MW

Under Construction

Jinnah Hydropower Project

Jinnah Hydropower Project (JHP) 96 MW is being constructed on the right side of Jinnah Barrage on Indus River about 5 Km downstream of Kalabagh Town, 234 Km from Islamabad.

Salient features

Installed Capacity	96 MW (12 MW x 8 units)
Design Discharge	2800 M^3/sec
Gross Head	4.8 M
Mean Annual Energy	688.27 GWh

PC-I approved by ECNEC for Rs. 13546.800 million with FEC of Rs. 6608.221 million on 02.09.2002. M/s Dongfang Electric Corporation (DEC) of China is the Project Contractor and Joint Venture consisted of M/s ACE (Pvt.) Ltd., M/s NESPAK, M/s NDC and M/s MWH are the Project Consultants.

The Project is at its completion stage and expected to be completed by October, 2013. Overall physical progress of the project is 99.84%. (Five) 5-Units out of total (08) Units have started their commercial operations. However, the work on remaining three (03) Units is under progress. Upto date Power Generation from Jinnah Hydropower Project is 232.7201 million KWH.

Separate PC-I for construction of O&M Staff Colony was approved on 19.11.2009 for Rs. 253.07 million. The Contract for construction of O&M Colony has been awarded to the Contractor M/s Khyber Grace (Pvt.) Ltd. on 26.03.2013. The Contractor has mobilized on the project site and has started the pre-construction foundation treatment activities.

PC-I Submitted

Harpo Hydropower Project

Harpo Hydropower Project 34.5 MW is located about 75 Km north-west of Skardu Town and 670 Km North-East of Islamabad.

Salient Features

Installed Capacity	34.5 MW
Design Discharge	5.8 M^3/sec
Gross Head	723 M
Mean Annual Energy	170 GWh

PC-II approved by CDWP for Rs. 113.809 million on 22.11.2008 for Detailed Engineering Design and preparation of Tender Documents. Consultants have submitted up-dated Feasibility Study on 19.12.2011. Gilgit-Baltistan Government has intimated their preference on 02.05.2012 to implement Harpo Hydropower Project alongwith transmission line from Gilgit to Skardu. AFD & KfW has confirmed financing

of (Euros 70 million). PC-I Performa amounting to Rs.12957.177 (Euros 106.206 million) submitted to Ministry of Water & Power Islamabad on 12.12.2012 and was cleared by the Ministry on 22.05.2013. PC-I duly signed by Secretary, Ministry of Water & Power has been submitted to Planning Commission for approval on 05.06.2013.

Feasibility Study
(Completed During 2009-10)

Lawi Hydropower Project

Lawi Hydropower Project 69 MW is located in district Chitral of Khyber Pakhtunkhwa (KPK) on the Shishi River near Lawi Village and is 350 Km from Islamabad.

Salient features

Installed Capacity	69 MW
Design Discharge	20 M^3/sec
Gross Head	405 M
Mean Annual Energy	303 GWh

The Feasibility Study of Lawi Hydropower Project was completed in April, 2009.

A meeting was held in Ministry of Water and Power dated 04.06.2010, wherein it was decided that the project would be developed on Public Private Partnership mode jointly by WAPDA and Infrastructure Project Development Facility from Ministry of Finance Government of Pakistan.

Government of KPK decided to take-up Lawi Hydropower Project from their own resources and asked WAPDA to provide feasibility study. The feasibility study and PC-I have been sent to Government of KPK after approval of Chairman WAPDA.

WAPDA has requested Ministry of Water and Power to withdraw already submitted PC-I from Planning Commission of Pakistan.

Detailed Engineering Design & Tender Documents
(Completed During 2009-10)

Kohala Hydropower Project

Kohala Hydropower Project 1100 MW is located near Muzzaffarabad in Azad Jammu Kashmir. The powerhouse of the Project is located near Barsala about 7 Km upstream from Kohala Bridge. Its intake is proposed at 28 Km upstream of Muzaffarabad Town along upper limb of Jhelum River. The Project area is 100 Km from Islamabad. The Project envisages the diversion of flows of Upper Limb to Lower Limb of Jhelum River through a pressure tunnel of 16 Km length.

Salient features

Installed Capacity	1100 MW
Design Discharge	425 M^3/sec
Gross Head	320 M
Mean Annual Energy	4800 GWh

PC-II was approved by ECNEC for Rs. 545.732 Million with FEC of Rs. 209.199 Million on 23.08.2006 for Feasibility Study, Detailed Engineering Design and preparation of Tender Documents. Feasibility Report finalized in December, 2008 by joint venture of SMEC, Scott Wilson, Sogreah, MAES and EGC. Detailed Engineering Design and Tender Documents completed in November, 2009.

A meeting regarding change of ownership of Kohala Hydropower Project from WAPDA to CWE China was held on 08.02.2011 in the office of Private Power Infrastructive Board Islamabad and following were decided:-

The Consultant shall submit all additional information related to progress achieved so far and WAPDA and its Consultant shall also suggest any other option regarding continual/withdrawal from the assignment to avoid duplication of work.

CWE/CTGI shall also submit its comprehensive report showing percentage of ctivities/milestones achieved.

The CWE/CTGI's Consultant shall submit a copy of the agreement for Consultancy with CWE/CTGI to PPIB at his earliest.

Further, a meeting regarding CDM issue was held on 23.05.2012 in the office of PPIB, Islamabad and following was decided in the meeting:-

M/s Perenial/SMEC will continue working as CDM Consultant for Kohala Hydropower Project.

A joint meeting of PPIB, WAPDA and Auditors appointed by PPIB was held on 13.09.2012 in PPIB office, Islamabad in order to discuss and resolve the outstanding queries regarding expenditures incurred on preparation of Feasibility Study & Detailed Engineering design of Kohala Hydropower Project.

WAPDA has put up its final demand to PPIB for release of total amount incurred on preparation of Feasibility Study & Detailed Engineering Design of Kohala Hydropower Project.

A meeting held on 30.01.2013 with reference to PPIB in the office of Chief Engineer PD, Dasu to settle the disputed claims costs.

Feasibility Study
(Completed During 2010-11)

Lower Palas Valley Hydropower Project

Lower Palas Valley Hydropower Project 665 MW is located on Chor Nullah, which is a left tributary of Indus River, 12 Km upstream of Patan Town in Kohistan District, KPK and 335 Km from Islamabad.

Salient features

Installed Capacity	665 MW
Gross Head	805 M
Design Discharge	101 M^3/s
Mean Annual Energy	2635 GWh.

PC-II approved by CDWP for Rs. 196.684 million with FEC Rs.113.888 million on 07.03.2005. KfW of Germany financed under grant for preparation of Feasibility Study of the Project. M/s ILF of Germany JV's were appointed as Consultants for the Project studies. The Consultants submitted feasibility report of 665 MW Lower Palas Scheme in June, 2010.

Expression of Interest documents have been issued to interested sponsors. Four bids were received upto last date for submission i.e. 18.11.2011 and the evaluation of bids has been completed. The recommendations made by Evaluation Committee have been approved by Authority on 20.03.2012.

Authorities recommend M/s K. Water & Daewoo Engineering Consortium of Korea for 665 MW Lower Palas Valley Hydropower Project. WAPDA has issued Letter of Acceptance to M/s KWater & Daewoo Engineering Consortium.

Prior to invite private sector for further negotiation to finalize the PPP modalities, the mater was discussed with govt. of Khyber Pakhtunkhwa regarding %age equity share with public sector. Government of Khyber Pakhstunkhwa intends to contribute 25% of the equity share. WAPDA would contribute 1% of the equity share.

A meeting among WAPDA, Private Power Infrastructure Board , Board of Investment, Planning Division, Finance Division Government of Khyber Pakhtunkhwa and Ministry of Water & Power was held on 29.08.2012 at Islamabad and the following decisions were made:-

1. PPIB shall handle the Lower Palals Valley Hydropower Project onwards under the Provisions of "Policy for Power Generation-2002".

2. Government of Khyber Pakhtunkhwa as an equity Partner shall be involved in the decision making regarding the Projects.

Memorandum of understanding between public and private sector sponsors has been signed on 24.12.2012.

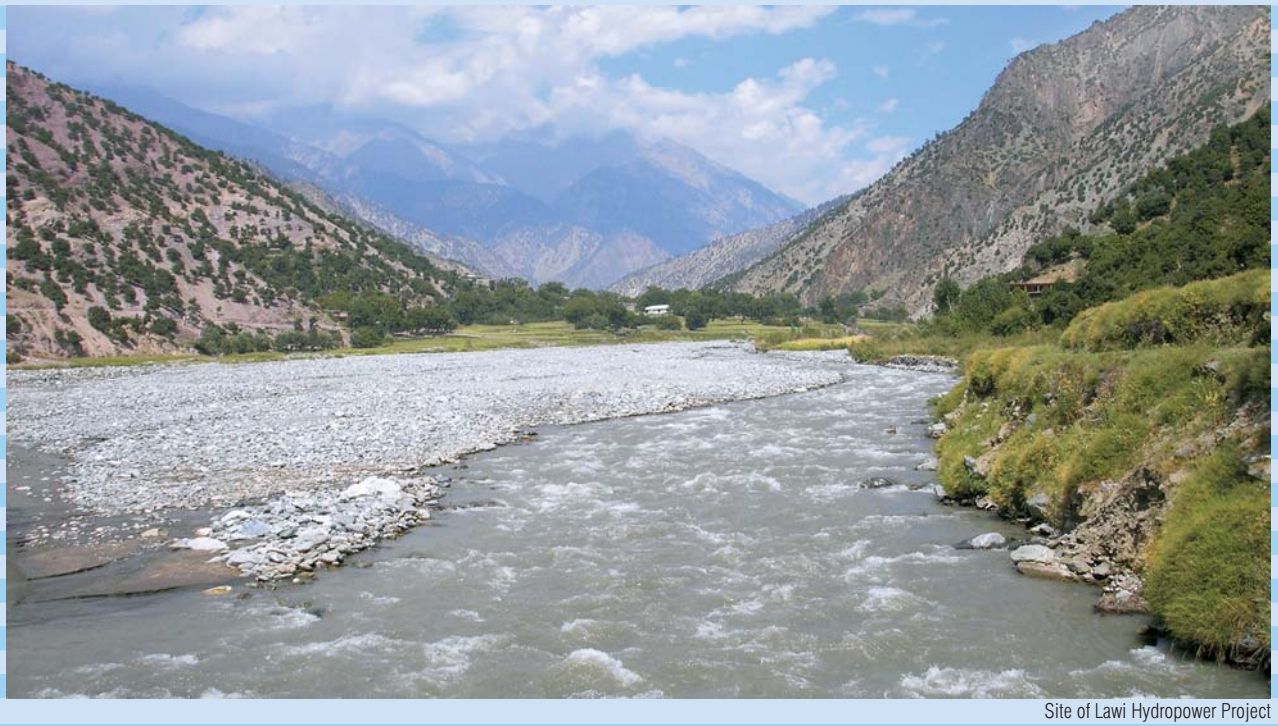
Draft of joint development agreement has been prepared and circulated among various WAPDA Organizations for review/comments.

Lower Spat Gah Hydropower Project

Lower Spat Gah Hydropower Project 496 MW is located at a left tributary of Indus River located 8 Km downstream of Dasu Town, 35 Km upstream of Patan Town in Kohistan district, KPK and 374 Km from Islamabad.

Salient features

Installed Capacity	496 MW
Gross Head	745 M
Design Discharge	81 M^3/s
Mean Annual Energy	2106 GWh.



Site of Lawi Hydropower Project

PC-II approved by CDWP for Rs.177.711 million with FEC Rs. 94.976 million on 07.03.2005. KfW of Germany financed under grant for preparation of Feasibility Study of the Project. M/s ILF of Germany JV's were appointed as Consultants for the Project studies. The Consultants finalized the Phase-1 Study "Ranking and Pre-Feasibility Study" of Hydropower Projects on 29.02.2008.

As per Phase-I study, Lower Spat Gah Scheme (496 MW) is ranked first and taken up for Feasibility Study. The Consultants submitted feasibility report of 496 MW Lower Spat Gah Scheme in June, 2010. WAPDA Authority in its meeting on 31.08.2010 decided to implement Lower Spat Gah Scheme in Public Private Partnership (PPP) mode. Expression of Interest documents for PPP mode have been prepared in consultation with CCC, WAPDA and IPDF, Islamabad and have been issued to interested sponsors.

Three bids were received upto last date for submission i.e. 18.11.2011 and the evaluation of bids has been completed. The recommendations made by Evaluation Committee have been approved by Authority on 20.03.2012.

Authority recommends M/s KOMIPO-POSCO Engineering Consortium of Korea for 496 MW Lower Spat Gah Hydropower Project. WAPDA has issued Letter of Acceptance to M/s KOMIPO-POSCO Engineering Consortium.

Prior to invite private sector for further negotiation to finalize the PPP modalities, the matter was discussed with govt. of Kyber Pakhtunkhwa regarding % age equity share with public sector. Government of Khyber Pakhtunkhwa intends to contribute 25% of the equity share. WAPDA would contribute 1% of the equity.

A meeting among WAPDA, Private Power Infrastructure Board, Board of Investment, Planning Division, Finance Division, government of Khyber Pakhtunkhwa and Ministry of Water & Power was held on 29.08.2012 at Islamabad and the following decisions were made:-

1. Private Power Infrastructure Board shall handle the Lower Spat Gah Hydropower Project onwards under the provisions of "Policy for Power Generation-2002".
2. Government of Khyber Pakhtunkhwa as an equity Partner shall be involved in the decision making regarding the projects.

A meeting between M/s KOMPIO-POSCO, WAPDA

and govt. Khyber Pakhtunkhwa was held on 11.09.2012 and 12.09.2012 under the chairmanship of Chairman WAPDA to discuss the road map for implementation of the project under Public Private Partnership (PPP) mode.

Memorandum of Understanding between public and private sector sponsors has been signed on 24.12.2012.

Draft of joint development agreement (JDA) has been prepared and circulated among various WAPDA Organizations for review/comments.

Detailed Engineering Design & Tender Documents (Completed During 2011-12)

Keyal Khwar Hydropower Project

Keyal Khwar Hydropower Project 128 MW is located in the Khyber Pakhtunkhwa (KPK) of Pakistan on Keyal Khwar in Kohistan District. The project is accessible by road and is at a distance of 310 Km from Islamabad. Keyal Khwar is the right bank tributary of Indus River.

Salient Features

Installed Capacity	128 MW
Gross Head	732 M
Design Discharge	22 M^3/sec
Mean Annual Energy	426 GWh
Height of Dam	42.5 M
Estimated Project	Rs. 29703.991 Million
EIRR (%)	15.50

PC-II approved by ECNEC on 07.01.2004 for Rs. 7066.961 Million with FEC of Rs. 3032.080 million. Feasibility Report was completed in October, 2007. Project Loan Agreement Euro 97 million between Government of Pakistan and KfW of Germany was signed on 11.11.2008 for implementation of the Project.

The Consultant JV comprising M/s Lahmeyer Germany as Lead Firm is association with M/s NDC and EASE PAK have been engaged for conducting Detailed Engineering Design and preparation of Tender Documents. Contract Agreement for Procurement of Consultancy Services was signed between WAPDA and Keyal Hydropower Consultants on 12th May, 2010. Amendment No.1 regarding additional period of 9 months from November, 2012 to July, 2013 for provision of Consultancy Services by Consultants has been signed on 13th May, 2013. Detail Engineering Design Report has been completed in December, 2011.

Construction of Power House Ventilation Tunnel (Contract KKHPP-01) was awarded to M/s Sarwar & Co. (Pvt.) Ltd in Authority meeting held on 27.09.2011 at cost of Rs.109.322 million. Contract Agreement has been singed on March 9, 2012. Overall actual physical progress of work is 70%. Construction activities of Lots-1,2,3,4,5,6,7 & 10 of WAPDA O&M colony is in progress. 408 Kanals land has been acquired and an amount of Rs.184.714 million has been paid for compensation. Additional land about 300 Kanals costing to Rs.200 million (approx) is proposed by Project Manager (KHPC) for contractors' camp faculties and surge tunnel area. Land acquisition process of additional Land is in process.

NOC regarding Environmental Impact Assessment (EIA) has been issued by Environmental Protection Agency (EPA) Khyber Pakhtunkhwa on 6th July, 2012.

Existing Chitral Power Station (5 MW)

Existing Chitral (1 MW) power station has been studied to enhance its capacity upto 5 MW. Field investigations have been carried out and tender design report has been prepared and submitted to concerned organization.

Detailed Engineering Design & Tender Documents (Completed During 2012-13)

Bunji Hydropower Project

Bunji Hydropower Project has been planned and designed as a run of the river scheme on Indus River, with dam 83 Km and powerhouse 60 Km from Gigit City in Gilgit Baltistan and 560 Km from Islamabad.

Salient Features

Installed Capacity	7100 MW
Gross Head	440 M
Design Discharge	1900 M^3/sec
Mean Annual Energy	24,760 Billion KWh

The revised PC-II for coming out feasibility study Detailed Engineering Design and Tender Documents was approved by ECNEC for an amount of Rs. 2091.406 million with FEC of Rs. 33.965 million on 26.05.2011. Draft Feasibility Report was prepared in March, 2009 and finalized in January, 2010. Draft detailed design and draft tender documents of different lots were prepared by the Consultants in December, 2010.

For detailed studies, extensive topographic survey, geological mapping, hydrological observations and sediment sampling were carried out.

Drilling in dam and powerhouse areas has been carried out by Dams Investigation Division WAPDA with total drilling as 11614.0 M. The peizometers and inclinometers are installed in some of the boreholes at Shengus area.

Model studies for (04) models: Sectional Model of Spillway, Comprehensive Model of Dam Area, Low and Mid Level outlets and Tailrace outlet models have been carried out. All tests proposed by Consultants and POE have been performed. Three models are retained upto June, 2014.

4 No. Exploratory Adits at dam area were completed. CMTL WAPDA has performed plate load tests in the adits, excavated in either banks.

Exploratory Adit to Fault Zone (Package-2) would be taken up as advance Package to main construction contract and its cost would be covered in the PC-I. The work for excavation of Exploratory Adit for under ground power house (Package-3) was awarded to M/s High Technology Engineering Company, Islamabad and contract agreement signed on 07.07.2011. The work for excavation of adit has been progressed to 416 M out of 600 M, upto December, 2012.A number of technical issues like seepage in adits non responsiveness of foreign firms to perform over curing tests etc. and slow progress of work due to steep downward slopes had led to conclude the Adit-3 works.

The work for excavation of Exploratory Adit for power shaft (Package-4) was awarded through retendering process to M/s High Technology Engineering Company, Islamabad and Contract Agreement was signed on 16.11.2011. Contractor mobilized and the work for excavation of adit progress upto 133.50 M up to 02.10.2012. An over burden material encountered at RD 133.50 M in adit-4 and the work has to be concluded as the contractor could not progress beyond 135.0 M and excavation in over burden material need costly support system with slow progress.

To finalize the Draft Design Report and Tender Documents incorporating the results of field investigations the Consultancy period for Bunji Consultants has been extended to 30.09.2013. Bunji Consultants (JV) has completed the Design Report and Tender Documents are in process of submission for implementation of Bunji Hydropower Project.

Detailed Engineering Design & Tender Documents (On Going)

Dasu Hydropower Project

Dasu Hydropower Project is run off river project with generation capacity of 4320 MW. It would be constructed along Indus River and located 7 Km upstream of Dasu Town, 74 Km downstream of Basha and 350 Km from Islamabad.

Salient Features

Installed Capacity	4320 MW
Gross Head	233 M
Design Discharge	2600 M^3/s
Mean Annual Energy	21300 GWh

PC-II has been approved by ECNEC for Rs. 796.778 million with FEC of Rs. 100.000 million on 27.09.2003.

Stage-I:

Feasibility Study for Rs. 540.902 million with FEC of Rs. 60 million.

Stage-II:

Detailed Engineering Design and Tender Documents for Rs. 255.876 million with FEC of Rs. 40 million.

Feasibility report (Stage-I) was finalized on 28.02.2009 by Joint venture of M/s NESPAK, ACE, MWH International (USA), and COLENCO Power

Engineering Ltd. (Switzerland) in association with Binnie and partners (overseas) Ltd., (UK).

Dasu Hydropower Consultants (DHC) for Detailed Engineering Design and Preparation of Tender Documents (Stage-II) was mobilized on 19.09.2011. PD (Dasu) office has been established at Dasu Town District Kohistan since November, 2011.

06 Nos, Micro Seismic Stations have been established in the Project area.

Topographic Survey work for re-location of KKH has been completed in the month of August, 2012 by Al-Hasnain Enterprises, Karachi.

Basic Design Report of Dasu Hydropower Project was received from DHC during April, 2012.

Dasu Hydropower Consultants (DHC) has submitted the Draft Detailed Engineering Reports. All Draft Reports have been submitted to the World Bank, Technical Panel of Experts and concerned quarters in WAPDA for their review and comments.

Detailed Engineering Design Reports consist of Engineering Design, Social Resettlement Management Plan, Environment Management Action Plan and Economic and Financial Studies.

Draft Pre-qualification and Bidding Documents of KKH re-location have been submitted to the World Bank.

Project Concept Clearance Proposal for Foreign Assistance prepared by WAPDA has been submitted to Ministry of Water & Power for further approval. Ministry of Water & Power forwarded the Project Concept Clearance Proposal to Planning Commission for approval.

Formal request for issuance of Section-4 for Land Acquisition process for different works like WAPDA offices & colony, Disposal area, Komila to Dasu Road, KKH By-pass road and Relocation of KKH (Part 1&2) has been made to Local District Government, District Kohistan, Khyber Pakhtunkhwa. The concerned teams of WAPDA, DHC and Local Government Department, Kohistan have been mobilized at Dasu for Land Acquisition Process. Survey work regarding marking the boundaries for acquisition etc. for Komila to Dasu Road, WAPDA Colony area and Disposal area has been completed at site.

Section-4 has been notified by District Administration of Kohistan for Land Acquisition of WAPDA offices & Colony, Disposal area and Right bank access road (Komila to Dasu).

Phandar Hydropower Project

Phandar Hydropower Project 80 MW is located between Phandar Lake and Chhashi Gol, near the Chhashi village on the right side of Ghizar River in Ghizar District of Northern Areas. Phandar Lake is located about 160 Km North-West of Gilgit Town and 772 Km North of Islamabad.

Salient Features

Installed Capacity	80 MW
Design Discharge	40 M^3/sec
Gross Head	237 M
Mean Annual Energy	348 Million KWh

Feasibility study was completed by HPO, WAPDA in collaboration with GTZ of Germany in 2003. PC-II approved by CDWP for Rs.120.376 million on 30.04.2007 for Detailed Engineering Design and preparation of Tender Documents. Consultancy Agreement for Detailed Engineering Design and Preparation of Tender Documents was signed between WAPDA (Hydro) Planning & Phandar Hydro Consultants (JV) on 22.10.2010.

Consultant submitted final draft Detailed Engineering Design Report and Tender Documents and PC-I on 15.03.2013. KfW Energy Mission visited the Phandar Hydropower Project site from May 23 to 26, 2013 and intends to finance for physical implementation of the Project.

Basho Hydropower Project

Basho Hydropower Project 40 MW is located along 1 Km lower stretch of Basho Lungma, a left tributary of Indus River about 40 Km of Skardu Town and 704 Km from Islamabad.

Salient Features

Installed Capacity	40 MW

Gross Head	974 M
Design Discharge	5.0 M^3/sec
Mean Annual Energy	165 GWh

PC-II approved by CDWP for Rs. 91.243 million on 27.11.2006 for Detailed Engineering Design and preparation of Tender Documents. Consultants have submitted updated Feasibility Report on 04.05.2012. Relevant documents were submitted to EPA GB govt. for review and subsequent approval and issuance of NOC. Comments on EIA received from GB-EPA have been communicated to M/s AFD for forwarding to consultants for incorporation in the final report.

Donor Agencies KfW and AFD decided to finance Harpo & Basho Hydropower Project in phased approach:-

i. Construction of one hydropower alongwith transmission line in phase-I with capacity building component and
ii. Construction of other hydropower project in Phase-II Gilgit Baltistan government has opted for implementation of Harpo Hydropower Project alongwith transmission line in Phase-I and Basho in Phase-II.

Feasibility Study to be Undertaken

Patan Hydropower Project

Patan Hydropower Project 2800 MW is located on Indus River about 4 Km upstream of village Patan downstream of Keyal Khwar. The powerhouse is situated on the left bank 8 Km upstream of Besham and 275 Km from Islamabad.

Salient features

Installed Capacity	2800 MW
Gross Head	150 M
Design Discharge	2600 M^3/s
Mean Annual Energy	15230 GWh

PC-II approved by CDWP for Rs. 731.233 million with FEC Rs. 357.502 million on 17.09.2009 for preparation of Feasibility Study. Evaluation of technical proposals submitted by 6 no. shortlisted firms is in process. M/s Patan Consultants (a joint venture), Lahmayer International Consultants as Lead firm with National Development Consultants & Pakistan Engineering Services have been appointed for preparation of feasibility studies of the Project by the WAPDA. Duration of the Consultancy Services will be 24-month commencing from 24.06.2013.

Thakot Hydropower Project

Thakot dam site is located in a narrow section of Indus River, about 3 Km downstream of Besham. Distance from Islamabad is about 240 Km.

Salient feature

Installed Capacity	2800 MW
Gross Head	138 M
Design Discharge	2900 M^3/sec
Mean Annual Energy	14095 GWh

Thakot was identified by MONENCO in "Inventory and Ranking Study" in November, 1984 for a capacity of 1043 MW with mean annual energy of 7820 GWh. Hydro Planning Organization, WAPDA reviewed and updated capacity to 2800 MW. The project is ranked third after Diamer Basha Dam. Govt. of Pakistan has approved PC-II for Feasibility Study amounting to Rs. 719.628 million including Foreign Component of Rs. 303.139 million on 18.06.2012. Expression of Interest from 8 No. JVs have been received and short listing of Consultants /Firms is in process.

Dudhnial Multi-Purpose Dam Project

The project is located on the right bank of Neelum River, 103 Km North East Muzaffarabad in Azad Jammu Kashmir. Dam site is to be located 2 Km upstream of Dudhnial village and powerhouse of Neelum Jhelum Hydropower Project dam site. The project area is accessible from Muzaffarabad, through Truckable road, 240 Km from Islamabad.

Salient feature

Installed Capacity	960 MW
Net Head	368 M
Design Discharge	300 M^3/sec
Mean Annual Energy	5425 GWh
Tentative Live storage	1.0 MAF

The project was initially conceived in early 80's. Hydro Planning Organization studied the project to generate 960 MW in addition to live storage 1 MAF. PC-II for preparation of Pre-feasibility study is submitted to Planning Commission in July, 2011.

Trappi Multi-Purpose Dam Project

The project area is located on the Siran River near Trappi Village in District Manshera in province KPK. The project is about 160 Km from Islamabad.

Salient feature

Installed Capacity	32 MW
Gross Head	171 M
Design Discharge	25 M^3/sec
Mean Annual Energy	232 GWh
Tentative Live storage	0.20 MAF

PC-II for preparation of Feasibility Study has been approved conditionally by CDWP on 23.11.2012. Due to status quo granted by Peshawar High Court in response to writ petition filed by a Private sponsor for withdrawal of NOC issued to WAPDA by government of Khyber Pakhtunkhwa for conducting studies, the study has not been taken up.TOR/EOI has been finalized and can be published in newspapers upon settlement of issue in favor of WAPDA.

Tangir Hydropower Project

Tangir Hydropower Project has been identified on the left bank of 4 Km intermediate stretch of Tangir River to generate 20 MW to meet the power demand for construction activities of proposed Diamer Basha Dam Project. Feasibility study of 20 MW on the basis of necessary field investigations and other studies have been prepared by Hydro Planning Organization.

Review and Evaluation of Master Planning of Water and Hydropower Resources of Western Rivers

Review and Evaluation of Master Planning of Water and Hydropower Resources in Upper and Lower Catchments of Western Rivers is intended to be started for:-

i. Assessment of the overall impacts of hydropower and water projects in Upper Catchments on water releases in to Lower Catchments.

ii. To recommend remedial measures in the form of modifications in the projects layouts in order to minimize the adverse impacts of projects in upper catchments.

iii. Quantification of impacts due to reduced water releases on Pakistani Projects.

The PC-II of the project submitted on February, 2012 and it is under process of approval from Government of Pakistan. The cost of the project would be met from PSDP Budget, Government of Pakistan.

Miscellaneous Works

1) Dams Investigation Division (DID), HPO, WAPDA

Dams Investigation Division under Hydropoewr Project, WAPDA carried out a total drilling of 11614.00 M for Bunji Hydropower Project, 1608 M for Keyal Khwar Hydropower Project, 150 M drilling for Phandar Hydropower Project and 94 M for Chitral Hydropower Project during the year under report.

2) Topographic and Mapping (T&M) Division, WAPDA, HPO, Peshawar

T&M Division carried out topographic survey of important structures of Phandar Hydropower Project and completed during 2011-12.

3) Expert Services for other Organizations

Hydro Planning organisation in addition to its own assignment is providing expert services in Hydro Power Development to Government of Punjab, Azad Jammu Kashmir and Private Power Infrastructure Board for review of irrigation studies being taken up at their level in Public or Private Sector.

Planning Aspects of HPO Include

- Inviting attracting Donors for short term financing (Feasibility Studies e.g. updation of Basho & Harpo, Detailed Engineering Design) and long term financing (such for Dasu and Keyal Khwar Hydropower Project e.g. financing for Detailed Engineering Design & Implementation).

Assistance to Ministry of Water & Power and EAD (GoP) for finalizing financing agreements (Grants, Loans, etc.).

Construction work on Neelum Jhelum Hydroelectric Project

Neelum Jhelum Hydroelectric Project

General

The Neelum Jhelum Hydroelectric Project has been undertaken as a part of WAPDA's Vision 2025 Programme. The project is a major milestone in hydropower generation. It has earned implementation priority in hydropower sector due to its location and the fast growing future power requirements of the country.

Location

The Neelum Jhelum Hydroelectric Project is a run of the river strategic project of immense national importance. It is located in the vicinity of district Muzaffarabad in Azad Jammu & Kashmir (AJ&K), envisages the diversion of Neelum River water through a tunnel and after producing power, out-falling into Jhelum River. The Dam and Intake is located at Nauseri 41 Km up stream of Muzaffarabad city. The underground powerhouse of the project is at Chattar Kalas which is 22 Km downstream of Muzaffarabad.

A Composite Dam (Gravity + Rock Fill) 160 M long and 60 M high (storage capacity 3.9 million cubic meter) is being constructed on Neelum River at Nauseri 41 Km North East of Muzaffarabad. The Dam will divert the water (280 Cumecs) into a Headrace Tunnel of 28.5 Km length. 19.6 Km stretch of the Headrace Tunnel is twin tunnel having dia of about 8.5 M each. The remaining 8.93 Km tunnel is a single tunnel of diameter 9.6 M. About 11.5 Km stretch of the twin tunnels will be constructed through Tunnel Boring Machines (TBM). The Headrace Tunnel is accessed by eight (8) entry points (Adits) for removal of excavated spoil and other works. The Headrace Tunnel shall cross Jhelum River approximately 200 M below its bed level. Power House of the Project is located near Chattar Kalas, 22 Km south of muzaffarabad. River Neelum has been diverted through a diversion tunnel (505 M) on 15th October 2011. Neelum Jhelum Hydroelectric Project has an installed capacity of 969 MW (4 x 242 MW) and will generate 5.15 billion units of electricity annually.

The original PC-I was approved by ECNEC on 28th February, 2002 for Rs. 84.502 billion including FEC of Rs. 46.6677 billion. As a result of various desisgn as well as other changes, 2nd Revised PC-1 amounting to Rs. 274.882 billion was framed for which ECNEC approval is awaited.

Design and other Variations which Resulted Increase in Cost

Different variations which have resulted in increase in cost are as under:-

Difference in price level

The 1st Revised PC-I was based on 2001 price level. The contract for the execution of the work was awarded in 2007 and its prices were based on 2006 price level. Even the amount of awarded contract was Rs. 90.90 billion which implied the need for revision.

Design & Technical Variations

After the award of the construction contact, in January, 2008, WAPDA through ICB selected a consortium of 2 International and 3 Local firms to work as M/s Neelum Jhelum Consultants (NJC) for the Project. As an aftermath of devastating Earthquake of 08th October, 2005 the Consultants as a part of their assignment reviewed the tender design and undertook additional studies and investigations. The design review identified many areas of concerns requiring design changes which resulted in increased quantities and additional work items with additional financial implication. The design changes were mainly due to:-

i. Higher seismic factor dictated by the Earthquake of 8th October, 2005 which is now 1.16g for Maximum Credible Earthquake (MCE) against 0.60g adopted in the tender design.
ii. Technical reasons to bring the improvement in design parameters which were initially assumed and to take into account other aspects.

The major design changes which form the major part of this additional cost include;

- Change in the height and design of dam to increase reservoir capacity, pass probable maximum flood (PMF) without overtopping and eliminate peaking storage in tunnel.
- Composite concrete-embankment dam to cope with fault movement.
- Cross sectional area of headrace has been increased as a result of fresh studies carried out by the present consultants to avoid any risk of head loss/loss of power generation.
- Originally, water was to pass through shotcrete tunnels which could result in maintenance problems and head loss. Therefore, instead of shotcrete tunnel, the concrete lining has been introduced in the Headrace Tunnel (except TBM excavated tunnels) to reduce head loss and eliminate other concerns.
- To avoid long shutdowns during maintenance period, Shallow Jhelum River Crossing instead of deep crossing, for natural draining of tunnel and providing steel lining in the tunnel under Jhelum River to guard against hydro jacking failures.
- Keeping in view the seismic concerns and for providing additional storage, design of steel gates of various components was changed.
- Design of electric equipment carried out in 1996-97 included in the approved PC-I was based on technology, which is outdated now. In the revised design the Consultants have proposed equipment in line with the state of the art technology.
- Provision for two spare runners of the Turbines of the power house to avoid extended shutdown of turbines in case of maintenance of original runners.
- Bridge on Neelum River and other additional works required for implementation of these changes.

Procurement of Two Tunnel Boring Machines (TBMs)

In view of the design changes, explained earlier, the scope of work enhanced (increased diameter of tunnels, new design of Dam, Shifting of Power House location etc.), Consultants revealed that with this increased scope of work, the Project was likely to be completed beyond 2018. Excavation of the Headrace Tunnel is a critical activity and its excavation, due to enhanced scope of excavation, was delaying the Project completion from 2016 to 2018. On the basis of recommendations of the Project Consultants, WAPDA Advisors, Panel of Experts deliberartion and post visit report to Gothard tunnel Switzerland by high level delegation, two Tunnel Boring Machines (TBMs) have been deployed. The Drill and Blast method and TBM demining have been synchronized to complete the headrace tunnel in 30 months. The cost of two TBMs is US $ 92.2 million.

It is estimated that the benefits from early operation of the Project will be much more than the additional cost being incurred. The cost being incurred on two TBMs will be reimbursed within three months of the commencement of the project. Besides, there would be colossal direct and indirect benefits of the Project. The TBMs could be deployed on future projects (Kohala, Dasu etc.).

HSFO Generators

WAPDA was required to provide uninterrupted power supply to the Contractor at three locations. Total power requirement at Project sites is 22.8 MW, whereas only 13.4 MW is available. The available electricity (13.4 MW) is also of poor quality and mars with unscheduled loadshedding. Power loadshedding and shortage would have greatly extended the construction period. Besides that voltage fluctuations experienced at site most of the time are risk to the Contractor's equipment. In view of the prevailing conditions, WAPDA/Board of Directors NJHPC approved the procurement of three (3) nos. 4 MW capacity WARTSILA Diesel generators at the cost of US $ 20.49 million (Rs. 1.23 Billion) as well as O&M cost for five years, which is estimated as Rs. 6.22 billion. After the Project completion, the generators can be used for other Projects.

Escalation

There was no provision for this essential item in 1st Revised PC-I. Provision of Rs. 17.85 billion has been made as per Planning Commission guidelines.

Enhanced Cost for Foreign Exchange Components

The provision of Rs. 37.2 billion has been made for the enhanced cost (Actual) for FEC year 2007-08 to 2010-11 due to variation in Dollar Exchange Rate to the actual additional cost up to year 2010-11 and beyond on the rate of 1 US $ = Rs. 86. No such provision was there in 1st Revised PC-I.

Interest During Construction

Increased as compared to 1st Revised approved PC-I from Rs. 29.1 billion to Rs. 33.44 billion due to increase in total cost.

Security Arrangements

Rs.1.2 billion have been provided for the security arrangements of the foreigners (a police force of 270 people under one SP), no such provision was catered in 1st Revised PC-I.

Salient Features

Type of dam	Composite (Concrete + Rock Fill)
Maximum Height	60 M
Crest Length	160 M
Crest Height/ RL	1019 M ASL
Tunnel System	Twin Tunnel 39 Km (19.6 x 2)
	Single Tunnel 8.94 Km
Gross Head	420 M
Installed Capacity	969 MW
	4 units @ 242.25 MW Each
Annual Energy	5.15 Billion Electricity Units
Contract Cost/Bid	Rs. 90.90 Billion
Date of Commencement	30th January, 2008
Completion period	106 Months

Environmental Impact

No adverse environmental impact being run of river project. Environmental Protection Agency, govt. of Azad Jammu & Kashmir issued NOC on 22nd January, 2011.

Consultants

The engineering design and construction supervision services of the project are being performed by M/s Neelum Jhelum Consultants (NJC), a joint venture comprising MWH International inc., USA, NORPLAN A.S, Norway, National Engineering Services of Pakistan (NESPAK) (Pvt.) Ltd., Associated Consulting Engineers (ACE) (Pvt.) Ltd. and National Development Consultants (NDC) of Pakistan.

Contractor

The construction contract was awarded to M/s CGGC-CMEC consortium of China at contract cost of Rs. 90.90 billion.

Deployment of Two TBMs

The mining operation of two tunnel boring machines (TBMs) remained in progress. Progress of TBM-1 (697) was 576 M and TBM-2 (696) was 228 M.

Electrical Mechanical and Hydraulics Works, Lot – E1, M1 & H1

- Design of EMH work has been completed.
- 4 No. Draft tubes have been shifted at site-C3

PHYSICAL PROGRESS
PROGRESS SUMMARY FOR TUNNELS

Tunnel Excavation	Site Location	Total Length (m)	Completed till end June, 2013	Percentage Completed (%)
Diversion Tunnel	C-1	505	505	100%
Headrace Tunnel (Single) TO-T1	C-1	509	484	95%
Headrace Tunnel (Single) T1-T1c	C-1	353	353	100%
Headrace Tunnel (Twin) T1-M1L	C-1	3,322	2,658	80%
Headrace Tunnel (Twin) T1-M1R	C-1	3,183	2,652	83%
Headrace Tunnel (Twin) M1- TBM1L	C-2	11,500	576	5%
Headrace Tunnel (Twin) M1-TBM2R	C-2	11,500	228	2%
TBM1 Chamber Left	C-2	200	200	100%
Headrace Tunnel (Twin) TBM1L-T3	C-2	488	488	100%
TBM2 Chamber Right	C-2	200	200	100%
Headrace Tunnel (Twin) Right TBM2R-T3	C-2	568	568	100%
Headrace Tunnel (Twin) T3L –T3aL	C-2	2,949	1,751	59%
Headrace Tunnel (Twin) T3R –T3aR	C-2	3,019	1,794	59%
Headrace Tunnel (Twin) T3b –T3cL	C-2	1,180	260	22%
H.R Tunnel (Twin) T3b –T3cR	C-2	1,179	235	20%
Headrace Tunnel (Single) - T4 -T3C	C-2	1,694	1,669	99%
Headrace Tunnel (Single) D/S T4-M4	C-2	2,769	2,712	98%
Headrace Tunnel (Single) U/S 22A-M4	C-3	3,622	3,033	84%
Tailrace Tunnel	C-3	3,550	2,056	58%
Desander Excavation	C-1	3,300,000	3,274,257	99%
Intake & Sedimentation Basins - Concrete	C-1	453,000	453,000	100%
Diversion Dam - Concrete	C-1	320,483	89,220	28%
Powerhouse Excavation	C-3	148,463	116,208	78%
Transformer Hall Excavation	C-3	51,371	51,371	100%
Progress of Adits at all sites	C-1, C-2, C-3	13,468	11,947	89%

Chatter Kalas. The manufacturing of other equipment is in progress in China.

Land Acquisition

The Project envisages acquisition of approximate 4210 Kanal of private and State land in the project area in Muzaffarabad district. About 4030 Kanal land is in possession.

Total land to be acquired for the Project	4210 Kanal
Total land in possession	4030 Kanal
Total land under process of award	254 Kanal*

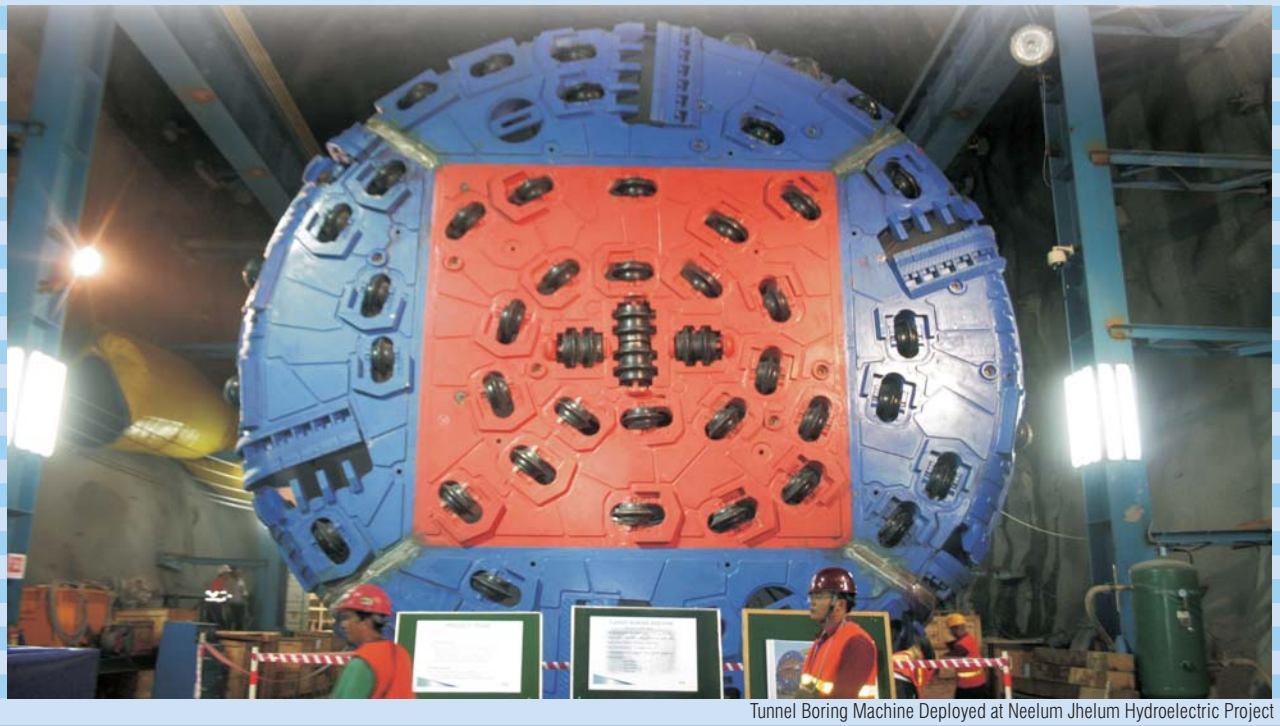
* Government of Azad Jammu & Kashmir is being pursued for Award/Lease of remaining land.

Compensation Package

A comprehensive land compensation and resettlement package has been agreed upon for affectees of the project. The agreement is ready for signing by the Government of Pakistan, WAPDA and Government of Azad Jammu & Kashmir.

Main points of the agreement are:-

- Land, compensation and resettlement
- Livelihood
- Confidence building measures
- Water use charges
- Provision of staff for smooth execution of the project



Tunnel Boring Machine Deployed at Neelum Jhelum Hydroelectric Project

Financing Arrangement

The implementation of the project is being done through Neelum Jhelum Hydropower Company. The local component required for the project is being arranged through a Neelum Jhelum surcharge imposed by Govt. of Pakistan on the consumers at Rs. 0.10/KWh and foreign component will be arranged through foreign donors.

Issues

Timely completion of project is associated with the availability of sustained cash flow.

PHYSICAL AND FINANCIAL PROGRESS OF THE PROJECT

	Progress in the period	Overall Progress
FINANCIAL PROGRESS (as per 2nd revised PC-I)	7.44% (July, 2012 to May, 2013)	24 %
PHYSICAL PROGRESS (as per 2nd revised PC-I)	18% (July, 2012 to June, 2013)	53%**

** Progress of tunnel excavation which is a critical activity for the project completion.

Water Divisions

WAPDA's Water Divisions are executing "Fast Track" basis projects under Vision 2025 Phase-I Programme as well as Surface Water Projects already in hand.

WATER DIVISION (CENTRAL)

Greater Thal Canal Project

The project is a part of WAPDA's Vision 2025 Programme for development of water resources. The project area lies in the Eastern part of Thal Doab in Punjab Province.

Main canal off-takes from RD 180+222 of Chashma Jhelum Link Canal. The command area falls within the boundaries of Bhakkar, Layyah, Khushab and Jhang districts.

Objectives of the Project

The Project aims at new irrigated agriculture development of 1.5345 million acres CCA in Eastern part of the Thal Doab which falls within the boundaries of Bhakkar, Layyah, Khushab and Jhang districts. The proposed irrigation system network of the Greater Thal Canal consists of 1475 Miles length of irrigation channels. Under the Water Accord, allocations have been made for the Project for Kharif season only, in addition to which surplus flood flows may also be available during monsoon. The project can be run with Kharif supplies augmented by surplus flood flows for which the annual crop production will be 22,87,290 tonnes. If the project is commissioned for Kharif supplies augmented by surplus flood flows, benefits will increase from Rs. 42.41 million in the first year to Rs. 5582.11 million at full development .The project will not only result in an increase in farm income but also the opportunities for labour will increase which will bring prosperity to the people in the project area and thus reduce drift of people to other areas for work. The project will have many positive impacts including increase in agricultural production resulting in boost to economy, improvements in physical environment including atmosphere, climate, land and water, improvement in quality of life due to betterment in socio-cultural and socio-economic conditions and enhancement of infra-structural and public health facilities.

Salient Features

Area	
- Gross Area	1.976 Million acres
- Culturable Command Area	1.739 Million acres
Irrigation Water Availability (Non-Perennial Irrigation during Kharif)	
- As per Water Accord 1991	1.873 MAF
- Additional Flood Supply	0.624 MAF
TOTAL	2.497 MAF
Main Canal	
- Capacity	8,500 Cusecs
- Lengthy	35 Km
Branch Canals	
- Capacity	1200 to 3900 Cusecs
- Lengthy	344 Km
Distributaries & Minors	
- Lengthy	1999 Km

Status of Approval and Cost

- PC-II amounting to Rs. 110 million was approved by CDWP on 19th September, 2000.
- PC-I amounting to Rs. 30,467 million was approved by ECNEC on 28th February, 2002.
- Revised PC-I amounting to Rs. 47,976 million is in process for approval in Planning Commission.
- Expenditure as on 30th June, 2012 is Rs. 9496.197 million.

Commencement

The President of Islamic Republic of Pakistan performed ground breaking ceremony on 16th August, 2001.

Consultants

Greater Thal Canal Consultants Joint Venture of NESPAK/NDC/ACE/BARQAAB/ EGC.

Completion

The first Phase of the Project is completed and handed over to Irrigation & Power Department, government of Punjab for Operation & Maintenance, in October, 2009.

District Wise Areas to be irrigated

District	CCA (Acre)	Area
Khushab	260,820	15 percent
Bhakkar	730,296	42 percent
Layyah	504,252	29 percent
Jhang	243,432	14 percent
Total	1,738,800	

Handing over of Phase-I of Greater Thal Canal Project to I&C Unit, I&P Department Govt. of Punjab

After successful test running of the completed system and joint inspection with Chief Engineer I&C Unit, I&P Department., government of Punjab, main canal & 08 distributaries directly off taking from the main canal, escape channel, outfall & interceptor drains, Mankera Branch & its distribution system have been handed over to Irrigation & Power Department, government of Punjab for operation & maintenance in October, 2009.

Present Status

Revised PC-I of the project is with Planning Commission, Govt of Pakistan for the approval to execute work on Phase-II and Phase-III of the project.

Kachhi Canal Project

Kachhi Canal Project off takes from Taunsa Barrage at Indus Punjab Province and will irrigate about 7,13,000 Acres cultureable command area in Kachhi Plain (Balochistan Province). Before entering into Balochistan, the Kachhi Canal will run parallel to the existing D.G.Khan Canal and Dajal branch on its right hand side for about 163 Km then after traversing further a long stretch of another 136 Km in Punjab it will enter in Balochistan. The length of main Kachhi canal within Balochistan province is 200 Km. The command area lies in the districts of Dera Bugti, Naseerabad, Bolan & Jhal Magsi.

Land Acquisition

Punjab

Main canal	306 Km	12,610 Acres

Balochistan

Main canal	194 Km	7,600 Acres
Distribution system	1500 Km	12,282 Acres

Salient Features

Main Canal		
Total length of canal	500 Km.	
Canal in Punjab	306 Km. (lined)	
Canal in Balochistan	194 Km (unlined)	
Peak Discharge	6,000 Cusecs	
Bed Width (unlined canal)	186 ft.	Lined canal 107 ft.
Flow Depth (unlined canal)	9.5 ft.	Lined canal 12 ft.
Top Width (unlined canal)	234 ft.	Lined canal 175 ft.
Distribution System	1500 Km (whole in Balochistan)	
Flood Carrier Channels	300 Km	
Gross Area	1,040,000 Acres	
CCA	713,000 Acres	
Structure (Main Canal)		
Head Regulator (at Taunsa)	1 No.	
Road Bridges	82 Nos.	
Railway Bridges	2 Nos.	
Cross Drainage Structures	79 Nos.	
Cross Regulators	12 Nos.	
HD Regulators (distributaries)	52 Nos.	
Other Minor Structures	1900 Nos.	
Watercourse Crossings	336 Nos.	
Sui Gas Pipeline Crossings	7 Nos.	
EIRR	**13.59%**	
Project Funding	Government of Pakistan	
Project Cost	Rs. 31.204 Billion Approved by ECNEC on 27th September, 2003	
Revised Project Cost	Rs. 88.179 Billion (CDWP cleared/ recommended for approval of ECNEC)	
Executing Agency	WAPDA	
Consultants	Kachhi Canal Consultants Joint Venture of NESPAK/ NDC/ACE/BARQAAB/EGC	
Date of Commencement	4th October, 2002 to 31st June, 2010	
Date of Completion	30th June, 2014 (Phase-I) Part A 31st December, 2014 (Phase-II) 30th June, 2015 (Phase-III)	

Water Availability

The Project will receive annually about 2.021 MAF water as per Water Apportionment Accord (WAA) 1991, the detail of which is as under:-

Nature of Flows	Kharif (MAF)	Rabi (MAF)	Total (MAF)
Perennial Flows	0.386	0.065	0.451
*Flood Flows	1.013	0.197	1.210
Raising of Mangla	-	0.360	0.360
TOTAL			2.021

- Subject to the availability.
- IRSA approved availability of water on 2nd September, 2003.

Project Benefits

- Irrigation supplies for 713,000 Acres new fertile area on RHS of Pat Feeder Canal.
- Employment opportunities.
- Increase in the value of land.
- Increase in exports and foreign exchange earning.
- Reduction in migration from Project to Urban areas.
- Increase in revenue to the Government.
- Enhanced production of food grain and oilseeds.
- Availability of drinking water.
- Cropping intensity shall increase from existing 4% to 80%.
- Agricultural benefits are estimated to be Rs.5 billion per year.

Physical Progress

Contract-wise detail of physical progress is as under:-

Phase-I

(Punjab)

- The KC-1 has been completed.
- The KC-2 has been completed.
- The KC-3 has been completed.
- The work on KC-4 is in progress with 85.50% completion out of scheduled 98%.
- The KC-4A has been completed.
- The work on KC-5 is in progress with73% completion out of scheduled 97%.

Balochistan

- The work on KC-6A is in progress with 93% completion out of scheduled 97%.

KACHHI CANAL PROJECT ALLOCATIONS & EXPENDITURES

(Rs. in Million)

FINANCIAL YEAR	ALLOCATION	EXPENDITURE
2002-03	300.000	384.965
2003-04	900.000	842.987
2004-05	1260.000	1240.307
2005-06	2588.000	2545.531
2006-07	6270.000	6040.041
2007-08	7375.000	7611.162
2008-09	3112.500	3460.388
2009-10	960.000	2172.094
2010-11	700.000	1380.174
2011-12	2250.000	2513.945
2012-13	7587.254	7994.996
Total	34907.000	36253.070

(%age) Phase - 1	PLANNED	ACTUAL
Physical Progress	83.00%	75.25%
Financial Progress	82.5 0%	74.30%

- The KC-6B, after release of M/s FWO from further performance of Contract KC-06B, re-tendering is under process.
- The work on KC-6C is in progress with 48% completion out of scheduled 98%.

International Water Logging and Salinity Research Institute (IWASRI)

International Water logging and Salinity Research Institute (IWASRI), WAPDA was established to manage and coordinate the research pertaining to water logging, salinity, drainage and related fields. The institute continued its research in collaboration with national and international organizations.

DETAILED ANNUAL PLAN WAPDA (WATER WING) 2012-13

Item	Name of Project		Unit	Physical Targets for 2012 - 13	Actual Achievement for 2012 - 13 (Upto 30.06.2013)	Phycial Targets fixed for 2013 - 14
CANALS	ii)	Kachhi Canal				
	A.	Consultancy	Man month	24	24	358
	B.	Land Acquisition	Acres	82	6	400
	C.	Civil Works	-	-	-	-
		a. Earthwork	Mcft.	551.673	309.951	241.72
		b. Lining	Mcft.	3.987	3.634	2.715
		c. Store Pitching	%cft.	-	-	-
		d. Brick Works	Sqft.	22500	15000	32000
		e. Structures	Nos.	60	20	240

Head Regulator of Kachhi Canal at Taunsa Barrage

Research work under the approved PC-II initiated in the year 2009-10 includes three research studies. The PC-II is being jointly executed by IWASRI and its two allied organizations i.e. Mona Reclamation Experimental Project (MREP) and Lower Indus Water Management & Reclamation Research Project (LIM). The objectives of the PC-II include:-

(a) Environment improvement through eradication of water logging and salinity.

(b) Increasing agricultural productivity of marginal lands and poor quality water environment.

(c) Poverty alleviation and

(d) Capacity building and human resource development.

Huge investment is being made in the water sector to meet the requirements of ever-increasing population of Pakistan. Full benefits of these investments can only be achieved when these are linked with knowledge-based research. Therefore, research is an integral part of water sector investment being planned under Perspective Plan. The studies planned under the PC-II along with their objectives are given below:-

Drainage Section

Study: Ground Water Management (Recharge Potential and Governance)

Due to seepage from the Indus Basin Irrigation System (IBIS) after its inception water logging and salinity problems spread to the maximum till 1960s. Whereas, about twenty years later, groundwater levels started falling in certain areas, due to increasing demand on groundwater and to some extent impact of decreasing online storage was also there. During the last 15 years, the falling trend in groundwarter levels has emerged as consistent feature in the form of groundwater depletion in certain areas of Punjab and Khyber Pakhtunkhwa. The main objective of the study is to review the issue of groundwater management and suggest appropriate and pragmatic policy directions for implementation by the Government. Under the study, groundwater depth and quality is being studied throughout the IBIS.

On the basis of depth to watertable data of June 2012, it is estimated that recharge potential in irrigated areas of the Punjab and Khyber Pakhtunkhwa provinces is 83.2 and 47.9 MAF, respectively. Bari Doab in Punjab and Bannu and DI Khan areas of Khyber Pakhtunkhwa are the most depleted. Based on groundwater levels of 2002 and 2012, it is

estimated that 18.9 MAF volume of groundwater has been depleted from the aquifer under Bari Doab in these 10 years duration. If the watertable depletion is allowed to continue as such, the result could be a serious threat to the ecology and sustainability of current production levels, which is vital for the nation's food security. Another, relatively severe impact of groundwater depletion is the quality deterioration of groundwater being pumped by the farmers, particularly in centers of the doabs, where deeper groundwater is having higher slat contents as compared to shallow groundwater seeped after inception of the irrigation system. So, there is need to restrict increasing groundwater use to the extent of its recharge. Therefore, necessary measures need to be taken for water resources sustainability and thereby agricultural production.

In order to find the reasons of unprecedented groundwater depletion in Bari Doab, design water allowance, water allocations in Water Apportionment Accord (WAA) of 1991, existing average canal water diversions, and relative crop water requirement in the form of irrigation water demand index (ETc minus effective rainfall) was compared for Punjab canal commands. In the last decade, Rabi canal supplies in Punjab were about 30% less than allocations in WAA of 1991. This was due to low river flows and online storage loss to siltation, thus dependence on groundwater increased ensuring to groundwater depletion. Following are the major factors contributing to unprecedented groundwater depletion in lowest part of the Bari Doab:-

- Absence of environmental flows particularly in Sutlej River is also adding towards groundwater depletion in the area. Indus Water Treaty (IWT) of 1960 with India has tried to compensate the flows of three eastern rivers but it can be claimed that it has been only partially successful, without the provision of environmental flows:-
- Non-perennial allocations along rivers, particularly along Sutlej river;
- Comparatively low canal supplies and annual normal rainfalls in the area, and
- High crop water requirements, particularly in Kharif season due to severe climate of the area.

Groundwater Management and Regulation Pontential

More than one million of tubewells are currently pumping groundwater for agricultural use in Pakistan, mainly drilled, operated, and maintained by farmers themselves. There is also the scant institutional capacity, both at Federal and Provincial level with respect to hydro-geological assessment, level and extant of data base regarding tubewells. Above all, there is lack of law enforcement capacity for any future regulation in this regard. Therefore, it cannot currently be expected that both, the users and the Government can contribute towards groundwater management costs. However, with the condition of assured surplus electricity provision in the country, enforcement can be bit easily taken up if all the butewells are converted on electricity.

Groundwater data analysis, current water availability, rainfall patterns and crop water requirement across Punjab shows that alarming situation with regard to groundwater depletion prevails in only few of the areas, amongst these Bari Doab is the highest depleted. The most important and supposed to be highly stressed conclusion is Rational Surface Water Management: A pre-requisite for Groundwater Management in Pakistan". In brief, keeping in many other socio-political factors in mind, following are the recommendations for sustainable groundwater management in the country:-

- Construction of mega reservoirs should be the first priority.
- Fresh assessment of crop water requirement, cropping patterns and intensities, and existing allocations is urgently needed and recommended. Re-allocating canal water for equity in relative irrigation demnand rather than supply at IBIS, provincial and canal command levels is crucial.
- Before moving towards farm level groundwater management, equity of surface water availability needs to be ensured, especially at farm gate. In watercourse commands, allocate less time at watercourse head and more towards tail reach, thus creating a sense of equal delivery of canal irrigation water at farm gate.
- The capacity of groundwater institutions should be developed to perform key functions of

planning, research and providing information/ technical support at regional and local levels.
- Frame a national water law for regulation of surface and groundwater at various levels.
- Surface water allocation should be geared towards recharge management.
- There is an urgent need to utilize recharge potential in river beds of Sutlej and Sukh-Beas by diverting surplus supplies during Kharif season, particularly there should be proper planning and implementation for utilizing such recharge potential during wet years.

Research Papers

Following research papers were presented on the eve of World Water Day 2013 held by Pakistan Engineering Congress, at its headquarters in Lahore:-

- Rational Surface Water Management: a pre-requisite for Groundwater Management in Pakistan,
- Water Cooperation in LBDC Irrigation System: Command Scale Conjunctive Water Management in response to Spatial Climate Variability,
- Groundwater Recharge Potential in Irrigated Areas of Indus Basin,
- Impact of Water Resources Management on Agriculture and Environment with Dungi Dam in Pothohar Area.

GIS Activities

- GIS is rapidly becoming technology for resource management and planning. It is being applied in urban planning, forestry, cadastral mapping, land information system, soils, environment, water resources, etc.
- GIS technology has made tremendous improvement in its ability to represent issues on large scale and effectively manage the irrigation and drainage systems. GIS can help to monitor the conditions to respond effectively and quickly. A GIS based drainage framework can make current data and all types of information readily accessible. In addition to its capabilities as a data management and integration tools, GIS is tremendously effective in analyzing data and communicating information. Groundwater monitoring data collected by IWASRI, SMO is acquired and converted into desired format. Topographic sheets from Survey of Pakistan, Base-maps field truthing, Global Positioning System (GPS) survey etc. are carried out to prepare final maps for digitizing. Watertable depth zone maps are generated through integrating IDRISI, Arc/Info and Arc/View GIS.
- Depth to watertable and water quality data collected by SMO Lahore and Hyderabad for Punjab, KPK and Sindh for the year 2012 has been processed. Final maps and results have been produced using GIS technology and handed over to SMO.

Water Management Section

Study: Engineering Economics and Hydrology of Canal Lining

Introduction

The economy of Pakistan is basically dependent on agriculture, and about 68% of the population settled in rural areas, is directly or indirectly involved in agriculture. Due to arid and semi-arid climatic conditions, water resources development for agriculture has provided a sustainable base for irrigated agriculture. The aggregate length of the canals is about 56,073 Km. In addition, the watercourses, farm channels and field ditches cover another 1.6 million Km. The irrigation system of the country draws an average of 105 MAF (million acre feet) of surface water each year for irrigation. Conservation of available water resources is very crucial for sustainable agriculture.

Different sets of technological measures such as excavation of surface drains, lining of canals, provisions of drainage systems were undertaken widely as alternative or complementary solutions to the water logging and soil salinization. Each of these alternatives involved huge capital investment as well as annual recurring O&M costs. But for the last 10-13 years, a spell of drought conditions was observed, which has resulted in a changed scenario of thinking for improvement in water management and a need for groundwater recharge rather than drainage. To rationalize the policy decisions on implementation of the future irrigation and drainage projects, the past experience suggests, it is imperative to critically

assess and compare the economics of the following methods of water conservation and management:-

(i) Lining of canals and irrigation water channels.
(ii) Groundwater development and utilization through tubewells.
(iii) Development and conservation of additional surface water storages.

The study is being executed in all the provinces of Pakistan. IWASRI and Mona are taking care of the selected sites in collaboration with University of Agriculture Faisalabad in Punjab and University of Agriculture Peshawar in Khyber Pakhtunkhwa. Whereas, LIM is taking care of sites in Sindh and Balochistan provinces in collaboration with Mehran University of Engineering and Technology, Jamshoro, Sindh.

Objectives

The main objectives of the study are as under:-

(i) To carry out economic analysis of lining of canals and irrigation water distribution system as water conservation and watertable control measures
(ii) To compare the economics of canal lining with development of groundwater recharge and its management as supplementing or alternative source of irrigation
(iii) To evaluate the economics of the above two alternatives with the provisions of additional surface warter storages and increased canal supplies

Practical Utility

Analysis on the basis of cost effectiveness will aid policy planners through furnishing:-

(i) Quantitative appraisal on the impact of lining/improvement of watercourses, canal distributaries and lining of main and branch canals.
(ii) Documentation of the relative economics of alternative engineering solutions to enhance irrigation water supplies and prevent water logging.
(iii) Guidelines for strategic policy decisions on making investments on lining of canals and irrigation water distribution channels under proposed irrigation and drainage schemes.

Progress of Work

The study covers hydraulic performance and engineering economics at main canals/branches, distributaries and minors level on selected distributaries in each province.

A comprehensive consolidated inception report of the study was prepared to highlight the detailed work plan.

The specific objectives of study are as under:-

(i) Evaluate the seepage loss rate of selected lined and unlined channels
(ii) Evaluate the measures hydraulic parameters of selected channels with the designed hydraulic data obtained from the Irrigation Department
(iii) Evaluate the equity of water distribution at various outlets at head, middle and tail of the selected channels.

The report has been prepared on the basis of data collection and analysis during 2012-13. The following two tables show the list of selected lined/unlined distributaries/minors for seepage loss measurement, silt measurement and also agro-socio-economic survey.

Silt Measurement

During bench mark survey, the activity of silt measurement was also performed in the annual

Lined Channels (Vehari Canal Division, Vehari)

Name of Channel	Parent Channel	Off-take (RD)	Authorised Discharge (Cusecs)	GCA (Acres)	CCA (Acres)	Total Length (RD)	Total No. Outlets
1R/7L Minor	Pakpattan Canal	32500/7-L	13.00	4172	3678	22000	11
1R/3L Minor	Pakpattan Canal	93983/3-R	25.00	7211	6480	27122	14

A View of the Experimental Cotton Crop on the site of Manchar Lake Drain near Sehwan Sharif in RBOD Area

Unlined Channels (Vehari Canal Division, Vehari)

Name of Channel	Parent Channel	Off-take (RD)	Authorised Discharge (Cusecs)	GCA (Acres)	CCA (Acres)	Total Length (RD)	Total No. Outlets
3L/9L Minor	Pakpattan Canal	62034/9-L	12.00	4025	3896	23048	9
Rukken-pur Minor	Pakpattan Canal	161174/7-R	15.04	4353	3071	19500	7

canal closure period of irrigation system of the respective canal divisions.

Salinity & Environment Section

Study: Re-Use of Saline Water for Agriculture in RBOD and LBOD Areas

Pakistan is an agricultural country and its economy mainly depends on this sector. Ever increasing population of the country demands proportionate increase in food production commensurate to the growing needs of populace. A sufficient percentage of the agricultural land is lying uncultivated due to acute shortage of canal irrigation water in the country. Soil salinity/sodicity and water logging have additive effect in imparing the productivity of the irrigated area. These constraints require the efforts for reversal of salinity and water logging hazard in the country and possible improvisation to use the degraded soil and poor quality groundwater water resources for development of community livelihood to meet with the food and fiber requirements of the ever increasing population of the country.

The area of RBOD and LBOD fall under arid and semi arid climatic zone. The present canal supplies are not sufficient to fulfill the enhanced crop water requirements. The alternative lies in the exploitation of groundwater reserves. In Pakistan about 50% of the groundwater reserves are fit for irrigation whereas the remaining 50% need careful application. In Sindh Province about 16% area has usable groundwater. Disposal of saline effluent is deteriorating the water quality of Manchar Lake and Hamal Lake. It also creates environmental hazards for down-stream users. The use of saline effluent may be tried for growing crops, trees and grasses. However, the quality of the drainage water determines which crops can be irrigated. Highly saline drainage water cannot be used to irrigate salt sensitive crops. It could,

however be reused on tolerant forages or in a saline agriculture – forestry system. It may also be used by blending with normal irrigation water or by using some inputs/amendments to avoid its toxic effects on soil and crops.

IWASRI research is developing and testing the technologies for the reclamation and management of salt affected soils, use of poor quality water and tolerance of crops, trees, grasses and shrubs under various soil and water salinity levels. Moreover, the finally developed and approved technologies are ultimately demonstrated to the farming community for the large benefit of agriculture.

Objectives

(i) Use of saline effluent for growing crops, fruit trees, salt tolerant trees and salt tolerant grasses.
(ii) Role of water treatment, soil management techniques, low and high delta crops, amelioration of saline effluent, impact of organic and inorganic amendments in sustaining saline effluent use for increasing area under crops.
(iii) Impact of canal and saline effluent conjunction on soil salinity/sodicity build-up and crop production.
(iv) Long-term impact of varying saline effluent water quality levels on soil salinity/sodicity build-up and crop production.
(v) Reduce drainage effluent disposal requirement.
(vi) Bring non productive lands under production.

Keeping in view the above described objectives, nine sub research studies have been planned to conduct in the LBOD and RBOD area.

(1) Use of saline water for growing of Low and High delta crops at Serani Branch Drain area.
(2) Use of saline water by growing of different crops and application of amendments.
(3) Use of saline water for growing of fruit trees at Sanghar Main Drain area.
(4) Growing of trees by using drainage water on salt affected soils at Naghan Dhoro Drain.
(5) Role of salt tolerant grasses by using drainage water.
(6) Role of Chemical amendments in facilitating use of drainage water on crop production and soil condition.
(7) Effect of drainage water on crop production and soil condition in facilitating with soil management practices.
(8) Effect of drainage water on tree plantation and soil conditions.
(9) Effect of drainage water in conjunction with canal water on crop production and soil condition.

The studies are being executed and data regarding crop yields, water quality, soil physical and chemical properties, infiltration rate of soil and depth of water applied etc. is being collected.

Practical Utility

The study will lead to increase area under crops, fruit trees, salt tolerant trees and salt tolerant grasses by the use of saline effluent and will improve the socio-economic condition of the farming community. It will improve water quality of Manchar Lake and reduce environmental hazard for downstream users.

International Sedimentation Research Institute, Pakistan (ISRIP)

The ISRIP's objective is to undertake research for developing means to manage sediment load through field measurements, laboratory analysis, data processing, and research management using modern techniques. Federal and Provincial agencies engaged in the areas of soil conservation, hydropower, flood control, irrigation and drainage are receiving problem solving support from ISRIP.

The organization is a self-financing formation which at present acts as a service organization for Federal and Provincial governments, WAPDA and Consulting firms to provide expert services in the area of its speciality. It generates its funds through deposit works entrusted by various government/semi-government organizations.

Services being provided by ISRIP

Hydraulic and Sedimentation Measurements

- Discharge Measurement along with water stage
- Sediment Sampling and Analysis
  (i) Suspended
  (ii) Bed Material
  (iii) Boil

Hydrographic Survey
Cross sectional observation of the wet portion of the river/reservoir for evaluation of capacity and bed profiles.

Bathymetric Survey
Cross sectional observation of the wet and dry portion of the river/reservoir upto the elevations as per requirement of the client on both banks.

Morphologic Survey
- Longitudinal bed profile of the river/canal/drain.
- Cross sectional observation of the river/canal/drain.

Training Programmes
Training to staff of WAPDA and other departments about ISRIP's activities regarding hydraulic, sedimentation measurement and analysis.

The details of activities on various projects are given below:-

Neelum-Jhelum Hydropower Project Environmental Assessment
On the advice of South African Modeler, Pakistan Commissioner for Indus Waters (PCIW) assigned to ISRIP the Cross Sectional Survey work of Jhelum River downstream of Neelum-Jhelum Tailrace Outfall to Kohala Bridge in the month of October, 2012.

In addition to the Cross Sectional Survey work, the environmental team of Hagler Bailly Pakistan working on the assignment was also required for flow measurement mainly on already surveyed cross-sectional locations of E.F-1 to E.F-7 sites. So the ISRIP team also observed water surface levels data in the presence of environmental team.

The cross sectional survey data, water surface levels data and profiles are presented in the report (ISRIP-260 Volume-II-A) which was issued in the end of October, 2012.

Remodelling of Warsak Gravity Canal System Project
Project Manager, NESPAK (Pvt) Ltd. Consultants for detailed design and construction supervision of remodeling of Warsak Gravity Canal System approached ISRIP for Discharge Measurement and Sediment Sampling (Equilibrium Observation) at one point at the head reach of Warsak Gravity Canal. On completion of field activities and data processing by ISRIP, the Data Report (ISRIP-262) was issued in October, 2012.

Cross Sectional Observation of CJ Link Canal
Chief Engineer & Project Director, Chashma Barrage & CRBC WAPDA approached ISRIP to observe the Cross sections of C.J Link Canal at 100 feet interval, 3000 feet downstream and 1500 feet up-stream from centre line of Thal Canal aqueduct-cum-head regulator.

The main objective is to study the downstream protection for the additional discharge in C.J Link Canal, as 50 Cumecs (1764 Cussecs) of water from C.J Link Canal is required for 3rd & 4th Units of 300 MW each at Chashma Site.

ISRIP observed the total 45 No. Cross Sections at 100 ft. internal, 3000 ft. downstream (RD 34+387 to RD 37+387) and 1500 ft. upstream (RD 34+387 to RD 32+887) from center line of the Thal Canal Aqueduct-cum-Head Regulator. Data Report (ISRIP-263) was issued in November, 2012.

Khan Khwar Hydropower Project: Sediment Sampling and Analysis during Flood Season 2011
Member (Water) desired to collect sediment samples of Khan Khwar and analyzed at site during flood season. So, obviously, the field team was constituted and proceeded to the site for sediment sampling at site.

The main objective of the study is to check the sedimentation concentration PPM as the Power House Operation has to shut-down when the sediment concentration reaches and exceeds 1,500 PPM.

The sediment sampling and analysis was done at site by ISRIP field team during Flood 2011. The data was provided on daily basis for running of the power house. The Report (ISRIP-264) containing this sediment analysis data was issued in November, 2012.

Sediment Management Studies of Tarbela Reservoir

To provide necessary input for Sediment Management Studies of Tarbela Reservoir (SMST), M/s Mott Macdonald Pakistan (MMP) Project Consultants assigned to ISRIP the work of sediment sampling and analysis at three locations of Indus River.

i. At Basham Qila
ii. D/S of Jinnah Barrage
iii. D/S of Guddu Barrage

After installation of the special type of equipment, the field activities were continued from March, 2012 to October, 2012. The sediment analysis results were provided to MMP regularly on monthly basis. The Data Report (ISRIP-265) was issued by ISRIP in the end of December, 2012.

5th Hydrographic Survey of Chashma Reservoir (2012)

"A meeting to resolve the issue of losses between Tarbela Chashma reach was held on 19th December 2011 in the committee room of IRSA HQs Islamabad. Member (Water) also attended the meeting and it was principally agreed that a fresh Hydrographic Survey of Chashma Reservoir to ascertain the present actual capacity of reservoir, should be carried out immediately." So Chief Engineer and PD Chashma Barrage approached ISRIP for the 5th Hydrograhic Survey of Chashma Reservoir.

The main objective of the study is to check the changes in river bed upstream of Chashma Barrage and to calculate the existing storage capacity of the reservoir.

The field teams completed the physical activities at site from June 2012 to December, 2012. After data processing, the Data Report (ISRIP-266, Volume I & II) was issued by ISRIP in February, 2013. This report (ISRIP-266, Volume-I & II) presents the results of the hydrographic survey i.e. cross sectional data and its plotting, thalweg profile, contour plans and storage capacity of the reservoir.

Chashma Jhelum Link Canal: Discharge Rating Curves

Chief Engineer & PD, Chashma Barrage & CRBC WAPDA approached ISRIP to carry out the field measurements for Development of Discharge Rating Curves/Tables at 4 Control Regulators of C.J Link Canal and Head Regulator of Greater Thal Canal (GTC).

It is imperative to develop rating curves for better control and proper regulation of the canal. Discharge Rating Curves at the following locations were developed:-

- D/S Thal Regulator RD 34+387
- D/S Dullewala Regulator RD 105+722
- D/S Adhikot Regulator RD 180+222
- U/S Tail RD 315+622
- D/S Greater Thal Canal (GTC) Head Regulator

The Data Report (ISRIP-267) was prepared in which the Gauge Discharge Data, Rating Curves in tabulated and graphical form is presented. The rating tables developed on the basis of the observed data are also prepared and presented in this report and it was issued by ISRIP in April, 2013.

Base Line Inspection of Mangla Dam Raising Project-2013

Field team performed successfully field activities in the month of April 2013 as per requirements of Mangla Dam Raising Project and concerned Consultants and the Data was handed over to them at site.

Soundings of Langerpura and Thotha Bridge on Jhelum River (AJK)

General Manager, NESPAK (Pvt) Ltd., Disaster Management & Reconstruction Division approached ISRIP for soundings of Langerpura and Thotha Bridge on Jhelum River, Azad Jammu & Kashmir.

Soundings (Hydrographic Survey) D/S of Langerpura Bridge and U/S of Thotha Bridge on Jhelum River at proposed locations was carried out successfully by field team of ISRIP and the report (ISRIP-268) was issued.

Sedimentation Study of Chashma Reservoir, Discharge Measurement and Sediment Sampling for Model Study of Chashma Reservoir

A joint visit of Tarbela Dam and Chashma Barrage

Khan Khwar Hydropower Project

was done by representatives of ISRIP and IWHR China under 2nd Executive Contract Agreement between IWHR China and WAPDA for Model Study of Chashma Reservoir. After joint visit and detailed discussion, it was decided to observe flow measurement and sediment sampling during this flood season (June, 2013 to September, 2013) upstream and downstream of Chashma Barrage. The previous and present Hydrographic Survey Data (Hard and Soft copies) was handed over to representatives of IWHR China.

ISRIP field teams have started flow measurement and sediment sampling in June, 2013.

Cross Sectional Survey of Jhelum River from Chakothi to Domel Muzaffarabad

40% survey work has been completed. The remaining work is suspended due to high flow and will be completed in the month of October, 2013 as per advice of the consultants NESPAK.

Scarps Monitoring Organization (SMO)

SMO carries out monitoring activities in the disciplines of Hydrological Monitoring i.e. bi-annual depth to water table observation, water quality and soil salinity monitoring needed for future investment purposes in Water Sector PC-II titled "Land and Water Monitoring / Evaluation of Indus Plain" covering all the three disciplines was approved by CDWP on 30th April, 2008 to continue the activities on regular basis through 2008-13. The extension in the study period from 1st July, 2013 to 30th June, 2014 has been approved to complete the remaining monitoring activities as outlined in the approved PC-II. The brief description of the activities completed during 2012-13 is as under:-

Hydrological (DTW) Monitoring

The bi-annual depth to water table observation is an important monitoring activity carried out by SMO. This is a time bonded activity and is conducted on pre and post monsoon basis. The following observations were carried out during the year under report.

Pre monsoon 2012

The preparation of GIS based maps have been completed, whereas, the report is under preparation. The water quality maps for the water samples collected during pre monsoon 2012 are being scrutinized for finalization.

Post monsoon 2012

This activity was carried out during November, 2012

to January, 2013. A total of 5854 points were observed to evaluate the DTW changes. Water samples were collected from these points and are being analysed in detail. The data processing and map preparation using GIS by IWASRI depicting all the results have been completed, whereas the analysis of water samples collected during post monsoon 2012 are near completion.

Pre monsoon 2013

This activity was undertaken during May-June 2013 to assess the pre monsoon DTW in all the four provinces. About 4100 points have been observed till June, 2013 and the field work is expected to be completed during July, 2013, whereas the collected water samples have been transferred to water quality labs. The data processing and the map preparation would be undertaken after the completion of DTW survey.

Installation of new piezometers

The wear and tear of the piezometer network has necessitated the replacement of the un-serviceable piezometers by new ones. The fund constraints do not allow the actual installation as per PC-II, however, 34 No. piezometers have been installed.

Water Quality Monitoring

Funds constraints did not allow to carry out regular water sample collection from tubewells, rivers, drains and other strategic points. The limited release of funds enabled this office to carry out this activity only for two months. A total 863 water samples were collected whereas 726 water samples were analysed in the laboratory for detailed chemical analysis.

The water quality maps prepared by IWASRI using GIS pertaining to the water samples collected during post monsoon 2010 are being checked for finalization.

Soil Salinity Monitoring

This activity could not materialize as per approved PC-II due to non release of funds on regular basis however Muzaffargarh canal in Punjab has been completed, whereas salinity survey of North West canal in Sindh is under process and about 0.48 million acres needed to be surveyed.

A total of 0.536 million acres pertaining to Muzaffargarh was surveyed with 437 auger holes and 1107 soil samples collected are being analysed. The data processing/report preparation would be undertaken during 2013-14.

The 0.344 million acres of North West canal was surveyed during 2012-13. A total of 243 auger holes with 586 soil samples were collected which are being analysed. The remaining portion would be surveyed during 2013-14 followed by data processing map preparation and initial/final report preparation/release.

The draft report pertaining to Rangpur Canal is reviewed by DG (IWASRI) is again resubmitted for finalization and preparation of GIS outputs pertaining to soil salinity and water quality.

Other Activities

SMO on regular basis provides lab analysis facilities to other WAPDA formations and consultants on payment basis. A total of 134 soil samples and 321 water samples were received/analyzed and the data provided to the requesting agencies.

Environment study of Munda Dam Project was carried out and the final report in coordination with Chief Engineer (P&I) and consultants has been finalized and submitted for approval/release.

WATER DIVISION (SOUTH)

Lower Indus Right Bank Irrigation and Drainage Stage-I (RBOD-I) Project

Location of Project

The Lower Indus Right Bank Irrigation & Drainage Stage-I (RBOD-I) Project is located on the Right Bank of River Indus within Districts of Larkana, Kamber-Shahdadkot, Dadu and Jamshoro. The area is irrigated by canals off-taking from right side of Sukkur and Guddu Barrage in Sindh Province.

Objectives of the Project

The project aims at providing the much needed out-fall facilities for the existing and proposed drains schemes to the Sea through RBOD-II being constructed by Army 5 corps under supervision of

IPD from Sehwan to Gharo Greek. The project will also improve the environmental conditions in Manchar and Hamal lakes which are being deteriorated due to continuous disposal of saline drainage effluent. In addition, rehabilitation of some of the existing drainage systems in area is essentially requiring timely drainage of excess water from low rice fields.

The LIRB Project Stage-I (RBOD-I) covers an area of 1.63 Million Acres under priority works, existing drainage facilities will be improved on 0.15 Million Acres while the remaining works cover 1.12 Million Acres.

The proposed works share the objectives of the agricultural sector aiming at increasing agricultural production and meeting targets of Food and Fiber.

Land Acquisition

Land acquisition is in progress at Larkana, Kamber-Shahdadkot, Dadu & Jamshoro districts of Sindh (Province)

Project Benefits

The primary objectives of the works included in LIRB Project Stage-I priority works are to provide much needed out-fall facilities for the existing and proposed

Salient Features

Commencement date	July, 2004
Date of completion	30-06-1998 (As per PC-I) Re-scheduled date of completion is 31.12.2008 Revised 31.12.2010 Proposed 31.12.2013
Gross Command Area	517,310 Acres.
Components:	
i). RBOD-I (MNVD) Extension to MKZP Contract No. R1(A)	Length : 39.36 KM Capacity : 2322 Cusecs
ii). Widening of IL-2 & IL-3 for 3500 Cusec Contract No. R1(B).	Length : 6.12 KM Capacity : 3500 Cusecs
iii). Balance work of IL-1 including its widening Contract No. R1(E).	Length : 18.767 KM Capacity : 3500 Cusecs
iv). Remodeling of MNVD from RD 220+000 to 342+000. Contract No. R-III(a/1)	Length : 35.2 KM Capacity : 3500 Cusecs
v). Remodeling of MNVD from RD 110+000 to 220+000. Contract No. R-III(a/2)	Length : 35.2 KM Capacity : 3500 Cusecs
vi). Remodeling of MNVD from RD 000+000 to 110+000. Contract No. R-III(a/3)	Length : 39.04 KM Capacity : 3500 Cusecs
vii). Construction of New Hamal Regulator at RD 342 + of MNV Drain Contract No. R-III (a/4).	
Project Cost:	
PC-1 (Original)	Rs.4395.00 Million.
PC-1 (Revised) (Approved by ECNEC on 30-11-2006).	Rs.14707.143 Million.
2nd revised PC-I	Rs.17505.018 Million (in process)
Project funding	Government of Pakistan
Executing agency	WAPDA
E.I.R.R	19.3%
Consultants	M/s. NDC, BARQAAB & Ease-Pak and Consultancy Service expired on 31.12.2010
Expenditure up to 05/2013	13428.400 Million
Overall Physical Progress	86.25%
Overall Financial Progress	91.30%

drainage projects, rehabilitation of existing drainage projects on Indus Right Bank in Northern Sindh.

The priority works would increase crop production through increase in cropping intensity and yields and also decrease agricultural risks on 842,500 Acres commanded by the Rice Canal, North West Canal and Dadu Canal.

Utilization of non-saline effluents to recharge lakes or feed irrigation system and segregate saline effluent for diversion into sea through RBOD-II.

Facilitate absorption of hill torrents.

FINANCIAL ALLOCATION, RELEASES, EXPENDITURE 2012-13

Year	Phasing as per Revised PC-I		PSDP Allocation Approved		Funds Released i/c O.H / DC		Actual Amount Utilized	
	Total	FEC	Total	FEC	Local	FEC	Local	FEC
1994-95	379.00	-	180.000	-	197.854	-	197.854	-
1995-96	974.00	-	463.800	-	550.378	-	550.378	-
1996-97	1472.00	-	362.000	-	344.923	-	344.927	-
1997-98	1570.00	-	625.000	-	449.863	-	449.863	-
1998-99	-	-	429.676	-	600.742	-	600.742	-
1999-00	-	-	650.000	-	594.188	-	594.188	-
2000-01	-	-	600.000	-	473.593	-	473.593	-
2001-02	-	-	600.000	-	703.599	-	703.599	-
2002-03	-	-	634.810	-	485.890	-	485.890	-
2003-04	997.850	-	800.000	-	808.071	-	808.071	-
2004-05	997.861	-	1100.000	-	1053.607	-	1053.607	-
2005-06	1520.767	-	1600.000	-	1720.767	-	1720.767	-
2006-07	2213.291	-	1500.000	-	1813.291	-	1813.291	-
2007-08	1885.902	-	1800.000	-	1321.551	-	1321.551	-
2008-09	1396.473	-	375.000	-	464.282	-	464.282	-
2009-10	700.000	-	500.000	-	255.425	-	255.425	-
2010-11	600.000	-	500,000	-	128.457	-	128.457	-
2011-12	-	-	1000.000	-	1168.799	-	1168.799	-
2012-13	-	-	1000.000	-	293.120	-	293.120	-
Total	14707.143		14720.286		13428.400 (P)		13428.400 (P)	

Physical Targets & Achievements 2012-13

Cont. No	Description	Contract Name & Address	Contract Cost	Date of Commence-ment	Date of Completion	Physical		Status
						Target %	Actual %	
R1 (A)	RBOD Extension upto Miro Khan Zero Point.	M/S Khyber Grace (Pvt.) Ltd. Islamabad	609.547 Revised 592.157	01.03.2005	18.02.2007 30-11-2007 EoT approved	100%	85.6%	The Authority accorded approval to release the Contractor M/s Khyber Grace (Private) Limited from further performance of Contract
R-III (a/1)	Remodelling of MNVD from RD 220+00 to 342+00.	M/S Khyber Grace (Pvt.) Ltd. Islamabad	525.00	20.04.2005	19.09.2008 18.03.2009 EoT approved	100%	100%	Taking Over Certificate and Defect Liability Certificate (DLC) approved by Authority and issued to the Contractor
R-III (a/2)	Remodelling of MNVD from RD 110+00 to 220+00	M/s S. H Haq Noor & Co.	315.283	20.06.2005	19.11.2008 19.05.2009 EoT approved	100%	100%	Taking Over Certificate and Defect Liability Certificate (DLC) approved by Authority and issued to the Contractor.
R-III (a/3)	Remodelling of MNVD from RD 00+00 to 110+00	M/s M. Ayoub & Brothers.	367.569	10.09.2005	30.11.2008 28.06.2009 EoT approved	100%	63%	The Authority accorded approval to release the Contractor M/s Muhammad Ayub & Brothers (Private) Limited from further performance of Contract

View of RBOD-III Complex Structure at Mero Khan Zero Point

Physical Targets & Achievements 2012-13

Cont. No	Description	Contract Name & Address	Contract Cost	Date of Commence-ment	Date of Completion	Physical		Status
						Target %	Actual %	
R-1 (B)	Widening of Indus Link IL-2 & IL-3	M/s Malik Riaz & Co (Pvt) Ltd Lahore	72.59	08.12.2005	07.12.2006 30.09.2009 EoT approved	100%	87.03%	The Authority accorded approval to release the Contractor M/s Malik Riaz & Co. from further performance of Contract
R-1 (E)	Balance Work of IL-1 including its widening	M/s Abrar Malik & Co. Lahore	155.81	14.01.2006	13.07.2007 31.12.2010 EoT approved	100%	81.91%	The Authority accorded approval to release the Contractor M/s Abrar Malik & Co. from further performance of Contract
R-III (a/4)	Construction of New Hamal Regulator at RD 342+ of MNVD	M/s Al-Raee Construction Co. (Pvt.) Ltd. and Marathon Construction Co. (Pvt.) Ltd. J.V.	175.896	15.8.2010	10.07.2011 30.06.2012 EoT approved	100%	94%	Work is in progress

Right Bank Outfall Drain Project (RBOD - III)

Location of Project

The project is located on the right bank of Indus River. Major parts of the area lies within Nasirabad, Jaffarabad Districts of Balochistan and Jacobabad, Shahdad Kot at Kamber, Districts of Sindh.

Objectives of the Project

To provide the direly needed effluent disposal facilities for existing and proposed drainage projects to reclaim the agricultural land converted in ponds of water due to lake of disposal of storm water and Irrigation surplus. Provide civil works and infrastructure to facilitate reuse of suitable water for Irrigation. Improving environmental conditions and water quality in Manchar and Hamal Lakes.

Salient Features

Commencement Date	July, 2004
Completion Date	Original June 30,2006 Re-scheduled 30.06.2013.
Gross Command Area	679000 Acres.
Components	
i. Hairdin Carrier Drain R-III (c)	Length = 44 Km Capacity = 435 cusecs
ii. RBOD Extension from MKZP to Hairdin Pump Station R-III (b)	Length = 70 Km Capacity = 765 cusecs
iii. Construction of Irrigation Channel upto Chitti River. R-III (f)	Length = 15 Km Capacity = 400 cusecs
iv. Hadero Drainage Unit R-III (d/1)	Length = 126 Km Capacity = 200 cusecs
v. Usta Muhammad Drainage Unit R-III (d/2)	Length = 192.9 Km Capacity = 365 cusecs
vi. Re-modeling of Shahdadkot Drain R-III (b/1)	Length = 18 Km Capacity = 1150 cusecs
Project Cost	Rs. 4485.20 M approved by ECNEC on 07 Jan,2004
Project Funding	Government of Pakistan
Executing Agency	WAPDA
E.I.R.R	12.61 %
Consultants	M/s. NDC, BARQAAB and EASE Pak and consultancy service expired on 31.12.2010
Expenditure upto 05/2013	5931.317 Million
Overall Physical progress	82.75%
Overall Financial progress	100%

Land Acquisition

Land acquisition is in progress in Shahdad Kot @ Kambar Ali Khan District of Sindh and Usta Muhammad, Jaffarabad and Jhal Magsi Districts of Balochistan.

Project Benefits

The Project will achieve the following benefits

i. Improving environmental condition and water quality.
ii. Increasing agricultural production by way of improving cropping intensity from 113% to 125% in the project area.
iii. Increasing area under Rabi Cultivation by providing condition by timely removal of surface water.
iv. Minimizing pollution of Hamal Lake.
v. Reclamation of Water logged areas of 6070 hectares

Financial Allocation, Releases, Expenditure 2012-2013

Year	Phasing as per original PC-1		PSDP Provision		Actual Amount Released		Actual Amount Utilized	
	Total	FEC	Total	FEC	Local	FEC	Local	FEC
2003-04	1215.196	-	100.00	-	102.25	-	102.25	-
2004-05	1969.757	-	400.00	-	399.695	-	399.695	-
2005-06	1300.246	-	500.00	-	500.509	-	500.509	-
2006-07	-	-	500.00	-	702.833	-	702.833	-
2007-08	-	-	900.00	-	842.070	-	842.070	-
2008-09	-	-	1200.00	-	518.936	-	518.936	-
2009-10	-	-	300.00	-	484.277	-	484.277	-
2010-11	-	-	180.000	-	274.160	-	274.160	-
2011-12	-	-	1000.00	-	1011.653	-	1011.653	-
2012-13	-	-	1000.00		1094.934		1094.934 (P)	
Total	4485.200	-	6080.00	-	5931.317 (P)	-	5931.317 (P)	-

Physical Targets & Achievements 2012-13

Sr. No.	Description	Contractor Name & Address	Contract Cost	Date of Award	Date of Completion	Target %	Actual %	Status
1.	Hairdin Carrier Drain Extension from Chukhi to MKZP and 6 Km North of Chukhi Contract No. R-III (c)	M/s Khyber Grace (Pvt) Ltd. Islamabad	439.694	04.02.2005	24.09.2007 Original EoT approved	100%	100%	Completed
2.	RBOD Extension from Miro Khan Zero Point to Hairdin Pump Station Contract No. R-III (b)	M/s Khyber Grace (Pvt) Ltd. Islamabad	1276.041	07.01.2006	23.07.2009 Original EoT approved	100%	82.5%	The work has been terminated by Aughority due to financial crunch
3.	Irrigation Channel for Reutilization of 400 Cusecs of Balochistan Effluent - From Drain RD 29 Km to Chitti River Contract No. R-III (f)	M/s Muhammad Ayub & Brothers (Pvt) Ltd. Islamabad	572.134	10.04.2006	19.11.2009 Original EoT approved	100%	99%	Work is Progress
4.	Construction of New Surface Drainage System for Usta Muhammad Drainage Unit- Hadero Branch Drain -Sub- Unit. Contract No. R-III (d/1)	M/s Muhammad Ayub & Brothers (Pvt) Ltd. Islamabad	535.636	09.09.2006	04.06.2009 Original 20.12.2009 EOT approved	100%	37.50%	The work has been terminated by Aughority due to financial crunch
5.	Construction of New Surface Drainage System for Usta Muhammad Drainage Unit- Usta Muhammad Drain-Sub-Unit. Contract No. R-III (d/2)	M/s Khyber Grace (Pvt) Ltd. Islamabad	279.269	20.11.2006	01.05.2009 Original EoT approved	100%	60%	The work has been terminated by Aughority due to financial crunch
6.	Re-modeling of Shahdadkot Main Drain from RD 00+000 to 58+000 R-III (b/1)	M/s Khyber Grace (Pvt) Ltd. Islamabad	641.449	26.06.2009	19.05.2012 Original 23.12.2013 EOT approved	100%	99.50%	Work is in progress

Installation of Pilot Treatment Plant Along RBOD System

Project Background

Pakistan is an agrarian economy and irrigated agriculture supports more than 90% of the total agriculture production of the country. However, Pakistan is facing number of challenges today despite of having the largest contiguous irrigation system in the world.

Development of additional water storages in Pakistan faces immense challenges and the ever expanding water needs for the growing economy and the population for meeting its food requirements, adds complexity to it. The current per capita water availability of 1100 m^3/ year estimated to further decline to 800 m^3/ year by year 2025, which is a threat to the food security in Pakistan.

As never before, there is now a strong and growing need to manage this precious resource more carefully and efficiently to ensure water for all on a sustainable basis. The Drainage Effluent being generated from the Right Bank commands (1.3 million hectares) of Guddu and Sukkur barrages in Balochistan and Sindh Provinces having average annual flows of about 750,000 AF was planned to be disposed off into the sea through Right Bank Outfall Drain (RBOD) system being constructed under RBOD I, II and III Projects. Manchar and Hamal Lakes are the two ecologically sensitive and economically important lakes in the RBMP area. Currently, the RBOD Effluent falling into Manchar Lake is the main source of water supply of the Lake. Previously before the construction of RBOD system,

MNVD (Now RBOD) carried fresh water to the lake. After the construction of RBOD system, the drainage effluent became more and more saline by time, and thus impacting the lake negatively, both by habitat and biological life (plants, animals, fish) living in it. This required integration of environmental concerns into the processes used to determine how RBOD sources of water should be conserved and used in a new challenge to Sindh water sector.

In recognition of this need, the President of Pakistan, in May, 2009, directed Wapda to undertake the study for treatment of RBOD effluent. Wapda accordingly engaged consultants for the study with the following objectives:-

i. Evaluate the water quality of the RBOD drainage effluent taking into consideration all the requisite parameters.
ii. Identify the toxic pollutants and their sources.
iii. Propose site specific, environmentally viable and cost effective treatments for RBOD effluent before its disposal into lakes / sea without damaging the aquatic life.
iv. Identify various uses of RBOD effluent for the salinity tolerant agricultural crops.

A presentation on the outcome of pre-feasibility study was given to the President of Pakistan on 15th October, 2009 wherein the President issued the following directives:-

"On the treatment of effluent of RBOD and uses of treated water, study initiated by the WAPDA should be completed within six months and comprehensive report submitted for usage of water"

To implement the directive of the Honorable President of Pakistan, Feasibility Study of "Installation of Pilot Treatment Plant was initiated by WAPDA covering the following objectives:-

i. Authenticate the results of previously carried out effluent analysis during Pre-feasibility stage and carryout salt recovery analysis.
ii. Prepare Feasibility Report of pilot treatment plant at suitable location.
iii. Study the commercial use of salt pellets to off-set the cost of treatment plant.
iv. Preparation of detailed design report and PC-I on EPC basis.

The consultant's local & International experts visited the already five selected sites for collection of effluent samples for carrying out analysis to authenticate the results of previously carried out analysis at pre feasibility stage. The results of this analysis were utilized for estimation of quantity of salts that can be extracted for sale on commercial basis to off-set the capital cost of the project. Moreover, the results of laboratory analysis were further authenticated at proposed pilot treatment plant site by installation of lab scale plant, run by foreign experts. The field results indicated that about 65 tons per day of various types of salts can easily be extracted through pellet reactors technology and 50-60% of overall operating cost of the plant will be subsided through the bi-product of salts only. It is recommended that, initially one treatment plant will be installed on Pilot basis. The performance of Pilot Treatment Plant will be monitored and utilized for designing of other treatment plants.

The standard methodology, as being used by the international funding agencies for preparation of appraisals of similar projects was adopted for the present Feasibility Study.The methodology of "with" and "without" project conditions is used for deriving agricultural benefits. However, the command area is lying abundant due to non availability of irrigation supplies at lower riparian of Johi branch, therefore, benefits under "without" project condition are minimum hence not considered.

Benefits from sale of minerals (salts extracted during treatment of water), and value of water supplied for drinking purposes (potable water) is derived and used in the analysis.

It is worked out that the implementation of project will result in three types of benefits as described below:-

Agriculture

The ensured irrigation supplies will bring abandoned area under plough and resulting bumper harvesting of crops.

View of Water Treatment Plant Installed at Manchar Lake

Sale of Minerals

The water treatment process will yield valuable salts in crystallized form (pellets) which have their market value due to their alternate uses in local chemical industries.

Value of Potable Water

The treatment plant will also provide pure, free of contamination water for both the urban and rural residents of project area within safe permissible limits (TDS less than 300 ppm).

The Project

The Pilot Treatment Plant has been designed for capacity of 40 cusecs (1.13 m^3/sec) and will be installed on left side of MNVD (RBOD) at RD ±93. The plant will treat the effluent of RBOD for agricultural use of about 10,984 Acres (4557 ha.) of lands located around villages in Johi Tehsil of district Dadu. The plant will be installed on left side of RBOD at RD ±93 of MNVD. The plant will provide 28,958 A.F treated effluent per year in addition to two million gallon per day drinking water for supply to nearby villages.

Design Basis for Treatment Plant

Input:

Hydraulic Inflow	40 Cusecs (+ 15%)
Pollution Load (TDS level)	500-8500 PPM
Ambient Temperature	20^0 C to 52^0 C

Output required:

Water for Irrigation (TDS<=1000 mg/l)	40 Cusecs
Potable Water (TDS<=300 mg/l)	2 Million Gallons per day
Salt Pellets of $CaCO_3$ and $MgCO_3$	50-60% of overall operating cost of the plant

Recommended Design of Plant

Keeping in view all the critical factors including the analyses reports, solubility levels of various salts and especially cost benefit ratio, two stages Fluidized Bed Pellet Extraction combined with Reverse Osmosis Systems for irrigation and potable water is proposed.

SALIENT FEATURES (Pilot Treatment Plant)

Type of Plant	Two stages Fluidized Bed Pellet Extraction combined with Reverse osmos Systems for Irrigation and potable water is proposed, being cost effective.
Capacity of Plant	40 Cusecs (1.13 m^3/s)
Area to be benefited	10,984 Acres
Development of Irrigation Network	49,600 ft.
Land Acquisition	200 Acres
Proposed Structures	14 Nos.
Project Benefits	The project will fetch the following benefits:- Bring 10, 984 Acres of area under command. Provide 28,958 A.F of water for agriculture Supply of 02 MGD potable drinking water. Benefits from sale of salts to be extracted.
Project Cost	
i. Plant Cost	Rs. 2629 Million (US $ 30.93 Million)
ii. Development and Land Acquisition Cost	Rs. 405.68 Million (US $ 4.772 Million)
iii. Admin & Conting: Cost	Rs. 261.19 Million (US $ 3.07 Million)
iv. Escalation	Rs. 57.33 Million (US $ 0.675 Million)
Total	Rs. 3353 Million (US $ 39.447 Million)
O & M Cost (Annual)	Rs. 237.748 Million (US $ 2.788 Million)
Project Benefits (Annual)	Rs. 643.68 Million (US $ 7.572 Million)
Economic Parameters	B/C Ratio =1.18:1 EIRR = 15.06%
Construction Period	24 Months
Project Life	30 Years

Project Approval

- During a presentation on 18th May, 2010 at Karachi, the President of Pakistan appreciated the initiatives introduced by WAPDA regarding water conservation strategy through re-utilization plan for RBOD effluent and approved the plan for installation of Pilot Treatment Plant Project.
- The PC-1 of the Project prepared by Wapda was submitted to the Planning Commission/ Division Government of Pakistan for approval.
- The ECNEC in its meeting held on 26th May, 2011 approved the PC-I of the Project at the rationalized cost recommended by CDWP.

Present Status

- M/s Enviro Consult (Pakistan) – GHD (Australia) JV have been engaged as Consultants for the Project and the Consultancy Services Agreement signed on 2nd April, 2013. The Consultants have mobilized and are evaluating the Pre-Qualification Documents for EPC Contract already submitted by the Firms/Suppliers. The EPC Contract for installation of Pilot Treatment Plant is likely to be awarded in the 1st Quarter of year 2013-14 after arranging the requisite funds.
- Preparation of design/tender documents for Infrastructure Development Component has also been taken up by the Project Consultants and the Contracts are likely to be awarded in the 1st Quarter of year 2013-14 after arranging the requisite funds.
- Construction of Residences and Office Block in WAPDA RBOD Colony Dadu is in progress under the head Camp/Colony Officers of PC-I and are scheduled to be completed by December, 2013.

- Installation of 06 Nos. Desalination Plants sponsored by Sindh government and 06 Nos. Desalination Plants sponsored by WAPDA has been completed and handed over to Irrigation Department, government of Sindh on 16th August, 2012 and 2nd April, 2013 respectively.
- The process for acquisition of land required for the Project has been initiated.

REHABILITATION OF SCARP TUBEWELLS & DRAINAGE SYSTEM OF LBOD COMPONENT PROJECT NAWABSHAH

PROJECT SALIENT FEATURES	
Name of work	Rehabilitation of SCARP Tubewells & Drainage System of LBOD Component Project Nawabshah
Location	District Shaheed Benazirabad (Nawabshah) & Sanghar
Name of Contractor	M/s Mian Abdul Jabbar & Co. Karachi
Project Area	56,700 Acres
Contract Cost i/c VO-1, 2, 3 & 4	Rs. 198.439 Million
Completion Period	12 Months
Completion Date	01.06.2010 (Original) 30.06.2012 (Extended)
EIRR	29.08%

OBJECTIVES

The main objectives of this project are to control the salinity and seepage problem of the area for which a scheme of installation of various Tubewells, Pumping Stations and Rehabilitation of sub-drains is scheduled.

SCOPE OF WORK

The Project comprises following works:-

- Installation of 11 No. new Tubewells (consisting of 07 Drainage T/W of Saline Water and 04 Seepage Wells of Fresh Water).
- Construction of 03 No. Pump Stations.
- Rehabilitation of 32 No. Seepage Wells along Rohri Canal
- Rehabilitation of A1R Sub-Drain, (from RD 0+000 to RD 19+750)
- Rehabilitation of E0R Sub-Drain (old Chinese Drain) from RD 0+000 to RD 72+000, (02 No.VRCs and 01 Minor Crossing) at Jam Minor.
- Rehabilitation of Amurji Branch Drain from RD 0+000 to RD 45+000
- Installation of 12 No. additional Tubewells have been included in the work

PHYSICAL AND FINANCIAL PROGRESS	
PSDP Allocation for FY 2012-2013	Rs. 90.000 Million
Releases from Federal Govt.	- Nil -
Expenditure in FY 2012-13 (upto 31.05.2013)	Rs. 20.521 Million
Total Expenditure up to 31.05.2013	Rs. 242.727 Million
Physical Progress up to 31.05.2013	95%
Financial Progress up to 31.05.2013	92.33%

PRESENT STATUS

- Earth work for rehabilitation of A-1R Sub-Drain RD 0+000 to RD 19+750 has been completed, Amurji Branch Drain from RD 0 to RD 45, E0R Sub-Drain (Chinese Trench) from RD 0 to RD 40 has been completed.
- Excavation work of 21 No. Tubewells: Disposal Channels out of 32 Nos. has been completed, work on remaining 11 No. is in progress.
- Installation of Pumps, motors & MCU etc. of 11 No. tubewells has been completed and all the tubewells are in operation.
- 21 No. Seepage Wells along Rohri Canal have been rehabilitated and 18 No. handed over to SIDA in operational position.
- Work on pump station No.2 and 3 has been completed whereas work on pump station No.1 is in progress.
- Drilling, installation of pumps, motors and MCUs of 12 No. additional tubewells have been completed and all the tubewells are in operation.
- Revised PC-I of Rehabilitation of SCARP Tubewells & Drainage System of LBOD Component Project Nawabshah has been forwarded by Secretary, Ministry of Water & Power, Islamabad to Planning Commission on 26th December, 2012 for approval of CDWP in its meeting.

Preparation of PC-I for Pilot Project on Pinyari and Dadu Canals

Background

During a briefing on Small/Medium Dams, Canal Lining and Hydropower Generation on 20th April, 2011 at Aiwan-e-Sadr, Islamabad, it was decided that Federal Government will provide US $ 100 million for projects of each Province, which will be spent through WAPDA.

In a meeting held on 3rd June, 2011 in the committee room of Ministry of Water & Power, it was informed that Federal Government will provide US $ 100 million to each province preferably for lining of canals. The Chair invited suggestions in this regard from all Provinces and WAPDA. Govt. of Sindh proposed Lining of Dadu Canal, NW Canal, Pinyari Canal, Jamrao Canal and Mithrao Canal. WAPDA proposed two Pilot projects on Pinyari and Dadu Canals costing US $ 50 million each.

Pilot Project Salient's

Pinyari Canal off takes from Kotri Barrage and Dadu Canal off takes from Sukkur Barrage. Pilot Project Salient's are in the below table:-

Present Status

PC-I's for both the Pilot Projects in a meeting held on 29th January, 2013 has been cleared by SRC and further sent to Secretary, MOW&P vide Letter No: D(L)South/DS-09/127-31 dated 13-03-2013 for onward transmission to Planning Commission and obtaining approval from CDWP/ECNEC.

Rainee Canal Project

Rainee Canal Project is located in Sindh Province. It off-takes from left bank of Indus River up-stream of Guddu Barrage and will command an area of 412,400 Acres (CCA) in arid zone along eastern fringe of Guddu Barrage Command, in the Districts of Ghotki, Sukkur and Khairpur. This barren land comprises flat patches with predominantly sand dunes.

Objectives

The Rainee Canal Project is a multipurpose project and will afford benefits in the following fields:-

a. Better utilization of flood water ensuring greater supply of water to Sindh.
b. Better flood mitigation and aversion of losses to property.
c. Irrigation of 412,400 Acres of barren land.
d. Cropping intensity during Kharif would increase from 0% to 80% in initial five years.
e. Improved Forestry & Fruit Production.
f. Development of cattle breeding, dairy farming.
g. Drinking water for Arid Zone.
h. Social uplift and poverty alleviation.
i. Environmental improvement due to charges of lakes.
j. Development of fish farming to extent of 258 tons annually.
k. Development of transportation routes in project area.
l. Creation of job opportunity and alleviation of poverty.

Scope of work

The length of Main canal is 175 Km with capacity of 5,155 Cusecs. About 609 Km of distributaries are almost completed. All the distributaries are lined. Out of 304 major and 1318 minor structures, most are completed.

The work on the project commenced on 3rd October, 2002 with ground-breaking ceremony performed by the President of Pakistan. The project (Phase-I) is expected to be completed by June, 2014. PC-I amounting to Rs.18.862 billion was approved by ECNEC on 18th February, 2004.

Pilot Project Salients

Pilot Project on	Canal Off Taking from	Location RD of Pilot Project	Saving of Seepage Cusec	Cost of Project Rs. in Million
Dadu Canal	Sukkur Barrage	473.630 to 611.830 (42.1 Km)	300	3885.648
Pinyari Canal	Kotri Barrage	114.000 to 168.400 (16.6 Km)	480	4403.346

Head Regulator of Rainee Canal

Salient Features

Main features of the Project are as under:-	
Canal Capacity	5155 Cusecs
Command Area	412,400 Acres
Canal Length	175 Km
Lined Portion of Canal	119 Km
Distribution System	609 Km
Lakes Storage	415,770 Aft.
Syphons	09 Nos.
Canal Head Regulator (at Guddu Barrage)	01 No.
Cross Drainage Structures	51 Nos.
Railway Bridge	01 No.
National Highway Bridge	01 No.
Road Bridges	120 Nos.
Head Regulator of Distributaries	67 Nos.
Project Cost	Rs. 18.862 Billion
EIRR	12%
Commencement Date	03.10.2002
Scheduled Completion Date of Phase-I	31.12.2010
Rescheduled Completion Date of Phase-I	30.06.2014

Revised PC-I amounting to Rs.32 billion has been forwarded by Ministry of Water and Power to Planning Commission P&D Division for clearance by CDWP and approval by the ECNEC.

Physical Progress

The project is being executed through following contracts mentioned in the table:-

Financial Status

PC-I to the extent of Rs.18.862 billion has been approved by ECNEC on 18th February, 2004 against which an expenditure of Rs.14,902.683 million has been incurred up to 31st May, 2013.

PSDP allocation for the year 2012-13 is Rs.4000.000 million, against which an expenditure of Rs.3033 million has been incurred up to 31st May, 2013.

Overall financial progress of Phase-I up to 31st May, 2013 is 89%.

Land Acquisition

Land acquisition process for 5959 Acres has been completed. Rs.1096.664 million has so far been provided to the government of Sindh for payment to the affectees, out of which Rs.1096.664 million have been paid to the land owners by the Land Acquisition Officer.

Preparation of Feasibility Study for Diversion of Rain/Flood Water to Thar Desert

Background

President of Pakistan in a meeting held on 30th October, 2011 at Bilawal House, Karachi directed WAPDA to undertake the study of diversion of

Rainee Canal Project - Contracts

Contract No.	Description	Progress as on 31.05.2013
RC-1	Earth work of Main Canal RD 18+000 to 38+000	Completed on 31.05.2003
RC-4	Head Regulator and Earth work From Head Regulator to RD 18+000	Completed on 30.09.2009
RC-5A (Balance works of RC-2,3 & 5)	Earth work & Structures RD 18+000 to 181+433	Completed on 09.02.2010
VO RC-5A/02	Construction of Escape Channel & its allied structures Off-taking from RD 181±	Completed on 20.03.2012
RC-6A (Balance works of RC-6)	Earth work, Concrete Lining and Structures RD 181+433 to 276+853	Completed on 20.02.2010
RC-7	Earth work, Concrete Lining and Structures RD 276+853 – 363+752	53% Work terminated by the Contractor under Clause 69.1 of CoC due to non payment of their certified amounts. Settlement Agreement approved by the Authority in its meeting held on 17th May, 2013 for resumption of balance works of RC-7 through sitting Contractor M/s RSL.
RC-7A	Distribution system from RD 181+433 to 363+752	Completed on 16.04.2012
RC-8,9 & 10	Earthwork, Concrete Lining and Structures RD 363 to RD 570	The works will be undertaken under Phase-II after completion of Phase-I.

Overall physical progress of Phase-I is 95%.

Rain/Flood water to Thar Desert. Authority in its meeting held on 28th December, 2011 approved to carry out the study on Diversion of Rain/Flood water to Thar Desert at the cost of Rs.40.948 million for a period of 8 months from 1st February, 2012 to 30th September, 2012. Sitting Consultants M/s ACE-BARQAAB-EASEPAK (JV) were awarded the Study which has been commenced w.e.f. 1st February, 2012.

Study Salients

There is waste potential for storing flood / rain water within lakes in Thar Desert Lake Complexes. Identified for possible storage are Hathongo Lake Complex and Kalankar Lake Complex and are 30 Km and 50 Km below Chotiari Reservoir respectively. The Study aims to divert Rain/Flood Water Flow from Spinal Drain to Hathongo and Kalankar Lakes Complex in Thar Desert. Both Lake Complexes have storage capacity of approximately 50,000 AF each. Water Quality in the Hathongo Lake Complex varies from 500 ppm to 15,000 ppm and 1,000 to 6,000 ppm i n Kalankar Lake Complex. Two Diversion Channels both having 1000 Cusec capacity have been designed to divert Rain/Flood Water to Hathongo and Kalankar Lakes Complex respectively.

Present Status

The updated progress is as under:-

Topographic Survey	Completed
Socio-Economic Survey	Completed
Environmental Survey	Completed
Geo-Technical Investigations	Completed
Design & Drawings	Completed
Feasibility Report	To be submitted by Consultants by June, 2013

Preparation of Feasibility Study & PC-I for Lining of Canals Emanating from Hub Dam Project along with Construction Management for Lining of Main Canal

Background

Project Director Hub Dam Project has reported that all the canals emanating from Hub Dam i.e Main canal, Karachi Water Supply canal, Lasbela canal and Bund Murad Minor are in deplorable condition especially Main canal and Karachi Water supply canal are in very bad condition and damaged at many places and precious water is being lost due to seepage from these canals. In addition, frequent breaches occur in these canals which badly disturb the supply of water to Karachi and to the command area. Authority in its meeting held on 25th March, 2013 approved to carry out the Study, along with Supervision and Implementation for Improvement & Lining of Canals emanating from Hub Dam Project at the cost of Rs. 24.200 million for a period of 6 months w.e.f 1st March, 2013 to 31st August, 2013. Sitting Consultants M/s ACE-BARQAAB-EASEPAK (JV) have been awarded the Study and they have commenced the study w.e.f 1st March, 2013.

Status of PC-II

PC-II for the study has been prepared by the office of GM(P), South and further sent to GM(P&D) vide Letter No: GM(P)South/2967 dated 29th May, 2013 for its approval from Member Water and SRC. The summary of the cost is as under:-

Present Status

Up to date progress of the study is as under:-

Reconnaissance Survey	Completed
Condition Survey	Completed
Socio-Economic Survey	Completed
Environmental Survey	Completed
Water Quality Survey	Completed
Agronomy Survey	Completed
Geo-Technical Investigations	In Progress
Design and Drawings	To be done
Feasibility Report	To be done
PC-I	To be done
Tender Documents	To be done
Implementation Lining Works	To be done
Final Completion Report	To be done

Hub Dam Project

Introduction

The project is located about 45 KM North-East of Karachi City. Since its inception in year 1981, the Hub dam is supplying water for Municipal, Industrial and Irrigation Supplies in Karachi and Lasbella Districts.

Description	Total Revised (Rs. in Million)
1) Works Cost	
a) Lining of Canals by Incomat Material	87.498
b) Lining of Canals by Geo-Synthetic Material	129.045
Sub Total (1)	216.543
2) a) Salary Cost	15.303
b) Direct Cost	8.723
c) Contingencies @ 2% of Direct Cost	0.174
Sub Total (2)	24.200
3) WAPDA's Bifurcated Cost	
a) Personnel (Pay & Allowances of WAPDA Staff)	15.782
b) Other Expenses (WAPDA Staff)	6.870
Sub Total (3)	22.652
4) Contingencies @ 3% of Total (1+2+3)	7.902
Total (1+2+3+4)	271.297
5) WAPDA Overheads @ 2.25% of Total (1+2+3+4)	6.104
Grand Total	277.401

Salient Features

AREA	
Catchments Area	3410 Sq. Miles
Reservoir Area	29.06 Sq. Miles (at EL.339 ft.)
MAIN DAM	
Maximum Height of Dam	154 ft.
Length of Dam	15640 ft.
SPILL WAY	
Type	Ogee Type
Crest Length	6020 ft.
Crest Elevation	339 ft.
Maximum Outflow Capacity	458,000 Cusec
RESERVOIR	
Full Reservoir Level	339 ft.
Maximum Reservoir level	346 ft.
Dead Storage level	276.25 ft.
Gross Reservoir Capacity	687,276 AF
Live Storage Capacity	645,470 AF
Dead Storage Capacity	41,806 AF
Total Annual Releases	216,406 AF

Present Status:

Constrains of funds are due to non-payment of O&M Cost from government of Sindh and government of Blochistan. An amount of Rs.355.748 million is due to government of Sindh and Rs.81.647 million to government of Blochistan, up to September-2013.

Darawat Dam Project

Project History / Background

The economy of the Sindh Province is mainly dependent upon agriculture. Being an arid region; characterized by low rainfall and frequent spells of drought, the agriculture is therefore entirely dependent upon irrigation. To address this important aspect, highest priority to Sailaba farming, Construction of storages (storage dams) for development of surface water in order to expand the command area and recharge the groundwater resource, has been given.

Feasibility Study

The Irrigation and Power Department, government of Sindh acquired the services of Joint Venture of M/s National Development Consultants (NDC), Lahore and M/s Techno- Consult International Karachi to carry out the feasibility study of the Dam reservoir at the site identified by the Irrigation and Power Department. The work on the study was initiated in March, 2007 and completed in March, 2008. Later, in June 2009, up-gradation of the feasibility study carried out which was awarded to M/s Cameos Consultants in association with M/s Spatsol by the Irrigation & Power Department, government of Sindh. After the transfer of the Dam from Irrigation & Power Department government of Sindh to WAPDA, the services of M/s Cameos Consultants were also transferred to WAPDA.

Financial Status of Hub Dam

Description	Amounts (Rs M.)	GOS SHARE (63.3%)	GOB SHARE (36.7%)	REMARKS
O&M / R&M Expenditure up to June, 2013	1041.895			Expenditures up to June-2013,
GOP Allocation.	464.118			Government of Pakistan allocation included for year 2013-14
WAPDA FUNDING (1 - 2)	577.777	365.733	212.044	
Expenditure for current financial year 2013-14 up to September -2013	15.841	10.027	5.814	Expenditure for the current financial year 2013-14; up to September-2013
Works to be executed.	59.134	37.432	21.702	The works are to be carried out, as per recommendation of DSO, Lahore for the safety of Dam.
Beneficiaries Share in Total (3+4+5)	652.752	413.192	239.560	Latest status.
Beneficiaries' contribution up to September-2013	215.357	57.444	157.913	1) An amount of Rs 1.500 Million received in July, 2013 from government of Sindh.
Balance receivable	437.395	355.748	81.647	

A View of Darawat Dam

Darawat Dam Project has been implemented as part of "Federal Public Sector Development Programme 2009-2010". The Government of Pakistan approved the 1st PC-I of Darawat Dam Project in September, 2009. Subsequently, ground breaking ceremony was graced by the President of Pakistan on 2nd January, 2010. The Project is being implemented by WAPDA on fast track basis through an EPC / Turnkey Contract.

Location

The proposed site for Darawat Dam is located across Nai Baran near Jhangri village in Jamshoro District. While the Command area falls in Thatta District. The Dam site is about 70 Km West of Hyderabad and 135 Km North East of Karachi and accessible from Karachi-Hyderabad Super Highway.

The Project

The project comprises on following components:-

Concrete Gravity Dam, Intake / outlet structure, Conveyance System; 25000 Acres of land; Infrastructure Facilities and Rehabilitation of access roads.

Award of Contract

An Engineering, Procurement, Construction (EPC) Contract was awarded by WAPDA on 9th June 2010, to the Joint Venture of M/s Sinohydro-MAJ for the construction of Project works at a Contract Price of Rs.7, 554,688,700/-. The Date of Commencement is 30th June 2010. The works are scheduled for completion within a period of 03 years starting from the Date of Commencement i.e. 29th June, 2013.

Project Consultants

Management Consultancy (MC) Services were engaged by WAPDA on 10th November, 2010, a joint venture of two national firms, led by National Development Consultants (NDC), Private Limited, Lahore and partner firm M/s Cameos Consulting Engineers, Architects and Planners, Islamabad to advise/assist the Employer in implementation of the Project through an Engineering, Procurement and Construction (EPC) / Turnkey Contract.

Salient Features

Dam	
Type	Concrete Gravity Dam
Length	306 M (1004 ft.)
Gross Storage	150 MCM (121605 Acre ft.)
Dead Storage	40 MCM (32428 Acre ft.)
Live Storage	110 MCM (89177 Acre ft.)
Life of the Dam	50 Years
Spillway	
Type of Spillway	Ogee Crested Weir with Flip Bucket.
Maximum Discharge Capacity	3600 Cumec (127132 Cusecs)

Implementation Agencies

The Project has been split into two phases:-

Phase-I

i. Construction of Dam, Structures and Irrigation System (main canal, distributaries and minors) will be executed by WAPDA.
ii. Cost of land acquisition, compensation and security arrangement will be borne by the Provincial government from their own resources.

Phase-II

i. Command Area Development will be executed by the Provincial government through concerned departments after completion of main dam by submission of new PC-I as per 18th constitutional amendment.

Physical Progress

- Scheduled/target Progress (up to 30 June, 2013) 100%
- Progress Achieved 87%

Description Activity / Works	Achievement (up to June, 2013)
A. General	
Mobilization, Camps, Site Installation	The works on these items have already been completed.
Coffer Dam (Stage 1 & 2)	The work has been completed.
Geo-technical Investigations & Topographic Surveys	These items have already been completed.
Design Submission and approvals	Ninety percent of designs submitted and approval accorded accordingly.
Main Dam	
Excavation for Foundation	This work has already been completed.
Concrete Works	Concreting on different sections of Main Dam has been completed.
Grouting Works	Consolidated Grouting is 100% completed.
Instruments etc.	Installation of Instruments in the specified dams' sections has been completed.
Spillway	
Excavation	Excavation for foundation of spillway has already been completed.
Concrete works	Concreting works on spillway are 100% completed.
Down Stream Protection Work	Down Stream protection works has been completed.
Irrigation works	Construction of irrigation works (Major and Minor canals is in progress). The physical progress is 30%.

Financial Progress

Financial Status	Local	Foreign	Total (Rs. in Million)
Approved PC-1 Cost	9300	-	9300
PSDP Allocation 2012-13	1800	200	2000
Expenditure up to June, 2012	1929.815	-	1929.815
Expenditure during the current F/Y (2012- 13)	2609.1808	-	2609.180
Up-date Expenditure	4538.995	-	4538.995

Mirani Dam Project

SALIENT FEATURES

DAM			
Type of Dam	Concrete Faced Gravel Fill Dam		
Height of Dam	127 ft.		
Length at Crest	3,080 ft.		
Reservoir Area	17,982 Acres		
Gross Storage	0.302 MAF		
Live Storage	0.152 MAF		
SPILL WAY			
Type	Un-Gated		
Maximum Capacity	384,000 Cusec		
IRRIGATION SYSTEM			
Type	Gravity, Lined Channels		
Water Allowance	11.36 Cusec/1000 Acres		
Outlet Diameter	6 ft.		
Capacity	377 Cusec		
CANAL DATA	**Length (Miles)**	**Discharge (Cusec)**	**Command Area (Acres)**
Right Bank Canal	12.55	236	20,800
Left Bank Canal	11.84	141	12,400
TOTAL	24.39	377	33,200
PROJECT COST (PC-I)			Rs. 5811 Million
RESETTLEMENT ACTION PLAN			
Total Cost			Rs. 1687.857 Million
Consultancy Services			Rs. 36.850 Million
Available for Resettlement			Rs. 1651.007 Million
Transferred to DCO Turbat			Rs. 1651.007 Million
Distributed by DCO			Rs. 1651.007 Million
DATE OF COMMENCEMENT			July 8, 2002
DATE OF COMPLETION			30-06-2007
EIRR			12%
CONTRACTOR			M/s MIRANI DAM JOINT VENTURE
PHYSICAL PROGRESS			100%
FINANCAIL PROGRESS			97.21%
COMMAND AREA DEVELOPMENT			
Land to be Developed			12,500 Acres
Land Developed			8,000 Acres (64%)
Water Courses			193 Nos. against 195 (98%)
Amount transferred to Secretary Agriculture, GOB as per PC-I			Rs.122 Million

Present Status

- Irrigation System handed over to Irrigation Department, government of Balochistan along with assets on 7th February, 2008.
- The Fishing rights have been transferred to the Fisheries Department, government of Balochistan.

Issues

Taking over of Dam

In this regard, government of Balochistan is being continuously persuaded, but still it is reluctant to take over the Dam, reasoning for complete payment of Mirani Dam affectees and construction of Additional Spillway.

Compensation to the Flood Affectees

As far as the issue of compensation to the affectees is concerned, Planning Commission Islamabad has constituted a Technical Committee of the following members to look into the matter of the compensation to the flood affectees:

1. Syed Ehsan Shah, Minister for Industries and Commerce Department, government of Balochistan
2. Dr. Abdul Malik Baloch, Senator Balochistan Joint Secretary Ministry of Water & Power, Govt. of Pakistan.
3. Member (Water) WAPDA, Lahore
4. DG (Infrastructure) Projects Wing, Planning Commission, Islamabad.
5. Commissioner, Makran Division, Ketch Turbat, Balochistan.

As a result of various meetings of the Technical Committee constituted by Planning Commission and recommendations of the Sub-Committee constituted by Technical Committee, the following decisions were made in meeting held on 3rd December, 2012 at Quetta: -

a) Planning Commission to take up the case of compensation of Rs. 833.831 million of damaged houses immediately for releases of funds to affectees in the first case.
b) Damages of trees amounting to Rs. 3390.58 million to be processed in the second phase for release of funds.
c) The compensation amount of Rs. 81.398 million for Kareezes, Tube-well, open Surface well to be deferred. The committee decided that instead of paying compensation to affectees, a separate project of development of water sources in the flood area to be prepared by Irrigation Department and submitted to Planning Commission for approval.

d) The list of beneficiaries of flood affectees should be given wide publicity for information of general public and ensure greater transparency.
e) Modes of operation of payment of compensation amount to flood affectees will be distributed through following committee:-

-	Commissioner, Makran Division	Chairman
-	Deputy Commissioner, Kech	Member
-	Project Director, Mirani Dam	Member
-	Rep: of Planning Commission	Member

The Chief Secretary government of Balochistan has been requested to take up the case for payment of compensation to the affectees of Mirani Dam since it is the responsibility of Provincial government under new scenario of 18th Constitutional Amendment and 6th NFC Award.

Additional Spillway

As far as the construction of Additional spillway is concerned, WAPDA had submitted:-

PC-II amounting to Rs. 50.787 million to the Ministry of Water and Power on 17th July, 2012 for obtaining the approval of competent authority, which is still awaited.

O&M of Mirani Dam

For the O&M and handing over of Mirani Dam to Balochistan Government a meeting was held on 10th September, 2012 at Planning Commission Islamabad under the Chairmanship of Additional Secretary, Planning Commission P&D Division regarding functional projects particularly about Mirani Dam Project.

During the meeting following decisions were made:-

i. Government of Balochistan will make arrangements on priority to develop the balance Command Area to derive maximum benefits from the Project.
ii. Provincial government will submit a Work Plan for the balance work to be done including details of O&M expenditure on priority.
iii. Based on the Work Plan and estimates of O&M costs for the current year, case for one time grant to government of Balochistan will be initiated for approval of the appropriate forum.

In response to the above, a Working Paper prepared by Irrigation Department, government of Balochistan was sent to this office.

The General Manager Finance (Water) has also written a letter to Joint Secretary (Water) Ministry of Water & Power Islamabad regarding the requisite payment (Rs.200 Million) on account of liabilities against Mirani Dam Project.

Sabakzai Dam Project

Location

Constructed across Sawar Rud, about 68 Km South West of Zhob Town in Balochistan Province. The Project area is located about 288 Km North-East of Quetta.

Objectives

- Irrigated agriculture development
- Flood Protection
- Drinking Water Requirement
- Fishiries

SALIENT FEATURES

DAM			
Type of Dam	Earth and Rock Fill Dam		
Height of Dam	114 ft.		
Length at Crest	1300 ft.		
Gross Storage	32,700 AF		
Live Storage	14,700 AF		
SPILL WAY			
Type	Ogee / Un-Gated		
Maximum Capacity	57,562 Cusec		
IRRIGATION SYSTEM			
Type	Gravity, Lined Channels		
Water Allowance	4.8 Cusec/1000 Acres		
Outlet Diameter	6.56 ft		
Capacity	33 Cusec		
CANAL DATA	Length (Km)	Discharge (Cusec)	Command Area (Acres)
Right Bank Canal	23.00	14	2,812
Left Bank Canal-I	11.30	7	1,479
Left Bank Canal-II	5.48	12	2,584
TOTAL	39.78	33	6,875
PROJECT COST (PC-I 2nd Revised)	Rs. 1960.823 Million		
DATE OF COMMENCEMENT	January 01, 2003		
DATE OF COMPLETION	June 30, 2009		
EIRR	10.60 %		

PHYSICAL PROGRESS	100%
FINANCIAL PROGRESS	97.01%
COMMAND AREA DEVELOPMENT	
Land developed	1,673 Acres (100%)
Water Courses completed (91%)	31 Nos against 34
Amount transferred to Secretary Agriculture, GOB as per PC-I	Rs 10.0 Million

Present Status

The Project is completed on 30-06-2009 and handed over to Irrigation & Power Department, GOB w.e.f 30-06-2010.

Naulong Dam

Location

Naulong Dam Project is located across Mula River at Sunth about 30 Km from Gandawa City in District Jhal Magsi of Balochistan Province.

Objectives

- To conserve flood water of Mula River for Agriculture Development.
- Hydropower generation.
- Flood mitigation.
- Socio economic uplift of remote areas of Balochistan.
- Women Emancipation.

Current Status

- Feasibility study and detailed Engineering design of the Project was completed in 2009.
- Revised PC-I of the project amounting to Rs.18.027 billion approved by ECNEC in its meeting held on 16th August, 2012 without Foreign Exchange Component subject to the following:-

  (i) Main Dam with allied structures and irrigation system (Main Canal, Distributaries and Minors) will be constructed by WAPDA.
  (ii) Power house and allied activities will be undertaken on Public Private Partnership (PPP) basis.
  (iii) Cost of Land acquisition, compensation and security arrangement will be borne by the provincial government from their own resources.
  (iv) Phase-II (Command area development) will be executed by the provincial government through concerned departments by submission of new PC-I after completion of Phase-I as per requirement of 18th constitutional amendments.

- Arrangement of concessional loan from China EXIM Bank of US $ 155 million:

SALIENT FEATURES

a)	**Hydrology**	
	Catchment Area	2,890 Sq. miles
	Mean Annual Inflow	152,000 AF
	Mean Annual Rainfall	8.9 Inches
	Probable Maximum Flood (PMF)	641,540 cfs
	Routed PMF	639,210 cfs
b)	**Reservoir**	
	Normal Conservation Level	730 ft.
	Gross Storage capacity	242,163 AF
	Live Storage Capacity	199,956 AF
	Dead Storage Capacity	42,207 AF
	Mean Sediment Load per year	3,286 AF/ Sq. miles
c)	**Irrigation System**	
	Command Area (CCA)	47,000 Acres
d)	**Main Dam**	
	Type	Zoned Earth fill
	Height	186 ft.
	Length	2,996 ft.
	Crest Elevation	751 ft.
e)	**Auxiliary Dam**	
	Type	Zoned Earth fill
	Height	179 ft.
	Length	1,574 ft.
f)	**Spillway**	
	Type	Orifice
	Gates of Size 40' x 30'	9 Nos.
	Crest	675 ft. a.m.s.l.
	Design Discharge	467,507 cfs
g)	**Fuse Plug Embankment**	
	Two Segments of Confined Sand Length Of Each Segment	165 ft.
	Width of Divide Wall	10 ft.
	Designed Discharge	197,986 cfs
h)	**Power Tunnel and Penstock**	
	Dia of Power Tunnel	10 ft.
	Dia of Penstock	6 ft.
i)	**Power House**	
	No. of units	2
	Maximum Total Output	2.6 MW
	Annual Energy Generation	15.6 GWh
j)	**Power House 2**	
	No. of units	2
	Maximum Total Output	1.8 MW
	Annual Energy Generation	11.0 GWh
k)	**Project PC-I Cost**	
	Total PC-I Cost	18.027 Billion

- A Memorandum of Understanding has been signed with EXIM Bank China by Economic Affairs Division (EAD), Government of Pakistan under which US $ 700 million will be provided by EXIM Bank of China for Small/Medium Dams. EXIM Bank will provide 85% of Contract Cost and remaining 15% will be arranged through PSDP.
- EAD has forwarded the loan application to EXIM Bank China for financing Naulong Dam Project through concessional/PBC Loan.

- The Technical and Financial proposals for appointment of Consultants for Construction supervision of Project works received from 05 Nos. short listed firms/ JVs. The Technical proposals are under process of approval.
- The tender for construction of Naulong Dam Project Contract ND-01 Main Dam and its Allied Civil works & Hydraulic steel structures works including irrigation system has been invited. The date of opening of the tender is 20th June, 2013.
- Deputy Commissioner/Collector, District Jhal Magsi has issued Notification under Section - 4 of Land Acquisition Act, 1894 on 29th August, 2012 for acquisition of 3871 Acres of land required for thirteen (13) components of the Project.

Garuk Dam

Location
The proposed dam site is located across Garuk River at about 47 Km South East of Kharan district of Balochistan

Objectives
- Storage of flood water.
- Conservation of flood water resources for irrigation, drinking and recharge.
- Development of new irrigated agricultural area.
- Improving human development.

Status
- PC-I amounting to Rs 1.790 billion approved by ECNEC on 3rd September, 2009.
- Revised PC-I amounting to Rs.7.921 billion is under preparation.

SALIENT FEATURES

DAM	
Dam Type	Earth Core Rock Fill
Height of Dam	184 ft.
Life of Dam	50 Years
Power Generation	300 KV
RESERVOIR	
Gross Storage	50,695 AF
Dead Storage	25,800 AF
Live Storage	24,895 AF
Normal Reservoir Level	RL 3182.42 ft. asl
IRRIGATION SYSTEM	
High Efficiency Irrigation System	Drip Irrigation
Command Area (CCA)	26,000 Acres

- Tenders for construction of Garuk Dam on EPC basis invited on Oct. 03, Nov. 19 2009, Feb. 20, March 24, Oct. 20 and December 23, 2010. No bid received.
- WAPDA proposed the project through local district contractors by subletting the various components to increase participation of the local community, local monetary benefits.
- Government of Balochistan suggested transferring the project to Irrigtion & Power Department, government of Balochistan for execution.

Hingol Dam

Location
Hingol Dam site is proposed across Hingol River about 16 Km up-stream of Makran Costal Highway Bridge in Lasbella district of Balochistan and about 260 Km from West of Karachi.

Objectives
- Agriculture development.
- Hydropower generation.
- Fisheries development.

Status
- Feasibility study completed by M/s NESPAK in 1992 - 93.
- Detailed Engineering Design and Tender documents of Hingol Dam Project with Dam Site at Aghor, 1 Km u/s of Coastal Highway completed by the Consultants M/s NDC JV in 2009.

Site of Pelar Dam

SALIENT FEATURES

DAM	
Dam Type	Central Core Zoned Dam
Catchment Area	13,500 Sq. Miles
Height of Dam	179 ft.
Life of Dam	50 Years
Power Generation	3.5 MW
Spillway Capacity	684,000 Cusec
RESERVOIR	
Reservoir Area	22,500 Acres
Gross Storage	1,405,084 AF
Dead Storage	699,872 AF
Live Storage	705,212 AF
Normal Reservoir Level	RL 188 ft.
IRRIGATION SYSTEM	
High Efficiency Irrigation System	Drip Irrigation
Command Area (CCA)	80,000 Acres
Design Discharge	630 Cusec
Cropping Intensity	105%
PC-I COST OF PROJECT	Rs. 16.832 Billion (Original) Rs. 26.463 Billion (Revised)
CONSTRUCTION PERIOD	3 YEARS

- Hindu Community raised objections due to submergence of their Holy Places. On the directives of Minister of Water & Power, WAPDA identified new site for construction of Hingol Dam across River Hingol at a distance of 18 Km from Coastal Highway.
- PC-I Proforma (New Site) amounting to Rs.26.463 billion considered by CDWP in its meeting held on 19th November, 2009 and cleared for approval of ECNEC.
- WAPDA appointed consultants for preparation of Project Planning Report and Tender Documents based on Detailed Engineering Design of the project for new identified site.
- Project Planning Report prepared by consultants. Additional investigations at newly identified site are in process.
- Abu Dhabi Fund has shown interest to finance the Project. Terms and conditions to be finalized.
- Government of Balochistan agrees participation of Abu Dhabi Fund for Corporate Farming.
- Geo-technical investigations, topographic survey, test trail pits, adits & geological mapping for the new dam site are in progress since March, 2012. Due to extrusive mud deposits on right abutment as determined from test bores, the consultants have shifted the axis of dam upward on the right abutment. In order to ascertain the feasibility of new dam axis, this scope of investigation has been widened to include Electric Resistivity survey, very low frequency- electromagnetic (VLF-EM), seismic survey reflection survey and vertical Electrical soundings.

- Funds amounting to Rs.50 million have been allocated in PSDP 2012-13 against the demand of Rs.1,000 million.

Pelar Dam

Location
Pelar Dam is located across Nal River about 160 Km from District Awaran of Balochistan.

Objectives
- Storage of flood water.
- Hydropower generation.
- Development of irrigation system.
- Socio-economic uplift of remote areas of Balochistan.
- Women emancipation.

Status
- PC-I for an amount of Rs.1.692 billion approved by ECNEC on 3rd September, 2009.
- Revised PC-I amounting to Rs.10.070 billion is under preparation.
- Tenders for construction of Pelar Dam on EPC basis invited on Sep. 30, Nov. 12 2009, March 17, October 27 and December 29, 2010. No bid received.
- WAPDA proposed the project through local district contractors by subletting the various components to increase participation of the local community, local monetary benefits.
- Government of Balochistan suggested transferring the project to I&P Department, Government of Balochistan for execution.

SALIENT FEATURES

DAM	
Dam Type	Concrete Gravity
Catchment Area	3,002 Sq. Mile
Height of Dam	60.14 ft.
Life of Dam	50 Years
Power Generation	300 KW
Spillway Capacity	253,547 Cusec
RESERVOIR	
Gross Storage	99,175 AF
Dead Storage	52,186 AF
Live Storage	46,989 AF
Normal Reservoir Level	RL 5294.88 ft.
IRRIGATION SYSTEM	
High Efficiency Irrigation System	Drip and Sprinkler
Command Area (CCA)	28,400 Acres

Winder Dam Project

Location
Winder Dam Project is proposed across Winder River about 100 Km from Karachi and about 66 Km of Uthal, District Lasbela of Balochistan Province.

Objectives
- Irrigated agricultural development.
- Hydropower generation.
- Socio-economic uplift of remote areas of Balochistan.
- Women emancipation by allotment of Government Land to landless women of the area.

Status
- Government of Pakistan assigned task for construction of Small/Medium Dams in four provinces including Winder Dam Project in 2009.
- PC-I amounting to Rs.1.696 billion approved by ECNEC in its meeting held on 2nd September, 2009.
- Revised PC-I amounting Rs.12.712 billion submitted to CDWP.
- Based on ICB process, the letter of Acceptance was issued to M/s Techno Engineering RSWI JV at a cost of Rs.7.735 billion on 15th February, 2010.

SALIENT FEATURES

Dam	
Dam Type	Earth Core Rock Fill Dam
Catchments Area	355 Sq. Miles
Height of Dam	102 ft.
Life of Dam	32 Years
Power Generation	300 KW
Spillway Capacity	152,000 Cusecs
Reservoir	
Gross Storage	36,484 AF
Dead Storage	316 AF
Live Storage	36,167 AF
Normal Reservoir Level	RL 354 ft.
Irrigation System	
High Efficiency Irrigation System	Drip/Sprinkler Irrigation
Command Area (CCA)	20,000 Acres
Design Discharge	50 Cusec
Cropping Intensity	113%
Approved PC-I Cost	Rs.12.712 Billion
Construction Period	3 Years

- The Authority in its meeting held on 11th July, 2012 accorded approval to cancel the Letter of Acceptance (LOA) issued to M/s Techno-Engineering-RSWI JV for construction of Winder Dam Project along with tendering process and to undertake detail Engineering design & tender on BOQ basis subject to the availability of funds.
- WAPDA assigned the job to establish a model farm for introduction of High Efficiency Irrigation System (HEIS) i.e. Drip Irrigation System to China Institute of Water Resources and Hydropower Research (IWHR).
- Revised PC-I was discussed in CDWP meeting held on 21st March, 2012. It was decided:-
  a. WAPDA will re-submit revised PC-I after detailed Engineering design.
  b. Implementation of scheme by the provincial government of Balochistan may be examined and this local issue may be resolved at gross root level.
- Chief Secretary, government of Balochistan accorded formal concurrence of government of Balochistan to implement Winder Dam Project through WAPDA.
- Authority has accorded the permission for re-tendering on EPC basis.

Nai Gaj Dam Project

Introduction

The proposed Nai Gaj Dam Project is under construction in Sindh Province. Nai Gaj is a hill torrent, which originates in the Balochistan, and enters in Kirthar Range of Sindh. However, Nai Gaj flows in the plains of Sindh for about 65 Km North West of Dadu City. Nai Gaj Dam site is situated at Latitude 26°52' N & Longitude 67°19' E.

The Nai Gaj Dam is a fast track project and will afford the benefits in the following areas:-

- Flood mitigation.
- Command Area development through high efficiency irrigation system.
- Increase in agriculture area.
- Assured water supplies to lower riparian.
- Assured water supplies for Manchar Lake.
- Power generation.
- Fisheries development.
- Employment generation.
- Socio-economic uplift inspiring emancipation of the women and the poor of the area.

Status

Original PC-I of Nai Gaj Dam amounting to Rs. 16.924 billion was approved by ECNEC in 2009. Bids for construction of Dam were opened on 16th July, 2010. Letter of Acceptance (LOA) issued to M/s NEIE-SMADB-LILLEY-RMS (JV) on 13th January, 2011. Contract Agreement was signed on 12th April, 2011. The work on the Nai Gaj Dam Project commenced on 25th April 2012, by the contractor M/s NEIE-SMADB-LILLY-RMS JV being lowest bidder amounting to Rs.38.792 billion, accordingly contractor was mobilized at site and Excavation of Main Dam, Spillway, Dykes and Irrigation System is in full swing. M/s Techno-Consult International (as lead firm) with M/s HPE, have been engaged as Consultants in September, 2012 for the construction supervision of Nai Gaj Dam project. The project is expected to be completed by April, 2015.

Revised PC-I amounting to Rs.26.236 billion has been approved by ECNEC on 16th August, 2012 deleting some item from original scope of work, subject to the condition that the Federal Government and the Government of Sindh would share the cost of Rs.24.337 billion and Rs 1.899 billion, respectively.

Physical Progress

Overall physical progress of the Project is 15.8%.

Component wise Progress:-

- General Items 34%
- Main Dam 3.63%
- Spillway 17.4%
- Dykes 0.5%
- Irrigation System 15.8%
- Geotechnical 1.65%

Financial Status

Revised PC-I to the extent of Rs.26.236 billion has been approved by ECNEC on 16thAugust, 2012 against which an expenditure of Rs.1957 million has been incurred up to March, 2013.

Original PSDP allocation for the year 2012-13 is Rs.2000 million, against which an expenditure of Rs.1957 million has been incurred up to March, 2013.

SALIENT FEATURES

COMPONENTS	DESCRIPTION	REMARKS
A) General		
Location	65 Km NW of Dadu	
River	Nai Gaj	
Purpose	Irrigation	
B) Reservoir	(with 100 Year Reservoir Life)	
Catchment	7019 KM	
Designed Flood	21106 Cumec	
Reservoir Area	2023 Ha (5000Acres)	
Storage	0.3MAF (Gross) & 0.16MAF (Live)	
C) Dam		
Type	Central Core Earth Fill Dam	
Height of Dam	59 Meter	
Length of Dam	1137 Meter	
Free Board	2.3 Meter	
Maximum Storage	177.5 Meter AMSL	
Dead Storage	148 Meter AMSL	
River Bed level	125 Meter AMSL	
Slope	2.5H : 1.0V (Up-stream) & 2.5H : 1.0V (Down-stream)	
D) Earthen Dykes		
09 Nos.	2 on Left Abutment & 7 on right Abutment	
Height	6 to 23 Meter	
E) Spillway		
Type	Orifice gatted	
Crest Elevation	166.1 Meter AMSL	
Gates	15 Nos. 13.4 Meter	
Width	241 Meter	
Discharge Capacity	19091 Cumec (674200 Cusec)	
F) Irrigation System		
Gross Command Area	22962 Hacter	
Cultivable	11655 Hacter	
Cropping Intensity	200%	
i) Main Canal		
Design Discharge	9.77 Cumec (345 Cusec)	
ii) Canal Length		
Main Canal	6.56 Km (4.07 Miles)	
Distributaries (Two)	23.1Km (14.35 Miles)	
Minors (Three)	30.552 Km (18.98 Miles)	
G) Power House		
Rated Head	42 M	
Maximum total output	4.2 MW	
Annual Energy Generation	17.67 Gwh	
H) Assured water supplies to Manchar Lake		
Gravity water main	52 Km of 0.7 to 1.0 m dia	
AC pipes	(50 Cusecs)	
I) RC Channel for Lower Riparian's & live stock	2-Nos.	
Periodic water releases in Nai Gaj		
J) Access Road		
Access road (Project Area)	3.11 Cumecs (110 Cusecs)	
Access road (project Colony)	11 Km	
K) Cost (Approved by ECNEC)		
Original PC-I Cost	Pak Rs.16.924 Billion (2009)	
Revised PC-I Cost	Pak Rs.26.236 Billion (2012)	

Gomal Zam Dam

Overall financial progress of the project up to 31st March, 2013 is 5.02%.

Land Acquisition

Land acquisition process is underway for the smooth construction work and compensates the landowners for the likely loss of property etc.

Issues

- Revision of PC-1 to incorporate deleted items from original scope of works.
- Supplementary Agreement with M/s China Harbour Electric Corporation in place of M/s Northeast China International Electric Power Corporation (NEIE). Provision of funds from China Exim Bank amounting to US $ 400 million as soft loan.
- ECNEC to approve foreign exchange component (FEC) of the Project.
- Revision of PC-1 to incorporate deleted items from original scope of works.
- Timely release of funds.

WATER DIVISION (NORTH)

Under Vision 2025 Phase-I Programme of WAPDA, the following projects are being implemented on "Fast Track" basis. The status of these projects is:-

Gomal Zam Dam Project

Gomal Zam Dam is located at Khajuri Kach on Gomal River in South Waziristan Agency, which is situated west of the districts of Tank and D.I.Khan of the Khyber Pakhtunkhwa. Project site is accessible from Indus Highway via D.I. Khan – Tank Road. From Tank, the dam site is about 60 Km to the West and connected through a metalled road.

Background

The need for storing the flood water of Gomal River had been observed as early as 1880 at the time of first settlement of D.I. Khan by the British Administration. After independence these studies continued and in 1957 a scheme known as "Gulbagh Dam Project" was approved by the Government and preliminary works were undertaken by the Provincial Irrigation Department which continued up to October, 1959.

On taking over the charge by WAPDA in 1959, the project was re-examined and a new proposal was

prepared by changing the site to Khajuri Kach, 30 Miles down-stream, thereby tapping the biggest tributaries Zhob River and Wana Toi. Further studies were conducted by WAPDA during the period 1960-90 through firstly by M/s Energoprojeckt (Yugoslavia) in 1963, then by M/s Coyne et Bellier, (France) during 1983-90. PC-I prepared by WAPDA in 1993 included irrigation works and a tunnel intake in view of Stage II – Hydropower. However by another updated feasibility study conducted within the framework of a contract signed between the Government of Khyber Pakhtunkhwa and M/s Coyne et Bellier for the additional studies. Consultants submitted feasibility report in 1995. PC-I, prepared on the basis of this report, was approved by ECNEC on 31st August, 2001.

Benefits

- Direct and Indirect Benefits

Benefits likely to accrue from construction of the dam at Gomal River are both tangible and intangible. Tangible benefits include increased agricultural production under perennial irrigation and hydropower generation while intangible benefits include increase in employment opportunities, increased economic activity in agriculture as well as trade & commerce, rise in income levels resulting in better standard of living etc.

- Irrigation Benefits

At present, Rod Kohi Irrigation is being practiced in the irrigation command area of the Project. The Project would provide a dependable source of water for irrigation. Overall annual cropping intensity will increase from the present 15.8% to 86.5%.

- Non-Agricultural Benefits

Other benefits include:- employment opportunities during construction and in the industry and commerce:- improved standards of living; security to farmers as a result of reliable water supply both for irrigation and domestic use, balanced diet through production of fruits, vegetables and other proteins foods; installation of agro-industries due to extension of electricity; improvement in regional environment due to increased income of people; and initiation of commercial fishing.

- Hydropower Benefits

Cheaper power as compared to thermal power would be provided. A hydropower station at dam site would generate 17.4 MW.

Socio-Environmental Implications

- Resettlement

No resettlement problem is involved in reservoir area. A nominal effect to the built-up property/houses in ROW of main canal and distributaries is involved.

- Socio-Economic Impact

The most important effect will be saving of flood losses in form of land, houses, livestock, infrastructure, roads, communication and human lives as well.

Contracts

- The main EPC turnkey contract was awarded to a joint Venture of China National Water Resources and Hydropower Engineering Corporation-Harbin Power Engineering Company in association with the Designer M/s TIDI of China on 17th June, 2002. The works included design and construction of dam; spillway; hydropower station; transmission line to Tank grid station; concrete lined main canal and distributaries; surface drains; and flood protection works. This contract stood terminated on 14th April, 2006 and a new EPC contract was awarded to FWO on 9th March, 2007 for the said works (less transmission line).

- Other contracts include:-

  - Construction of a RCC Bridge at Gardavi on Gomal River awarded to M/s M. Khalil, D.I. Khan.
  - Rehabilitation/Improvement of 34 Km Access Road awarded to M/s Malik Qasim, D.I. Khan,
  - Supply and Erection of Steel Bridge to replace the existing Bailey Bridge at Adam Kok awarded to M/s Mabey & Johnson of UK.
  - Construction of Submersible Multicell Culvert at Neelikuch and Causeway cum Fall Structure on M.K Tanai Road awarded to Malik Muhammad Akber Khan, Wana, SWA.

- Construction of Barracks for Frontier Constabulary awarded to M/s Sawan Enterprises, D.I. Khan.
- Construction of piquets for security purpose awarded to M/s Sawan Enterprises, D.I. Khan.

SALIENT FEATURES

Hydrology		
River	Gomal	
Catchment	20196 Km^2 (11316 $Mile^2$) (At Khajuri Kach)	
Average Annual Flow	511 MCM	
Reservoir		
Gross Storage	1400 HM^3	(1.140 MAF)
Live Storage	1100 HM^3	(0.892 MAF)
Dead Storage	300 HM^3	(0.243 MAF)
Dead Storage level	711.00 Meter	(2333 ft.)
Conservation level (Stage I)	743.20 Meter	(2438 ft.)
Conservation level (Stage II)	750.40 Meter	(2462 ft.)
Dam and Spillway		
Location	Khajuri Kach	
Type	Roller Compacted Concrete (RCC) Gravity Dam	
Height	133 Meter	(437 ft.)
Length	231 Meter	(758 ft.)
Spillway discharge	4330 Cumecs	
Power House		
Installed Capacity	17.4 MW	
Irrigation System		
a. Command Area		
Perennial Water Rights	12,500 Ha.	(30,888 Acres)
Flood water Rights	53,500 Ha.	(132,198 Acres)
Total Irrigated Area	66,000 Ha.	(163,086 Acres)
b. Main Canal		
Length	60.5 Km	(37.8 Miles)
Capacity	24 Cumecs	(848 Cfs)
c. Distributaries		
Length	204 Km	(127.5 Miles)
d. Barrage		
Length	189 Meter	(620.0 ft.)
Capacity	4000 Cumecs	(141,200 Cfs)

Project Cost

The estimated total cost as per PC-1 (2001) is Rs.12829 million, which is being revised to cater for the prevailing conditions as the new estimated cost comes out Rs.22480 million i.e. equivalent to US $ 225 million.

Project Status

Contract No.GZD-01

This Contract was awarded to M/s CWHEC-HPE JV of P.R. China in June, 2002. After commencement on 15th July, 2002 the work continued till 9th October, 2004, the day on which two Chinese engineers and a local police guard were kidnapped by terrorists, after which they abandoned the work at site forthwith. Efforts were made through meetings and correspondence to persuade them to resume the work. However, on their failure to resume the work, their Contract was terminated by WAPDA effective 14th April, 2006. There was no progress of work during the year 2005-06 and 2006-07. M/s CWHEC-HPE JV had executed following works before termination of their Contract.

- The Contractor had substantially completed mobilization and had established main camp at dam site and other camps at Hathala and Barrage sites for works in the irrigation command area.
- Design documents relating to major components of works had been submitted by the contractor and reviewed by the management consultants. These documents were being finalized by the contractor.
- Concrete lined diversion tunnel had been completed. Work on both abutments excavation was underway. Total achievement on dam and spillway component was about 8.2%.
  - In the command area work on concrete lined main canal was in progress. Total achievedment on this compnent was about 4.6%.
  - Foundations for transmission line were under construction and fabrication & erection of towers was in progress. Total achievement on hydropower component was about 9.5%.

Contract No. GZD-02

For re-start of works, in the meeting of ECC of the Cabinet held on 14th April, 2006 it was decided to award the contract to FWO on negotiated rates for

completion of the Project on EPC/turnkey basis. WAPDA accordingly asked FWO to submit their proposal. After reviewing proposal submitted by the FWO in August, 2006, WAPDA awarded the Contract to FWO on 9th March, 2007 to complete the works within 3 years & 4 months with effect from the commencement date notified as 11th June, 2007.

Updated Physical Status of the Project

FWO contractor sub-letted Dam and Hydropower Component to M/s Sinohydro Corporation of China while Irrigation and Flood Protection Component to M/s TEKSER of Turkey. The works were scheduled to be completed within a period of 3 years and 120 days to be reckoned from 11th June, 2007 the notified commencement date with date of completion as 8th October, 2010.

Unfortunately the project suffered delay mainly due to paucity of funds and also on account of other reasons such as precarious Law & Order situation in the project area and the extra-ordinary wet season of monsoon July/August also affected the progress adversely. However, hectic efforts were made for funds and after negotiation of about 06 months, finally USAID agreed to grant US $ 40 million for Dam & Hydropower Component. In this context, agreement was signed in January, 2011 and till July, 2012, US $ 43.009 million have been released in instalments as per payment schedule.

Similar efforts have been made for USAID funding for completion of Irrigation and Flood Protection Component. After lengthy negotiation, USAID agreed to grant US$ 40 million for completion of this component as well. In this context, the previous agreement which was signed in January, 2011 had been revised for amount of US $ 85 million and till July, 2012, US $ 30.5 million have been released for Irrigation and Flood Protection Embankment in instalments as per payment schedule. New date of completion of Irrigation & Flood Protection Embankment as well as the Project is December, 2013.

Moreover, USAID has also been agreed to finance the construction of Waran Canal System and Minors. In this regard an Activity Agreement for US $ 12 million has been approved by USAID Pakistan on 30th July, 2012 and further WAPDA has requested for enhancement of this grant up to US $ 30.5 million because of high bid price.

Components-wsie progress achieved so far ending June, 2013 is as under:-

Dam & Spillway	99.39% against the target of 100%
Hydropower component	94.28% against the target of 100%
Irrigation and Flood component	77.08% against the target of 100%
Overall Progress of the Project	90.75% against the target of 100%

Financial Progress

Financial progress (Project) up to ending June, 2013	=	124.16% of the approved PC-I cost i.e. Rs.12,829 Million

Other Contracts

The works awarded to other contractors for construction of RCC Bridge at Gardavi; Rehabilitation/ Improvement of 34 Km Access Road; Supply and Erection of Steel Bridge at Adam Kok; Construction of Submersible Multicell Culvert and Causeway cum Fall Structure on M.K Tanai Road; and Construction of Barracks/Piquets for Security purpose stand completed.

Golen Gol Hydropower Project

Background

Golen Gol Hydropower Project, a run-off river high-head scheme, was initially conceived to generate about 31 MW power in two phases, by diverting the flow of the Golen Gol River, a major tributary of the Mastuj River, into a power tunnel and finally releasing it into the Mastuj River. The idea was to take care of the energy needs of the Chitral district as an isolated scheme. However, the connection of the Chitral district to the National Grid makes the project viable for development to its full potential. A number of alternatives were studied and it was finally decided to design the scheme for the generation of about

106 MW (installed capacity) with an average annual energy output of slightly over 400 GWh.

Project Area, Location and Access

Golen Gol Hydropower Project is located in the Chitral district. Chitral is the capital of the Northern most district of KPK. Chitral district lies from 35^{o}-15' to 36^{o}-55' North latitudes and 71^{o}-12' to 73^{o}-55' East longitudes. The district is surrounded by Afghanistan in the North and West, Gilgit district in the East and Dir and Swat districts in the South. The total area of the district is 14,850 km^{2}. The project will be located on the left bank of the Golen Gol. The intake weir will be about 1 Km upstream of Babuka Village. From the intake there will be a headrace channel leading to the tunnel, which will discharge the flow into the surge chamber and a combination of vertical and horizontal pressure shafts from where water flows to the surface power house which is located on the left bank of Mastuj River, just downstream from the confluence of the Golen Gol and Mastuj River. From the powerhouse to Chitral the distance, on a metalled road, is 25 Km.

Chitral Town is accessible by road from Peshawar and by plane from both Peshawar and Islamabad. Traffic on the road, however, is suspended at the Lowari Pass (3200 masl) due to snow in the winter (normally November to May).

The distance by road from Islamabad via Peshawar to Chitral is 365 Km.

Feasibility Study

- Feasibility study was completed by HEPO and GTZ in, 1997 and updated in, 2005.
- PC-I was approved by ECNEC on 2nd September, 2002 for Rs.7035.128 million(US $ 117 Million) with FEC of 2638.12 million (US $ 44 Million) for the following work/contract:-

Present Status

Lot-1

The O&M staff colony for Golen Gol Hydropower Project consists of residential and non-residential buildings i.e. residential flats, houses, dispensary, primary school and shops etc.

For the construction of the O&M staff colony 119 Kanals of land was required. The colony was intended to be constructed into two phases. Construction of Phase-I has been substantially completed, it comprises residential flats (20 nos. Cat-IV & 20 nos. Cat-V), residential houses (12 nos. Cat-III & 4 nos. Cat-II), XEN office, shops, rest house, mosque, dispensary, primary school, external water supply system and security guard room.

Details of Lots Comprising the Project

Lot - 1	O&M Staff Colony
Lot - 2	Construction of Diversion Weir, Intake, Gravel Trap, Sand Trap, Headrace Tunnel, Pressure Shaft, Pressure Tunnel & Roads
Lot - 3.1	Construction of Civil Works for Power House, Tailrace and Switchyard
Lot - 3.2	Procurement/Design, Supply, Installation, Testing and Commissioning of E&M Equipment for Power House and Switchyard
Lot - 4	Procurement/Design, Supply, Installation, Testing and Commissioning of Transmission Line Equipment

Present Status of Different Lots

Contractor	Lots	Work	Present Status
M/s Qazaffi	1 - B	Water Supply , Sewerage, Primary School, Mosque, Dispensary, Shops, Access Roads, Security Guard Room	Substantially Completed
M/s Malik Behramand	I - C	Cat-IV Flats (20 Nos.)	Substantially Completed
M/s Ihsanullah	I - D	Cat-V Flats (20 Nos.)	Substantially Completed
M/s Shuaib	I - E	Cat-III Flats (20 Nos.)	Substantially Completed
M/s Rehman	I - F	Cat-II Flats (04 Nos.), Rest House, XEN Office	Substantially Completed
M/s Shuaib	I - H	Overhead Tank	Substantially Completed
M/s Shuaib	I - J	External water supply system	Substantially Completed

Present status Lot-2

Item	Total Quantity	Completed	% age completed	Remarks
a. Tunnel Excavation				
1. At to PT	87.5 m	5-87.5 m	100%	All requirement has been finalized
2. Aeration tunnel	67 m	67 m	100%	Excavation completed
3. Pressure tunnel	555 m	555 m	100%	Unforeseen hazards to be handled
4. Head Race tunnel	3808 m	2475 m	65%	Seemingly hard stable rock good progress expected after completion of other small tunnel
5. At to HRT	179 m	179 m	100%	Excavation completed
6. Present shaft	396	199	50.25%	
b. Weir				Increase in progress is expected
1. Access road to weir	5.725 Km	5.725 Km	80%	Road way has been made topping
2. Access road to surge chamber	3.7 Km	3.7 Km	80%	remain

i. Batching plat at access road to weir RD2+000: Functional
ii. Crushing plant Functional
iii. Batching plant at weir site: Functional
Lot-2 Overall progress till July, 2013 = 35%

Lot-3.1 Construction of Civil Works for Power House Tailrace and Switchyard

Item	Total Quantity	Completed	% age completed	Remarks
Power House		Excavation 100%	Excavation 100%	1st 2nd 3rd and 4th bench have been completed
Tailrace				Is in progress
Switch Yard				Due to design requirements new switchyard area has been selected

Lot - 3.1 Overall Progress till July 2013 is 20.66%
Lot - 3.2 After the Authority decision the tenders for Lot - 3.2 will be opened on 5th August, 2013 at 11.00 a.m. in WAPDA Auditorium, WAPDA House, Lahore.

Lot-4 The tenders of Lot-4 have been re-floated.

WATER (NORTHERN AREAS)

Satpara Dam Project

Satpara Dam Project is being executed on Satpara Nullah down-stream of Satpara Lake. The main objectives of the Project are:-

- Irrigated agriculture development
- Assured drinking water supply
- Hydroelectric power generation

Main Components

Main Dam, Spillway, Outlet Structure, Powerhouses and Canal Irrigation System are the main components of the Project.

PC-I of the Project was approved by ECNEC on 2nd September, 2002 at a total cost of Rs. 2090.431 million. 1st Revised PC-I was considered/approved by ECNEC on 3rd September, 2009 at a total cost of Rs. 4480.021 million. 2nd Revised PC-I was submitted to Planning Commission on 10th December, 2012 at a total of Rs.5524.303 million. Satpara Dam Consultants (a consortium of six consultancy firms) were fielded to review design / supervise the construction works in the capacity as "the Engineer." The construction work commenced in April, 2003 and first Powerhouse # 1 having total capacity of 4.86 MW was commissioned in October 2007 and inaugurated by the President of Pakistan on 24th October, 2007. Powerhouse # 2 having total capacity of 8.76 MW was commissioned in December 2008. The two additional Powerhouses # 3 & 4 have been substantially completed. Up-to-date power generation from both the Powerhouses is more than 149 million units. Maximum impounding of Dam to a level of 8716 ft. has been affected (84% of design capacity). The Project will irrigate around 15,000 Acres of land and generate about 17 MW of power with two additional Powerhouses # 3 & 4. The shortage of funds with WAPDA affecting the completion of Project has been taken care of through

grant by USAID worth US $ 26 million. The dam stands completed.

The Project construction has been executed under following Contract Lots:-

Lot-1A: (Civil and Hydraulic Steel Works)
The Contract was awarded to M/s DESCON Engineering Ltd. and J&P Joint Venture on 14th April, 2003. Progress of works is 100%.

PH # 3 & 4

- Civil Works: Supplementary Agreement # 1 for construction of PH # 3 & 4 amounting to Rs. 441.549 million was signed on 25th April, 2011 with M/s DESCON. Construction activities were started from 1st May, 2011 and progress of works is 100%.
- E&M Works: Contract was awarded to M/s Andritz Technologies Limited, China at total cost of US $ 5.942 million and Rs. 5.443 million and contract agreement signed on 9th June, 2011. Order to commence the works was issued on 10th June, 2011. Progress of works is 99.5%. Power house # 3 & 4 were completed substantially in April, 2013 and June, 2013 respectively.

Lot-1B: (PH # 1&2 - Electrical & Mechanical Works)
The Contract awarded to M/s CMIC, China and Letter of Commencement was issued on 5th November, 2003. The Powerhouse # 1 & 2 were commissioned in October, 2007 - December, 2008 respectively. 149 million units have been generated upto 30 June, 2013.

Lot-2: (Irrigation System)
The Contract has been awarded to M/s CCPG, China and Letter of Commencement was issued on 23rd November, 2004. Progress of works is 100%.

Lot-3: (Construction of Operator's Quarters) – Completed.

Lot-4: (Shatung Nullah Diversion)
Deferred by the Authority on environmental and technical grounds.

Allai Khwar Hydropower Project

The Project is being implemented on Allai Khwar (Allai Nullah) a Left Bank Tributary of Indus River near Besham Town in District Battgram of Khyber Pakhtunkhwa Province. It is 265 Km from Islamabad and 365 Km from Peshawar on famous Silk Route called Karakuram Highway.

The project stands substantially completed. The Powerhouse generates 121 MW hydel power by drawing 21 Cumecs water through 2366 Meter long Pressure Tunnel and utilizing maximum of 687 Meter head. PC-I of the Project was approved by ECNEC on 2nd September, 2002 with a total cost of Rs. 8577.824 million that includes Rs.3453.540 million as foreign exchange component. 1st Revised PC-I was considered/approved by ECNEC on 29th July, 2011 for a total cost of Rs.13834.948 million that includes Rs.6522.261 million as foreign exchange component. 2nd Revised PC-I was submitted to Ministry of Water & Power on 19th February, 2013 for a total cost of Rs.16221.844 million that includes Rs.8889.192 million as foreign exchange component. IDB provided a loan of US $ 38.435 million.

Contract for Civil and Hydraulic Steel (C&HS) works was awarded in June, 2003 to M/s Dongfang Electric Corporation (DEC) at a Contract Price of Rs.2163.5 million. Contract for Electrical and Mechanical (E&M) works was awarded to M/s VA Tech at a contract price of US $ 25.1 million.

Progress of civil works was affected by July, 2010 floods and up-to-date progress of civil works is 99.8% while that of E&M works is 99.9%. Commercial operation of the Powerhouse commenced on 25th March, 2013 with up-to-date generation as 224 million units. The Project was inaugurated formally by the President of Pakistan on 4th March, 2013.

Khan Khwar Hydropower Project

The Project has been implemented on Khan Khwar (Khan Nullah) a Right Bank Tributary of Indus River near Besham Town in District Shangla of Khyber Pakhtunkhwa Province. It is 265 Km from Islamabad and 350 Km from Peshawar on famous Silk Route called Karakuram Highway.

The Project has been completed. The Powerhouse

generates 72 MW of hydel power by drawing 35 cumecs water through 4517 Meter long tunnel and utilizing maximum of 257 Meter head. PC-I of the Project was approved by ECNEC on 2nd September, 2002 with a total cost of Rs. 5362.705 million that includes Rs. 2644.098 million as foreign exchange component. 1st Revised PC-I was considered/ approved by ECNEC on 20th August, 2009 for a total cost of Rs. 8301.479 million that includes Rs. 3727.791 million as foreign exchange component. 2nd Revised PC-I was considered/cleared by CDWP on 18th June, 2012 for a total cost of Rs. 10732.788 million that includes Rs. 5049.633 million as foreign exchange component. IDP provided a loan of US $ 30.805 million.

Contract for Civil and Hydraulic Steel (C&HS) works was awarded in June, 2003 to M/s China National Water Resources and Hydropower Engineering Corporation (CWH-HE JV) at a contract price of Rs.1816.3 million while contract for electrical and mechanical (E&M) works was awarded to M/s Dongfang Electric Corporation (DEC), at a contract price of US $ 12.2 million.

Progress of Civil and E&M works is 100%. Commercial operation of the Powerhouse commenced on 8th November, 2010. The Powerhouse has generated 592 million units upto 30th June, 2013. The Project was formally inaugurated by the Prime Minister of Pakistan on 14th July, 2012.

Duber Khwar Hydropower Project

The Project is being implemented on Duber Khwar (Duber Nullah) a Right Bank Tributary of Indus River near Pattan Town in District Kohistan of Khyber Pakhtunkhwa Province. It is 300 Km from Islamabad and 400 Km from Peshawar on famous Silk Route called Karakoram Highway.

It will generate 130 MW of hydel power by drawing 29 cumecs water through 4873 Meter Long Tunnel and by utilizing maximum of 540 Meter head. PC-I of the Project was approved by ECNEC on 2nd September, 2002 with a total cost of Rs. 9754.260 million, which includes Rs. 4147.510 million as foreign exchange component. Revised PC-I was considered /approved by ECNEC on 20th August, 2009 for a total cost of Rs. 16324.476 million that includes Rs. 8255.821 million as foreign exchange component. 2nd Revissd PC-I was submitted to Planning Commission on 19th March, 2013 for a total cost of Rs. 20823.721 million that includes Rs. 9739.475 million as foreign exchange component. IDB provided a loan of US $ 80.960 million.

Contract for civil and hydraulic steel (C&HS) works was awarded to M/s China National Water Resources and Hydropower Engineering Corporation (CWH-HE JV) at a Contract Price of Rs. 2744.5 million while contract for electrical and mechanical (E&M) works was awarded to M/s VA Tech at a contract price of US $ 22.9 million.

High Head Consultants (a consortium of nine consultancy firms) reviewed the design prepared by the Contractor and supervised the construction works in the capacity as "the Engineer."

The Project was worst affected by July 2010 floods and up-to-date progress of civil works is 97% and that of E&M works is 93% and is likely to be commissioned by August, 2013 on availability of 132 KV Transmission Line Pattan-Besham.

Supply and Construction of 132 & 220 KV Transmission Lines for Power Dispersal of 3-High Head Hydropower Projects (i. Duber Khwar, ii. Khan Khwar & iii. Allai Khwar) on Indus river under Contract # HIC-1

These transmission lines Project is planned for evacuation of power from 3-High Head Hydropower Stations. The entire transmission project is being implemented by NTDC in three lots as under:-

Lot-I

132 KV Duber Khwar, Khan Khwar and Allai Khwar, D/C, Twin Bundle Rail Conductor, Transmission Line

These transmission lines (50.5 Km) will interconnect all the three power plants at Allai Khwar Switchyard from where onward; the power will be transmitted to National Grid at 220 KV ISPR Grid Islamabad.

The contract for construction of the above transmission lines was awarded to M/s NEIE, China

for Rs. 1008 million on 29th March, 2005. The segment Duber-Besham remains incomplete whereas other segments are in operation. Overall progress of work is 98.44%

Lot-II

Allai Khwar – Mansehra New, D/C, Twin Bundle Rail Conductor, 220 KV Transmission Line of about 82.3 Km

The contract for construction of this line was signed with M/s NEIE, China on 29th March, 2005 for Rs.1184 million. The work is substantially completed and in operation.

Lot-III

220 KV Mansehra New – Islamabad Peshawar Road (ISPR) Grid Station, D/C, Twin Bundle with Rail Conductor, Transmission Line (about 100 Km)

The contract was awarded to M/s ICC Lahore on 19th March, 2005 for Rs. 1256 million. The work is substantially completed and in operation.

Total cost of Contract No. HIC-1 (Lot-I, II & III) has been revised to Rs. 5867 million from contract agreement cost of Rs. 3448 million.

Hydro Projects under implementation

Name of Project	Capacity (MW)	Year of Commissioning
Duber Khwar HPP	130	2013

Hub Dam Project

General

The preliminary works of Hub Dam, built across the Hub River, were commenced in September 1963. The Project completed in June, 1981 with Capital Cost of Rs. 843.597 million (excluding interest charges), was meant to construct a storage reservoir for regulating the flows of Hub River for the purpose of municipal, industrial water supply and irrigation releases to Karachi in Sindh and Lasbela District in Balochistan. The Hub Dam is an inter-provincial Project as the beneficiaries are located in the two Provinces, Sindh and Balochistan.

The total live storage of the reservoir 656,000 AF is about 2 times planned annual withdrawal of 216,406 AF, considering Reservoir Losses (Evaporation/ Seepage, 35% on average). Normally, the filling of reservoir takes place during monsoon season, in the months of July and August. The Project is designed to supply 100 MGD (Million Gallons Per Day) of water to Karachi (Sindh) for municipal and industrial purposes, and 15 MGD to the Balochistan industries besides irrigation of 21,000 Acres (C.C.A.), i.e. 44 MGD, in Balochistan and 1000 Acres ,i.e. 2 MGD in Sindh. Thus, the reservoir release of 216,406 AF is shared by Sindh 63.3% and by Balochistan 36.7%. This supply is ensured for a period of 75 years.

The Hub Dam Canal System

The Hub Dam Canal System consists of Main Canal, Karachi Water Supply Canal, Lasbela Canal, and a Bund Murad Minor. The Main Canal, having design discharge capacity of 370 cfs, off-takes from Hub Dam and bifurcates into two branches after flowing about 5.2 Miles (8.32 Km) at Head Regulator. At Head Regulator, the water supplies to Sindh and Balochistan are controlled by manually operated vertical gates. Whereas, supply to Bund Murad Minor is controlled through Lasbela Canal about one kilometer from Head Regulator.

At Head Regulator one branch is known as Karachi Water Supply Canal with design discharge capacity of 210 cfs. This is a very sensitive canal as it supplies 20 to 25 % of the Municipal and Industrial waters to Karachi. It is a 14 Miles (22.4 Km) long open channel, which terminates at Karachi Water & Sewerage Board (KW&SB) Pumping Station near Manghopir, Karachi. It is lined with concrete tiles and crosses a number of natural drainage channels that necessitated construction of aqueducts and drainage crossings, beside a road bridge and 3 village road bridges. There are also two fall structures at this canal. The un-interrupted water is supplied through this canal at allocated rate of 100 MGD (million gallons per day).

The second branch is called Lasbela Canal (21 Miles or 33.6 Km long) with a design discharge capacity of 160 cfs supplies water for irrigation of 21,000 Acres of land and 15 MGD water for industries in Lasbela District, Balochistan. Hence a total of 59 MGD water is supplied for municipal, industrial, and irrigation purposes to Lasbela District as per their allocation. The Lasbela Canal is lined canal and crosses a number of drainage channels necessitated constructions of aqueducts, siphons and drainage crossings. The total number of structures on this canal is 58. This distribution system of Lasbela Branch comprises 8 minors for irrigation purposes besides outlets for industrial water supply.

The Bund Murad Minor (handed over to government of Sindh on 01.01.86) also off-takes from Lasbela Canal to supply irrigation water on replacement basis, to 1000 Acres of those agricultural farms which were under existence prior to the construction of Hub Dam Project.

O & M of the Project

WAPDA built the Project from the Federal Government finances and is also maintaining it from the interest free loan from Federal Government. The Planning Division, Government of Pakistan constituted "Cost Apportionment Committee" to resolve the issue of project's O&M funding. It was decided that Capital as well as O&M cost would be shared by beneficiaries in proportion of benefits i.e. 63.3% for Sindh and 36.7% for Balochistan on the basis of an agreed formula evolved during various policy meetings held from 1972 to onwards.

Hub Dam Lake

Conclusions & Achievements

Recoveries from the Beneficiaries

As per decision of ECNEC, the water releases are made un-interruptedly and round the year as per allocated quota to respective beneficiaries' i.e government of Sindh & government of Balochistan at 63.3% & 36.7% respectively.

Since 1972 high-level meetings were held to decide the apportionment of cost of Hub Dam. It was decided that the apportionment should be shared in the agreed percentage of 63.3 for Sindh and 36.7 for Balochistan. The matter has not yet been finally implemented. As a result, beneficiaries are not contributing their due share for financing the O & M activities.

To meet the basic requirement of O & M, Government of Pakistan is providing interest free loan, which is totally insufficient in comparison to actual budgetary requirement. As a stopgap arrangement WAPDA is also contributing meager essential amount through Bridge Financing.

Due to inadequate funding there is a big inventory of deferred maintenance works that were recommended for immediate execution during various periodic and annual inspections by the team of experts.

Current Status of O&M Cost Share of Govt. of Sindh

Due to continuous efforts of this office, government of Sindh agreed to pay Rs. 2.00 million per month to this project as O&M cost w.e.f 1st July, 2008 in the meeting held on September, 2008 & February, 2012 at P&D department government of Sindh chaired by ACS (Dev), but so far they have only contributed Rs. 32.00 million in against payable amount of Rs. 118.00 million. Whereas Rs. 365.809 is total liability of government of Sindh which is payable to this project

Current Status of O&M Cost Share of Govt. of Balochistan

Since continuous efforts and meetings with the representatives of government of Balochistan, they are kind enough to pay their major share of Rs. 157.913 million as O&M cost in account of Hub Dam Project, WAPDA Karachi. However, the remaining due amount of Rs. 86.611 million payable by government of Balochistan

Annual Inspection

The annual inspection of Hub Dam was carried-out

by experts of DSO, Lahore in follow- up of the 4th periodic inspection from 20th to 24th December, 2010 and report was submitted by them with principal findings and recommended works for the safety of dam & its components

Security & Surveillance

Keeping in view the present law & order situation, the security and surveillance of the dam area is being carried out vigilantly round the clock throughout the year.

SALIENT FEATURES

General Purpose	Storage of Hub River Flows for Regulated Releases of Municipal, Industrial and Irrigation Uses	
Location	45 Km North-East of Karachi City	
Area		
a) Catchment	3,410 Square Miles	
b) Reservoir	29.06 Square Miles (at EL. 339)	
Life of Dam	75 years	
Type of Dam	Earthen Dam	
Main Dam		
Max. Height of Dam	154	
Length of Dam	15,640	
Crest Road Level	352	
Maximum Base Width	965 - 8	
Saddle Dam		
Max. Height of Dam	66	
Crest Length	5,762	
Max. Base Width	340	
Spillway		
Type	Ungated uncontrolled Concrete Ogee	
Crest Length	6,020	
Crest Elevation	339.3	
Max. Outflow Capacity	458,000 cfs	
Flood		
a) Maximum Anticipated	480,000 cfs	
b) Maximum Recorded	521,000 cfs	
Reservoir		
Full reservoir Level	339.0	
Maximum Reservoir Level	346	
Dead Storage Level	276.25	
Gross Reservoir Capacity	6, 87,276 AF	(R.L. 339.3)
Live Storage Capacity	6, 45,470 AF	(R.L. 339.0 to 276.25)
Dead Storage Capacity	41,806 AF	(below R.L. 276.25)
Total Annual Releases	216,406 AF	

Power Wing

Hydel Energy Generation

Ghazi Barotha Power House

Hydel Energy Generation

The total installed generating capacity of 16 WAPDA hydroelectric power stations is 6733 MW. These power stations produced 29,554 MKWh of the net electrical energy during the year 2012-13.

The station-wise performance is given as under:-

TARBELA

The annual generation parameters of the power stations having total installed capacity of 3478 MW (10 units of 175 MW and 4 units of 432 MW each) are as follows:-

Brief description of major works carried out during the year 2012-13

Installation & Commissioning of Digital Governor on Unit #9

The installation, testing and commissioning of new Digital Governor for unit #9 was completed during the year.

Annual Maintenance of Units

Annual maintenance of Unit # 2,8,9,10,11,12,13,14 along with associated equipment was carried out as per prescribed check sheets.

Ghazi Barotha

The annual generation parameters of the power stations having total installed capacity of 1450 MW (5 units of 290 MW each) are as follows:-

Net electrical output	14755.599 MKWh
Maximum monthly generation during August, 2012	2418.167 MKWh
Maximum daily generation on 18th September, 2012	87.235 MKWh
Maximum load attained on 18th September, 2012	3674 MW
Cumulative generation up to 30th June, 2013	412,061 MKWh

Net Electrical Output	7082.849 MKWh
Maximum monthly generation during October, 2012	775.161 MKWh
Maximum daily generation on 24th October, 2012	26.958 MKWh
Maximum load attained on 1st July, 2012	1,450 MW
Cumulative generation up to 30th June, 2013	66588.89 MKWh

Brief Description of major works carried out during the year 2012-13:-

Annual Maintenance of Units

Annual maintenance of Unit # 1,2,3,4 & 5 along with associated equipment were carried out as per prescribed check sheets.

500 KV/220 KV Switchyard

- Annual maintenance of 500 KV SF-6 circuit breaker of Bay # 4,5 & 6 was carried out as per prescribed sheet
- Annual maintenance of 220 KV circuit breakers along with associated disconnect switches was carried out.

Mangla Power Station

The annual generation parameters of the power Station having total installed capacity of 1000 MW (10 units of 100 MW each) are as follows:-

Major Works

Following works are in progress:-

- Installation of 132/220 KV SF-6 circuit breakers
- Installation and commissioning of new Bus Bar Protection Scheme

Annual Maintenance of Units

Annual maintenance of Unit# 1,2,3,4, 5 & 8 along with associated equipment was carried out as per prescribed check sheets.

Hydel Training Centre Mangla

Hydel Training Center Mangla is playing a pivotal role in capacity building of officers and officials of hydel organizations. It is the sole institution functioning at present to impart training to all the technical/non-technical employees of WAPDA Water and Power wing formations.

During the period under report, (10) senior engineers, (38) junior engineers and (148) officials have been imparted training. A reasonable number of 185 officials participated in Departmental Promotion Exams (DPE) conducted under control of this training centre. In addition to above, 91 students of various Engineering Universities have completed their internship from Hydel Training Centre Mangla.

Following courses were conducted for the employees of Hydel Organization:-

Refresher Course (pre-promotion) for Sr. Engineers (RC), Sector Specific Course (Pre-promotion) for Jr. Engineers (SSC), Jr. Engineer Induction course (JIC), Upper Technical Subordinate Staff (UTS), Internship Training Course of student engineers, Advance Operators Training Course (AOC), Basic Operators Training courses (BOC), Basic Craftsman training course (BCC), Ministerial Staff Training Course for Jr. Clerks, Sr. Clerks, Assistants (MTC-1), Ministerial Staff Training course of Jr. Clerk to Steno-II (MTC-2), Training course of Steno Grade-II to Grade-I (MTC-3), Training course of Telephone Staff (TST), Drawing staff Training Course (DST), Training course of Store staff (SST) and Computer Office application course (COA) for local staff.

Warsak

The annual generation parameters of the power station having total installed capacity of 243 MW (4 units of 40 MW and 2 units of 41.48 MW each) are as follows:-

Brief description of major work carried out during fiscal year 2012-13.

Major Overhauling

Major overhauling of Unit No.3 was carried out.

Net electrical output FY 2012-13	4576.548 MKWh
Maximum monthly generation attained during October, 2012	600.205 MKWh
Maximum daily generation attained on 17th October , 2012	22.17 MKWh
Maximum load attained on 25th September ,2012	1115 MW
Cumulative generation up to 30th June, 2013	203994.18 MKWh

Net electrical output during FY 2012-13	1034.443 MKWh
Maximum monthly generation attained in August, 2012	136.402 MKWh
Maximum daily generation attained on 1st September, 2012	4.844 MKWh
Maximum load attained on 31st August, 2012	203 MW
Cumulative generation up to 30th June, 2013	40,390.06 MKWh

Annual Maintenance of Units

Annual maintenance of Units Nos.1, 2, 4, 5 & 6 along with associated equipment was carried out as per prescribed check sheets.

Chashma

The annual generation parameters of the power station having total installed capacity of 184 MW (8 units of 23 MW each) are as follows:-

Net electrical output during FY 2012-13	1115.134 MKWh
Maximum monthly generation attained during September, 2012	114.038 MKWh
Maximum daily generation attained on 6th October, 2012	4.341 MKWh
Maximum load attained on 28th September, 2012	184 MW
Cumulative generation up to 30th June, 2013	12458.441 MKWh

A large quantity of trash travels towards intake of power house. The quantum of trash increase manifold during flood and rainy seasons. All the available trash disposable resources are best coordinated to minimize the generation loss for obtaining optimum output. The removal of trash is being handled with the following installed equipment:-

1. Trash Rack Cleaning Machine
2. Mobile Crane
3. Dragline
4. Monorail Cranes

During the year, quantity of trash removed was 53741 m^3 through above means.

Annual Maintenance of Units

Annual maintenance of Unit# 1,4,5,6, & 7 along with associated equipment was carried out as per prescribed check sheets.

Khan Khwar

The annual generation parameters of the power station having total installed capacity of 72 MW (2 units of 34 MW and one unit of 04 MW) are as follows:-

Net electrical output during FY 2012-13	291.873 MKWh
Maximum monthly generation attained during March, 2013	50.34 MKWh
Maximum daily generation attained on 23rd August , 2012	1.75 MKWh
Maximum load attained on 10th March, 2013	72 MW
Cumulative generation up to 30th June, 2013	591.15 MKWh

Annual Maintenance of Units

Annual maintenance of Units # 1, 2 along with associated equipment was carried out as per prescribed check sheets.

Allai Khwar

Allai Khwar Hydropower Plant is located in the Khyber Pakhtunkhwa on Allai Khwar in Battagram district. The Station area is accessible by road and is at a distance of approximately 245 Km from Islamabad. The intake structure is located on the left bank of Allai Khwar and Power House is located at the left bank of Indus at an elevation of 562.5 masl. The maximum power output of this Hydropower Plant will be 121 MW corresponding to a maximum design discharge of 21 m^3/sec at a gross head of 687 M with annual energy generation of 463 MKWh.

The two generating units of 60.5 MW each were commissioned during this year on 25th March, 2013 (Unit No.1) and 30th March, 2013 (Unit No.2).

The annual generation parameters of the power station are as follows:-

Net electrical output during FY 2012-13	221.84 MKWh
Maximum monthly generation attained during May, 2013	75.27 MKWh
Maximum daily generation attained on 21st May, 2013	2.914 MKWh
Maximum load attained on 21st May, 2013	121 MW
Cumulative generation up to 30th June, 2013	222.078 MKWh

Jinnah

Jinnah Hydropower Project is located on the Indus River adjacent to existing Jinnah Barrage, 5 Km away from upstream township of Kalabagh, distt. Mianwali Punjab. It is a low head run-of-river plant utilizing available head from 3.2 to 6.2 Meters. The pit type Kaplan (horizontal) turbines have been installed and it is first one of its type in Pakistan. Project was commenced on 18 February, 2006. So far, Units 1~5 & 8 have been commissioned while remaining 2 units are expected to be commissioned upto mid of August-2013.

Five generating units were commissioned during year 2012-13 as under:-

Unit No.	Date of Commissioning
2	07.09.2012
3	15.07.2012
4	27.03.2013
5	27.03.2013
8	26.06.2013

Net electrical output during FY 2012-13	198.123 MKWh
Maximum monthly generation attained during April, 2013	32.398 MKWh
Maximum daily generation attained on 13th April, 2013	1.301 MKWh
Maximum load attained on 10th April, 2013	59.70 MW
Cumulative generation upto 30th June, 2013	231.341 MKWh

Annual Maintenance of Units

Annual maintenance of Units No.1 & 3 along with associated equipment was carried out as per prescribed check sheets.

Small Hydel Power Stations

Eight small hydel power stations Rasul (22.0 MW), Dargai (20.0 MW), Nandipur (13.8 MW), Shadiwal (13.5 MW), Chichoki (13.2 MW), Kurram Garhi (4.0 MW), Renala (1.1 MW) and Chitral (1.0 MW) with a total installed capacity of 88.6 MW collectively generated 283.95 MKWh (net electrical output) during the year.

Hydel Development Projects

Rehabilitation of Existing Hydel Power Stations

To meet the ever increasing power demand of the country and to ensure optimized, sustainable and economical power supply, WAPDA has undertaken rehabilitation / refurbishment of existing old hydel power stations in addition to construction of new hydel Power projects.

The details of the rehabilitation projects, both ongoing and proposed, under jurisdiction of WAPDA hydel development are as under:-

Rehabilitation of Jabban Hydroelectric Power Station

Jabban Hydroelectric Power Station is located in district Malakand, Khyber Pakhtunkhwa, at a distance of 45 Km from the city of Mardan and 7 Km upstream of 20 MW Dargai Hydroelectric Power Station. The British Government constructed the Jabban Hydroelectric Power Station in 1937 with three units of installed capacity 3.2 MW each (9.6 MW in total) on Upper Swat Canal. Addition of 2 Units was made in 1952 (5 MW each) increasing the total installed capacity to 19.6 MW. The power plant utilizes the water of upper Swat Canal through Benton & Barkit Tunnels.

The 70 year old Power Station was badly damaged due to a fire incident on 12th November, 2006. Restoration of old units was not possible due to extent of damage. WAPDA, therefore, decided to carry out rehabilitation of power station on "Fast Track basis."

After approval of PC-I of the project in September, 2007, NESPAK was engaged to prepare detailed design and tender documents. As per design, four units of 5.5 MW each will be installed thus increasing the capacity of 19.6 MW to 22 MW with annual generation of 122 GWh and transmission of power to 132 KV Mardan – Chakdara line.

The bids were opened in December, 2008 and contract was signed on 15th October, 2009 with a Joint Venture of Habib Rafiq Limited (HRL) and CCPG (China). The total project cost is Rs. 3753.57 million including foreign component of Rs. 1649.48 million. The French Donor agency AFD has provided a loan of Euro 26.5 million for rehabilitation of Jabban and training of WAPDA personnel. The work at site commenced in February, 2010. First unit was inaugurated by Chairman WAPDA and French

Mangla Hydel Power Station

ambassador on 26th June, 2013 whereas remaining units will be completed upto October, 2013.

Rehabilitation of Mangla Hydel Power Station

Mangla Dam Project was constructed in 1967 and the power house completed in four stages, the initial phase comprising of four units of 100 MW each was completed in 1967-69. Further extensions of six units were completed subsequently. Units 5~6 (2x100 MW) in 1974, units 7~8(2x100 MW) in 1981 and units 9 &10 in 1993-94, thus attaining the maximum capacity of 1000 MW.

Since the reservoir capacity had reduced to 4.674 MAF from 5.88 MAF due to sediment deposition, Raising of Mangla Dam by 30 ft. was taken in hand which has now completed. The Project will provide additional water storage of 2.88 MAF, increase water head by 40 ft. and power generation of 644 GWh per annum.

There are four age groups of Mangla machines units 1~4 (40 years), units 5~6 (35 years), units 7~8 (28 years) & units 9~10 (15 years). The first 6 units with age of 30~40 years have outlived their useful lives due to which more resources and time are required for maintenance of old equipment besides less operational reliability.

WAPDA has planned to carry out up-gradation & re-furbishment of the old generating units and allied equipment to ensure their optimized, reliable and sustainable operation in the post Raised Mangla Dam scenario. As a first step, feasibility study has been carried out by WAPDA through the Consultants. MWH – NESPAK JV to assess the present operating conditions of existing civil structures and Plant & Machinery to determine the most viable option, technical as well as economical, for up-gradation/ re-furbishment of the existing units of Mangla Power Station keeping in view the aging effects on electrical & mechanical equipment and to effectively utilize the improved power potential after Dam Raising.

Present Status

The Project Concept Clearance Proposal and PC-I were submitted to the Planning & Development Division, Government of Pakistan in March and April, 2013 respectively and their approval is under process.

Pre-qualification of contractors for refurbishment of units 5 & 6 has been evaluated and in the process of approval.

Detailed design and preparation of different packages are being carried out by the consultants.

Rehabilitation of Warsak Hydroelectric Power Station

Warsak Hydel Power Station is located on Kabul River at 30 Km in North-West of Peshawar. The Project financed by Canadian Government was completed under Colombo Plan in two phases, in 1960 (160 MW) and in 1980-81 when two additional generating units each of 41.48 MW capacity were added to achieve total installed capacity of 243 MW. The Project suffered severe structural deformation and rapid erosion of the hydraulic equipment which reduced the capacity to 150 MW. A Rehabilitation Project was commenced in 1996 with the Canadian Technical Assistance under CIDA grant and completed in 2006 at the total cost of Rs. 1000 million.

WAPDA has planned to carryout second phase of rehabilitation with the objective to ensure that the six generating units of Warsak Power Station, having spent life of 50 years (units 1~4) and 30 years (units 5~6) are made capable to operate efficiently & reliably at the total installed capacity of 243 MW for another 40~50. As a first step the services of consultants are being hired for carrying out a feasibility study and preparation of detailed design & tender documents and PC-I for rehabilitation, up-gradation and modernization of Warsak. The basic objective is to determine the most viable options, technical as well as economical keeping in view the aging effects of electrical & mechanical equipment and civil structures and then prepare detailed design & tender documents and PC-I for implementation of the project. The consultancy agreement with the Joint Venture of RSWI Canada and DCE Pakistan was signed on 13th September, 2011. The consultants conducted the site visits, submitted inception report and delivered a presentation to WAPDA Authority. WAPDA Authority accepted the recommendations of the consultants and asked to proceed further for following tasks:- Construction of a new underground Power Station adjacent to the existing Warsak Power Station having the capacity of about 300 MW. Maintenance of existing old Warsak Power Station (243 MW) to retain and keep the units in running condition for operation during high flow season when the surplus available water has to be spilled over. New hopper type sediment collectors were installed for management of sediments. The consultants have submitted draft feasibility report to WAPDA in November, 2012 and delivered a presentation in which the consultants provided the estimated cost of US $ 175.802 million & 408.2 million for rehabilitation of existing power station and for construction of new power station respectively. Draft final feasibility study on rehabilitation of power station has been submitted in January, 2013. WAPDA has offered comments on economic & financial analysis which are being reviewed / studied and 95% have been completed. These will be incorporated in final feasibility report which is expected by the mid of July, 2013.

Rehabilitation of Renala Hydropower Project

WAPDA has planned to rehabilitate the existing 84 years old Renala Hydel Power Station on LBDC (RD 160 + 686) to enhance its capacity from 1.1 MW to 4.0 MW by utilizing full available discharge of 170 m^3/sec in LBDC at Renala, against the existing use of 71 m^3/sec. Annual energy generation from Renala Hydel Power Station after proposed rehabilitation is approximately 25.6 GWh. Estimated cost for the proposed rehabilitation scheme is about Rs. 1434.939 million.

The feasibility report of the proposed rehabilitation was prepared by GM (Hydro) Planning WAPDA in 2007. Before proceeding for implementation of the Project involving changes in the existing Power Channel off-taking from LBDC, formal consent of Punjab Irrigation & Power Department was requested on 6th August, 2007 which was issued on 22nd February, 2011.

Updated feasibility Study was finalized by GM Hydro Planning office in light of comments of GM Hydel (Development) in October, 2011. General Manager Hydel (Development) made the presentation to the authority on 5th March, 2012 where Chairman WAPDA directed to intact the existing Power House and construct a new one adjacent to existing building. Same was conveyed to GM Hydro Planning to up-date the feasibility study already carried out by them keeping in view the Alternative-II in which replacement of all the existing 5 machines with new ones of 0.33 MW plus installation of 2 additional units each of 1.2 MW (Pit type Kaplan Turbines) with extension in Power Station to achieve the total

capacity of 4.0 MW approximately (1.65 + 2.4 MW). This also involves remodeling of Power Channel to utilize the full available discharge in LBDC (170 m^3/sec.) instead of the present 70 m^3/sec. New feasibility study is under progress in the office of GM (Hydro) Planning.

Proposed Upgradation of 1 MW Chitral Hydropower Project

The existing 1.0 MW Chitral Hydel Power Station is located on the right bank of Lutkho River, 5 Km upstream of Chitral city. The Project was commissioned in 1975 by diverting the flows of Lutkho River through 3.72 Km long channel and installing 2 units of 200 KW and 2 units of 300 KW each. The power generated from Chitral Hydel Station is supplied to Chitral city through 11 KV transmission line.

The power demand in Chitral area has increased and there is a dire need to upgrade the capacity of existing Hydel Power Station at Chitral. In the initial construction phase of Project, limited flows of Lutkho River were diverted to Power Channel for generation of 1 MW only. However, the river has abundant flows which can be utilized for power generation by constructing a small diversion weir, remodeling of power channel & fore bay and installation of new penstocks and additional units. It is estimated that the power can be enhanced upto 4 MW.

WAPDA has started preliminary studies for the proposed up-gradation. Topographic survey, geological mapping for weir intake, power channel and power house areas and drilling at weir and power house areas have been completed while structural design is being prepared. The studies will be completed shortly.

WAPDA has requested Ministry of Water & Power to sell and transfer the existing Chitral Hydropower Station to government of Khyber Pakhtunkhwa through SHYDO and in case of unwillingness of Khyber Pakhtunkhwa government, the same may be privatized through the Privatization Commission, Government of Pakistan. The complete profile of Power Station featuring the financial, operational and technical has also been provided to the Ministry of Water & Power.

INSTALLED CAPACITY OF HYDEL POWER STATIONS 2012-13

STATION	WATER WAY (River/Canal)	LOCATION	INSTALLED CAPACITY (MW)			DATE OF COMMISSIONING
			UNITS NO.	CAPACITY OF EACH UNIT (MW)	INSTALLED CAPACITY (MW)	
Tarbela	Indus (Reservoir)	Swabi/Haripur	1~4	175	700	Jul. 1977
			5~8	175	700	Dec. 1982
			9~10	175	350	Apr. 1985
			11~14	432	1728	Feb. 1993
				Total	3478	
Ghazi Barotha	Indus (D/S Tarbela)	Distt. Attock	1	290	290	Jul. 2003
			2	290	290	Aug. 2003
			3	290	290	Oct. 2003
			4	290	290	Dec. 2003
			5	290	290	Mar. 2004
				Total	1450	
Mangla	Jhelum (Reservoir)	Mirpur/AJK	1~4	100	400	1967/1969
			5~6	100	200	Mar. 1974
			7~8	100	200	Jul. 1981
			9~10	100	200	1993-1994
				Total	1000	
Warsak	Kabul (Reservoir)	Warsak	1~4	40	160	Jul. 1960
			5~6	41.48	82.96	Mar. 1981
				Total	242.96	
Chashma	Indus (Chashma Barrage)	Distt. Mianwali	1	23	23	May. 2001
			2	23	23	Apr. 2001
			3	23	23	Apr. 2001
			4	23	23	Mar. 2001
			5	23	23	Mar. 2001
			6	23	23	Feb. 2001
			7	23	23	Dec. 2000
			8	23	23	Dec. 2000
				Total	184	
Allai Khwar		Distt. Shangla	1	60.5	60.5	Mar. 2013
			2	60.5	60.5	Mar. 2013
				Total	121	
Jinnah	Indus Jinnah Barrage	Distt. Mianwali	1	12	12	Mar. 2012
			2	12	12	Oct. 2012
			3	12	12	Aug. 2012
			4	12	12	Mar. 2013
			5	12	12	Mar. 2014
			6	12	12	
			7	12	12	Units 6~8 Under
			8	12	12	Construction
				Total	96	
Khan Khwar		Distt. Shangla	1	34	34	Nov. 2010
			2	34	34	Nov. 2011
			3	4	4	July. 2012
				Total	72	

STATION	WATER WAY (River/Canal)	LOCATION	INSTALLED CAPACITY (MW)			DATE OF COMMISSIONING
			UNITS NO.	CAPACITY OF EACH UNIT (MW)	INSTALLED CAPACITY (MW)	
Rasul	UJC	Distt. Mandi Baha-ud-Din	1~2	11	22	Jul. 1952
				Total	22	
Dargai	Swat	Distt. Malakand	1~4	5	20	Dec. 1952
				Total	20	
Nandipur	UCC	Distt. Gujranwala	1~3	4.6	13.8	Mar. 1963
				Total	13.8	
Shadiwal	UJC	Distt. Gujrat	1~2	6.75	13.5	Jan. 1961
				Total	13.5	
Chichoki	UCC	Distt. Sheikhupura	1~3	4.4	13.2	Aug. 1959
				Total	13.2	
K/Garhi	Kuchkot	Distt. Bannu	1~4	1	4	Feb. 1958
				Total	4	
Renala	LBDC	Distt. Okara	1~5	0.22	1.1	Mar. 1925
				Total	1.1	
Chitral	Ludko	Chitral City	1~2	0.3	0.6	1975
			3~4	0.2	0.4	1982
				Total	1.0	
TOTAL HYDEL INSTALLED CAPACITY					6733	

Finance & Administration

Public Sector Development Programme
Financial Review
Administrative Support
Balance Sheet

A View of Satpara Dam

Public Sector Development Programme 2012-13

The final allocation for WAPDA's Water Sector Projects/Schemes financed by the Government of Pakistan through its Public Sector Development Programme 2012-13 stands at Rs. 22,708.532 million as tabulated below:-

(Rupees in Million)

Description	Original Allocation 2012-13		Excesses/Surrenders (Cut/Short Releases) 2012-13		Final Allocation 2012-13	
	Total	Foreign Assistance	Total	Foreign Assistance	Total	Foreign Assistance
Water Storages Dams	9,000.000	1,400.000	-) 3,210.000	-) 400.000	5,790.000	1,000.000
Medium Irrigation Dams	6,500.000	200.000	-) 2,840.000	-) 200.000	3,660.000	-
Canals (Irrigation)	4,900.000	-	-) 6,240.000	-	11,140.000	-
Flood Damages Scheme	1,025.000	-	-) 434.900	-	590.100	-
General Investigation and Other Schemes	205.000	-	-) 84.000 -) 1,082.568	-	121.000	-
Drainage Projects	2,490.000	-		-	1,407.432	-
Grand Total	24,120.000	1,600.000	-) 1,411.468	-) 600.000	22,708.532	1,000.000

Description	Expenditure (Rs. in Million)		Physical Achievements		
	Total	Foreign Assistance	Description	Units	Achievement During 2012-13
Water Storages Dams	*12,607.785	1,621.543	i) Gomal Zam Dam (Dam & Hydropower)		
			Consultancy	Man Months	29
			Civil Works		
			Earth Work	M.Cum	8.942
			Concrete	M.Cum	0.609
			Lining	M. Sqm.	0.702
			Structure	Nos.	422

*Inclusive of expenditure of Rs.4,228.421 million against medium irrigation dams.

Description	Expenditure (Rs. in Million)		Physical Achievements		
	Total	Foreign Assistance	Description	Units	Achievement During 2012-13
			(Irrigation and Flood Protection Component)		
			Consultancy	Man Months	25
			Civil Works		
			Earth Work	M.Cum	7.389
			Concrete Lining	M.(Sqm)	0.628
			Steel Work	Ton	81.00
			Structure	No.	640
			ii) Raising of Mangla Dam Project		
			Infrastructure Development & Public Buildings in new city and four small towns.		
			Area	Acres	25
			Buildings		
			Contract No. / No. of Building		
			MDR-28A / 46	%	15.40
			MDR-29A / 23	%	28.30
			MDR-35A / 26	%	28.00
			MDR-36A / 26	%	29.50
			iii) Kurram Tangi Dam Project		
			Consultancy	Man Months	65
			Land Acquisition	Acres	1434
			iv) Satpara Dam Project		
			Consultancy	Man Months	126
			Civil Works		
			Earth Work	Mcft.	1.105
			Concrete Lining	Cft.	78043
			Steel Work	Ton	76
Medium Irrigation Dams			v) Darwat Dam Project		
			Consultancy	Man Months	470
			Civil Works		
			Earth Work	Cu.m	915,915
			Concrete (Main Dam)	Cu.m	132,074
			Concrete Lining	Cu.m	10,753
			Steel Work	Ton	1,398
			Structure	Nos.	6 (Partially completed)

Description	Expenditure (Rs. in Million)		Physical Achievements		
	Total	Foreign Assistance	Description	Units	Achievement During 2012-13
			vi) Nai Gaj Dam Project		
			Consultancy	Man Month	172
			Civil Works		
			Earth Work	M. Cum	5.75
			Concrete	Cu.m	5.287
			Steel Work	M.Ton	63.424
			Structure	Nos.	2 (Partially completed)
Canal	12,065.460	---	vii) Kachhi Canal Project		
			Consultancy	Man Months	24
			Land Acquisition	Acres	6
			Civil Works		
			Earth Work	Mcft.	309.951
			Lining	Mcft.	3.634
			Brick Works	Sqft.	15,000
			Structure	Nos.	20
			viii) Chashma Right Bank Canal		
			Civil Works		
			Earth Work	Mcft.	141.962
			Concrete Lining	Mcft.	1.36
			Stone Pitching	Mcft.	3.848
			Brick Work	Mcft.	0.401
			Steel Work	M. Kg.	1.550

Description	Expenditure (Rs. in Million)		Physical Achievements	
	Total	Foreign Assistance	Earth Works (Mcft)	Structures Nos.)
Flood Damages Schemes	839.651	---		
- Rehabilitation of Flood 2010 Damages (RBOD-I)	536.531	---	16.81	---
- Rehabilitation of Flood 2010 Damages (RBOD-III)	251.004	---	61.041	02
- Construction of Flood Management Structure in District Tank	52.116	---	20.000	---

General Investigation Schemes	109.214	---	Research activities continued at IWASRI, MONA & LIM Research Organizations besides Land & Water Monitoring/ Evaluation of Indus Plains by SMO.		
Environmental Works	58.066	---	ix) Mangla Watershed Management Project		
			a) Afforestation including raising of Plants/Restocking of Failures etc.	Million Nos. Acres	0.483
			b) Extension Services	Nos.	23
			c) Raising/Purchase of Fruit Plants	Million Nos.	0.055

Description	Expenditure (Rs. in Million)		Physical Achievements	
	Total	Foreign Assistance	Earth Works (Mcft)	Structures Nos.)
Drainage Projects	1,015.857	---	842.863	69
- RBOD-I	321.868	---	625.874	362
- RBOD-III	545.500	---	0.555	---
- Drainage System, Banizarabad	78.416	---	0.151	---
- Installation of Effluent Treatment Plant (RBOD-III) Pilot Project	70.073			

Hydroelectric Power Development Programme

In order to meet the ever growing Electric Power demand of Pakistan,Ê control load shedding, provide quality customer services, ensure safe and continuous electric power supply to industry/ business and for maximum utilization of hydroelectric potentials of the country, the Government of Pakistan had approved PSDP Rs.63,982 million for Hydel Power Development Projects. The development programme was planned to be financed through foreign loan of Rs.15,109 million, CDL of Rs.7,785 million whereas balance was to be financed through Hydel Power sale income, Surcharge and issuing Sukuk/Bond from the local banks.

Allai Khwar Hydropower Project (121 MW), has been completed in FY 2012-13, Jabban Hydropower (22 MW), Dubair Khwar Hydropower Project (130 MW) and Jinnah Hydropower Project (96 MW) will be completed in the current financial year 2013-14, therefore available funds were strategically utilized on the near to completion projects, to ensure their timely completion.

WAPDA has invested Rs.55,182.079 million for Hydel Development Projects during FY 2012-13 through various Sources of Financing as set out in the table below:-

Hydel Power Development Projects Expenditures during FY 2012-13 (Rs. in Million)

Name of HPP	Financing Arrangements			
	Total	Expenditure Self Finance	GoP CDL	F. Loans
Diamer Basha Dam	2,174.103	926.309	1,247.794	-
Tarbela 4th Extension	1,094.763	467.793	-	626.970
Duber Khwar HPP	5,166.995	3,503.399	-	1,663.596
Allai Khwar HPP	4,652.179	3,220.540	-	1,431.639
Jinnah HPP	1,755.948	1,755.948	-	-
Keyal Khwar HPP	379.759	291.847	-	87.912
Golen Gol HPP	1,512.325	877.834	-	634.491
Jabban Rehab.	1,618.296	250.413	-	1,367.883
Feasibility Studies by GMHP	397.995	397.995	-	-
Sub. Total	18,752.363	11,692.078	1,247.794	5,812.491
Neelum Jhelum (SPV)	36,429.716	28,956.716	1,500.000	5,973.000
Grand Total	55,182.079	40,648.794	2,747.794	11,785.491

Warsak Hydel Power Station and Spillway

Financial Review

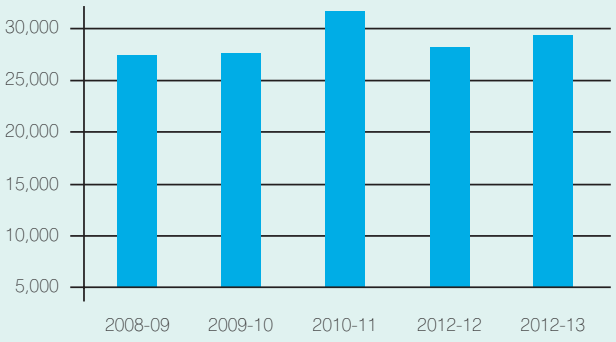
WAPDA Power Wing (Hydroelectric) is operating under generation license granted by the Power Regulator 'NEPRA', for operation, maintenance and development of hydel power resources in Pakistan.

Operational Performance

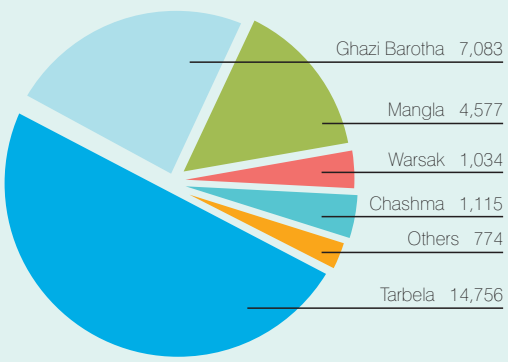
WAPDA-Hydroelectric owns and operates 15 hydel power stations with aggregated installed generation capacity of 6,612 MW. Major hydel power stations include Tarbela (3478 MW), Ghazi Barotha (1450 MW), Mangla (1000 MW) Warsak (243 MW). The Allai Khwar Hydel Power Project of 121 MW started its test generation in April, 2013.

The utilization of capacity for Hydel generation is largely dependent on net head of respective power station and quantum of water indents allowed by IRSA. The Net Electrical Output (NEO) for the year stood at 29,339 GWh as compared to last year NEO of 28,235 GWh with increase in Generation 1,104 GWh, during FY 2012-13. This excess generation was contributed mainly by Tarbela HPS 700 GWh, Jinnah HPS 200 GWh and Khan Khwar 100 GWh. The generation of 215 GWh from Allai Khwar Project for the period from April to June, 2013 was billed in subsequent year.

Generation Trend (Gwh)



Generation (Gwh) FY 2012 - 13



Profitability Position

Power sales revenue during FY 2012-13 stood at Rs 42,893 million (2012: Rs 39,861 Million), due to upward revision of power sales tariff while cost of electricity stood at Rs 21,073 Million (2012: 19,769 Million) bringing the net revenue surplus of Rs 11,923 million (2012: 9,975 Million). The investment in property, plant and equipment increased to the level of Rs. 268,538 million (2012: Rs. 251,854 Million). The average return on investment workout as 6.2% for the period under report as against 6.7% of last year.

Profit & Loss Comparison

Particulars	FY 2012 - 13 (Million Rs.)	FY 2011 - 12 (Million Rs.)
Sales (Exclusive GST)	42,893	39,861
Other Income	1,049	1,462
Total Revenue	43,942	41,323
Cost of Sales		
O&M	11,635	9,742
Hydel Levies	6,831	6,840
Depreciation / Ijara Rental	9,438	10,027
Total Cost of Sales	27,904	26,609
Surplus / (Deficit)	16,038	14,714
Less: Financial Charges	4,115	4,739
Surplus for Development	11,923	9,975

Liquidity Position

During FY 2012-13 CPPA has made payment of Rs. 29,545 million against the billing of Rs. 43,238 million (Inclusive GST), which works out 68% of billed amount for the year.

During the year Rs. 4,498 million has been incurred on Salaries & Establishment Expenses and Rs. 1,621 million has been paid on account of pension charges to the pensioner of WAPDA. Repair & Maintenance and Capital expenditures stood at Rs. 2,618 million during FY 2012-13.

Net Hydel Profit (NHP) of Rs. 3,400 Million and other hydel levies of Rs. 1,002 million have been paid, whereas, NHP amounting to Rs. 7,000 million to GoKPK and Water Usage Charges (WUC) amounting to Rs. 79 million to Govt. of AJ&K is payable as on 30.06.2013.

Redemption on maturity of Sukuk-I Rs. 8,000 million along with Ijara rental of Rs. 502 million was made during FY 2012-13 whereas Sukuk-II ijara rental of Rs. 2,156 million and Supplier Credit Rs. 1,649 million for Jinnah Hyper Power Project was also paid during FY 2012-13.

In order to effectively implement ongoing repair & rehabilitation plans and to build strategic stock inventory material procurements of worth Rs. 962 million has been made during FY 2012-13.

Govt. of Pakistan has adjusted its pending Debt Service Liability (DSL) upto FY 2012-13 and has also adjusted DSL for FY 2013-14 and FY 2014-15 as prepayment against WAPDA Power Sales receivable from National Transmission and Despatch Company/ Central Power Purchase Agency (NTDC/CPPA). Because of this adjustment of Rs. 90 billion, Trade Receivable from CPPA has been reduced to the level of Rs. 6.3 billion at the year end.

Power Expansion

Further, release of funds of Rs. 6,361 million has been made as bridge financing to Neelum Jhelum Hydel Power Co. making it Rs. 16,177 million in total as of year end under report. Rs. 8,516 million have been released to other Hydroeletric development projects. The development cost of Allai Khwar and apportioned cost of Gomal Zam Hydro Power Project has been capitalized on beginning of generating power whereas partial capitalization of generating units of Jinnah and Jabban Hydro Power Projects have been made for being in operation upto the end of FY 2012-13.

Repair & Rehabilitation

Apart from routine preventive maintenance as a part of Rehabilitation and Refurbishment Program replacement of Relief valves and By-pass valves of Unit 1 to 10 of Tarbela Power Station has been completed during the year. Whereas, replacement of old Electro-mechanical Governors of Unit 1 to 10 of Tarbela Power Station with the latest Digital Governors, replacement of Excitation System of Unit 1 to 6 and up-gradation of SCADA System at Tarbela Power Station is in process.

The detail engineering & design and preparation of tender documents of Mangla Power Station is in progress in line with the recommendations of Consultants made in the feasibility study for up-

gradation and refurbishment of old generating units and allied equipment.

Feasibility study for rehabilitation, up-gradation and modernization of generating units of Warsak Power Station including new underground Power House of 375 MW, has recently been completed by the Consultants. Now, the process of detail design and preparation of tender documents will be initiated.

Investing Activities

During the period under report, WAPDA Power Wing received dividends amounting to Rs.1,616 millions from KAPCO against its Share-holdings, whereas, dividend of Rs. 563 million has been adjusted by CPPA against capacity payment invoice of KAPCO and CPPA will pay the same to WAPDA later. No further ordinary shares were issue by Ex-WAPDA Disco's and Genco's to WAPDA against deposit of share created on transfer of business of said entities by WAPDA on unbundling of WAPDA Power Wing. The income from investing activities has also been employed in financing of Development Projects.

Administrative Support

Internal Audit

Internal Audit Division, headed by a Chief Auditor, is responsible to the Authority for the examination of accounts and related records of WAPDA formations. The office of the Chief Auditor WAPDA was established in December, 1959.

Internal Audit reviews the financial and operational accounts of formations of WAPDA. It also conducts the physical verification of stock held at various stores, checking of payments made to consultancy services engaged on development projects and special audit as per directives of the Authority.

Internal Audit conducted audit of 52 formations and physically verified stock of 42 formations during the financial year 2012-13. The audit of payments made to consultants engaged on five projects was also carried out.

As a result of review of payments made to consultants and follow up of audit previously conducted a sum of Rs.6.80 million, pounds 150884, EURO 234977, YEN 3505902 has since been recovered.

One of the important functions of Internal Audit Division is to assist/coordinate the WAPDA formations, external audit and Ministry/PAO Secretariat to finalize replies to the audit reports, special audit reports and performance audit reports prepared by Auditor General of Pakistan Department and submit compliance of PAC/DAC, directives. During the period 2012-13, updated compliance status on following audit reports were prepared and sent to the Ministry of Water & Power for submission to the National Assembly Secretariat, Auditor General of Pakistan.

Submitted Compliance report on	1996-97, 1999-2000, 2000-01, 2004-05
PAC Directives	2005-06, 2006-07, 2007-08, 2008-09
DAC Conducted	2010-11, 2012-13

Central Contracts Cell (CCC)

In order to implement projects through its own experienced engineers with quality home office support, the Authority decided to create a department which should provide the contractual and related services to the field formations involved in the Project implementation. Accordingly, Central Contracts Cell (CCC) was created in May, 1974. Besides formulating guidelines and issuing instructions to streamline the contact management functions within WAPDA on behalf of the Authority, CCC is providing specialized assistance on preparation/vetting of tender documents for construction, supply and other turn key contracts, evaluation of tenders, review of contractor's claims, variation orders etc. in respect of local/international contracts financed by International Funding Agencies or WAPDA/Pakistan's own resources. The Cell has rendered valuable services to WAPDA over a period of more than 39 years and selfless services rendered by all the staff of CCC has justified its existence.

The CCC is a Common Services department of the Authority, headed by a General Manager who is working in the association of one Chief Engineer (Civil), Chief Engineer (Consultancy Services), one Additional Director General (Finance) and six Directors, drawn from Water, Power and Common Services Wings, each of whom is a specialist in his field. To provide services to PEPCO, a unit comprising of Chief Engineer (Power) PEPCO and two Directors with Specialists expertise in Distribution and T&G departments are also associated with the General Manager (CCC). The Cell has now grown into a self-sustaining institution, which is working as an independent advisory body to the Authority and its duties encompass all activities right from tender opening to implementation and ultimate completion of a project. Another important aspect dealt with by CCC is processing of cases of registration of 'A' class civil works contractors with WAPDA and their renewals.

During FY 2012-13, the CCC evaluated 39 cases of tender evaluation, reviewed 90 tender documents and processed enlistment/renewal of 76 contractors. Besides above, it also participated in 39 tender openings, processed 60 claims of EOT, 58 cases of VOs, Misc. advice on 116 and Misc. cases 134.

CASES DEALT BY THE CENTRAL CONTRACTS CELL, WAPDA DURING THE YEAR 2012-13

Description	Director (CS)	Director (C&CW)	Director (DBD)	Director (PGH)	Director (CW-I)	Director (CW-II)	Director (Distb.)	Director (T&G)	Total
Evaluation of tenders	-	-	11	15	08	03	01	01	39
Review vetting of tender documents	20	08	06	33	16	03	04	-	90
Enlistment of Contractor/ Renewal	-	76	-	-	-	-	-	-	76
Processing of Extension of Time Cases (Amendments)	16	02	08	02	28	04	-	-	60
Processing of Variation Orders	-	-	28	04	19	07	-	-	58
Participation in Tender Opening	-	32	-	-	-	-	07	-	39
Processing of Claims	-	-	06	09	06	11	-	-	32
Advice on Misc. contract cases	62	-	08	27	12	04	03	-	116
Miscellaneous Cases	25	02	23	37	31	12	01	03	134
Total Cases	123	120	90	127	120	44	16	04	644

Training

The Training Department of WAPDA is led by General Manager (Training) who heads the two premier Training Institutions of the country namely WAPDA Administrative Staff College, Islamabad and WAPDA Engineering Academy, Faisalabad. The Training Institution at Islamabad is responsible to cater to the managerial needs of WAPDA/PEPCO officers whereas the Academy at Faisalabad is responsible to look after the technical requirements of officers and upper technical subordinates working on different echelons in WAPDA/PEPCO. During the year 2012-13, 713 participants were trained at WAPDA Administrative Staff College, Islamabad whereas 687 participants received training at WAPDA Engineering Academy, Faisalabad.

Examinations Directorate under General Manager (Training) is responsible to conduct DPE of all categories for promotion to BPS-17 and above as per SOP-2005. This is besides the recruitment/ induction examinations conducted as and when required as per policy of the Authority.

At present following institutions are functioning under the administrative and technical control of General Manager (Training):-

- Wapda Administrative Staff College, Islamabad
- Wapda Engineering Academy, Faisalabad

WAPDA Administrative Staff College Islamabad

During financial year 2012-13, 24 Nos. courses were conducted in which 15 courses were of long duration for 6 - 11 weeks and 09 were of 3-4 weeks duration. During these courses 713 participants were trained out of which 434 officers were of BPS 17-19 and 279 were of supervisory staff of BPS-16. Out of these courses, one special Junior Management Course and one Middle Management Course were conducted for IESCO and NTDC officers to clear the backlog of training in these organizations.

Latest topics regarding Management have been incorporated into Syllabi of various courses and in addition to the faculty members the guest speakers of national and international caliber were invited to deliver lectures in their specific fields. Computer based Application Programmes like MS Word, MS Excel, MS Power Point, Internal and MS Project tools were part and parcel of the courses. Presentation activities like Talawat and Tafseer, Thought of the Day,Formal speech individual management Experience, Random Ability Test, Case Studies,

Lectures, Book Review, Tour "D" Briefing, Group Research Work and Individual Research Paper etc. were also an essential part of the Curricula.

As a part of the course syllabi, the participants of the courses were taken for educational instructional visits of various public and private sector organizations within the country and abroad. The participants of 45th SMC along with (03) faculty members of WASC visited Turkey on instructional visit w.e.f. 24th January, 2012 to 3rd February, 2013. The participants of 85th & 86th MMC visited Golen Gol Hydropower Project Chitral from 5th to 9th May, 2013 & participants of 101-102 JMC and EMC visited small hydel power stations in AJK division administered by the AJK Hydro Electric Board and Neelum Jhelum Hydropower Station Muzaffarabad.

Four weeks Engineering Management Course for non Engineers started with collaboration of GIKI was conducted from 10th September to 5th October, 2012. Twenty three participants took part in the course. Syed Raghib Abbas Shah, Chairman WAPDA graced the graduation ceremony as Chief Guest.

A one day workshop/seminar on training of the trainers (TOT) was arranged on 25th March, 2013 in WAPDA Administrative Staff College Islamabad, by the Consultants (M/s Integration, Germany) hired by the donor agency (AFD) France for establishment of Hydro Power Training Institute (HPTI) Mangla. All the necessary arrangements were made by WASC as per requirement/satisfaction of the Consultant (M/s Integration, Germany). The workshop was conducted by Mr. Michael Hoffman (Consultant) successfully on the said date; twenty two (22) participants from Hydel formations of WAPDA and seven (7) faculty members from WASC attended it.

The WAPDA Administrative Staff College main and Hostel Computer labs have been up-graded by replacing the old P-III and P-IV desk top computers with latest dell brand core i-5 computers. The compelling need of this up-gradation was being pointed out by the participants of the courses since long. Now independent computers and internet facility is available to every participant during the training.

WAPDA Engineering Academy Faisalabad

The Academy being unique of its kind in the country is playing vital role in boosting up the technical know-how of Engineers and supervisory staff representing public and private sector. It consists of Electrical, Mechanical, Civil Laboratories/ Workshops & Gas, Steam, Analogue Simulators to carry out various practical training courses directly related to the sphere of duties of the Engineering staff.

During the financial year 2012-2013, forty (40) technical courses of different durations were conducted and 687 Officers/officials were trained.

The salient disciplines are Transmission , Distribution, Generation, IT & Civil Engineering which encompass Grid system operation, distribution system operation & Maintenance, Cable jointing, Advance Fitting practices, Electronic control circuitry, Industrial Electrical skills, Instrumentation and control, programmable logic controllers (PLC), Mechanical Instrumentation, Steam & Gas Turbine Simulators operation & fault Analysis, Construction of Dam & Barrages, Irrigation Channels, Vertical Drainage system / Tube wells, miscellaneous Civil Structures & their maintenance, Environmental implications, Tender documents & Contract Management, hydrology, geology & seismology, sedimentation, Remote sensing/GPS surveys, tunneling & quality

COURSES CONDUCTED BY WAPDA ADMINISTRATIVE STAFF COLLEGE, ISLAMABAD DURING 2012 - 13

Course Title	Target Group (BPS)	Duration (Weeks)	No. of Courses	No. of Participants
Senior Management Course	19	11	1	26
Middle Management Course	18	09	5	123
Junior Management Course	17	09	8	260
Basic Engineerinmg Concept Management Course (Non Engineers)	17-18	04	1	25
Elementary Management Course	16	04	7	248
Mandatory Course for AB&AOs	16	06	1	16
	Total		24	713

assurance & control, IT & Telecom Concepts, hands on Microsoft Office, DBMS and other specific Job Oriented Softwares and Browsing/Downloading data using Broadband Internet services etc.

The faculty of the Academy consists of experienced Engineers and Staff. The technical knowledge of the trainees is enhanced through Class room lectures, Lab practical, mutual interaction and study tours of relevant installations in the country.

During the financial year 2012-13 report 687 Engineers & Technicians of WAPDA GOVT/Semi GOVT; departments and private sector were trained in this Academy. Post training studies and evaluation has revealed marked improvement in the technical capabilities of trainees. They are rendering outstanding services to their parent departments in best National interest with renewed vigor and confidence based on professional competence achieved through training at this Academy.

The Academy has opened its training courses to National Organizations like IPPs, KAPCO, KESC, directly and through all Chambers of Commerce & Industries of Pakistan.

Faculty at WAPDA Engineering Academy, Faisalabad

The Academy's faculty consists of a multi-disciplinary group of highly qualified and trained Instructors having a blend of academic and operational experience. They are experts in their fields of specialization many of whom hold advanced qualification. The full time faculty is supported by a group of eminent guest speakers from WAPDA and private/public sector who are authority in their fields.

Hydel Training Center Mangla

Hydel Training Center Mangla is playing a pivotal role in capacity building of Officers and Officials of Hydel Organizations. It is the sole institution functioning at present to impart training to all the technical/non-technical employees of WAPDA Water & Power Wing formations. During the period under report (10) Senior Engineers, (38) Jr. Engineers and (148) officials have been imparted training. (185) officials participated in Departmental Promotion Examinations conducted under control of Hydel Training Center Mangla. In addition to above, (91) students of different Engineering Universities have completed their internship from Hydel Training Center Mangla.

Following Courses were conducted for the employees of Hydel Organization

Refresher Course (pre-promotion) for Sr. Engineers (RC) , Sector Specific Course (pre-promotion) for Jr. Engineer at the verge of promotion (SSC), Induction Course (JIC) for newly inducted Jr. Engineer, Upper Technical Subordinate Staff (UTS), Internship Training course for student engineers, Advance Operator Course (AOC), Basic Operator Training Course (BOC), Advance Craftsman Training Course (ACC), Basic Craftsman Training Course (BCC), Ministerial Staff training course for Jr.Clerk/Sr.Clerk & Assistants (MTC-1), Ministerial Staff Training Course of Jr. Clerks eligible for promotion as Steno-II(MTC-2), Ministerial Staff Training Course of Steno Gr-II to Gr-I (MTC-3), Telephone Staff Training Course (TST), , Drawing Staff Training Course (DST), Store Staff Training Course (SST) and Computer Office Application Course (COA) for local staff. Apart from that Special Training Courses for Data Entry Operator, Plant Operators and Lift Operators were also conducted for the officials whose time-scale up-gradation cases were pending for want of DPE and Mandatory Pre-promotion Departmental Training.

Upgradation of Hydel Training Center Mangla as WAPDA Hydro Power Training Institute (HPTI)

A study was carried out to upgrade the existing Hydel Training Center Mangla as Pakistan's First multi-disciplinary Hydropower Training Institute (HPTI) for meeting training needs of WAPDA, other public

Manpower Trained at WAPDA Engineering Academy Faisalabad during July-2012 To June-2013

No. of Courses held during 2012-13	No.of Participants Trained				Total
	(BPS) 17-20	(BPS) 11-16	(BPS) 5-10	Private	
40	321	262	---	104	687

organizations as well as Private Sectors and it would be further developed to become a National Center of Excellence. On its completimon, the proposed HPTI Mangla is expected to be a learning facility and a multipurpose Training Institute for providing training to Electrical, Electronics and Mechanical Engineers deployed on various assignments at Hydropower Projects and existing Hydropower Plants to meet the needs of sophisticated and state of the art future hydropower plants. The up-gradation is being financed through AFD France Loan of 1.5 million Euro (Rs.180 million). The progress made during financial year 2012-13 is given as under:-

HPTI Building

- Architectural drawings have been prepared by CDO WAPDA Lahore.
- Detailed Engineering drawings at Location Plan A & B at Bruti'site Mangla is also prepared by CDO WAPDA Lahore
- Procurement of Hardware and Training Tools is in progress with Integration Germany and local Contractor M/s Electra Consultants

Training Aid Equipment

- Procurement of 10 No. new computers a/w all related peripherals has been completed.
- The case for purchase of 04 No. vehicles (01 Toyota Coaster, 01 Hiace, 01 Single Cabin Pick-up & 01 Honda 125 Motorcycle) has been completed. Delivery of 01 Single Cabin Pick & 01 No. Honda 125 Motorcycle has been made by the firms, whereas Purchase Orders for 01 Toyota Coaster & 01 Toyota Hiace have been placed with Toyota Azad Motors and delivery of the vehicles is likely to be received in next few weeks.
- Cases for purchase of of I.T equipment including 01 Public Address System a/w all accessories, 2 No. Lap Tops, 02 No. Multimedia Projects, 02 No. VGA WIFI presentation dongle & 02 No. 6x6 Multimedia Projector Screen (Motorized) have been approved by the Authority in its meeting held on 19th December, 2012. Technical vetting of CEO (PITC) Lahore has also been obtained and purchase orders are being placed with relevant firms for procurement of these IT equipment.

Training Courses (Officers / Subordinates) at Hydel Training Centre Mangla

Name of Course held during 2012-13	No.of Courses	Name of Participants		Total
		Officers BSP 17-20	Staff BSP 5-16	
Refresher Course (pre-promotion) for Sr. Engineers (RC)	01	10	-	10
Sector Specific Course (pre-promotion) for J.Es (SSC)	02	20	-	20
Jr. Engineer Induction Course (JIC)	02	18	-	18
Upper Technical Subordinate Staff (UTS)	01	-	08	08
Internship Training course for student Engineers		91 No. Engineering Students		91
Advance Operator Course (AOC)	01	-	25	25
Basic Operator Training Course (BOC)	01	-	11	11
Basic Craftsman Training Course (BCC)	01	-	20	20
Advance Craftsmen Training Course (ACC)	01	-	28	28
Ministerial Training course for Jr.Clerk/Sr.Clerk & Assistants (MTC-1)	01	-	27	27
Ministerial Staff training course (MTC-2) Categories : Jr.Clerk eligible for promotion as Steno -II	01	-	03	03
Telephone Staff Training Course (TST)	01	-	03	03
Drawing Staff Training Course (DST)	01	-	01	01
Training Course of Steno Gr-II to Gr-I (MTC-3)	01	-	07	07
Computer Office Application Course (COA)	01	-	05	05
Special Training Course for Lift Operators/Lift Attendants	01	-	04	04
Training Course for Data Entry Operators	01	-	03	03
SpecialTraining Course for Plant Operators	01	-	03	03
			TOTAL	287

Departmental Promotion Examination (BPS-1 to 15 Power Wing)

Name of examination held during 2012-13	No. of Exams	No.of Candidates	Passed	Failed	Total
DPE of Sub Engineers/Attendants & ASA	01	76	68	08	76
DPE of Stenographer Grade-II to Gr-I	01	01	Result in process		01
DPE of Store Staff	01	03	Result in process		03
DPE of Telephone Staff	01	02	02	-	02
DPE Maintenance Staff (AFM & Jr. Tech, AC Supervisor, Asstt. Test inspecxtor etc.)	02	40	33	07	40
DPE Maintenance Staff (Cable Jointer, Motor Winder, Crane Operators, DG Mechanic, TRCM Operator, Pump Operator etc.)	02	51	51	0	51
DPE of Line Staff ALM, LM & Line Supdt.	02	12	12	0	12
Total	10	185	166	15	185

Admn Division

During the year 2012-13, the Directorates working under MD (A) maintained sustained improvement of their performance as organizational mission. Brief achievements of ADMN Division are as under:-

Medical Services

WAPDA Hospitals/Dispensaries

Introduction

Pakistan WAPDA along with its sister corporate entities constitute a huge establishment in terms of number of employees. The fact that it has various formations and activities spread throughout the length and width of the country, puts on it even more enormous responsibility to look after its precious human resource. WAPDA strives hard to take care of the social needs of its employees and their dependent family members. Most important of these facilities is the health cover because a healthy and mentally satisfied worker is the backbone and vital asset of any dynamic organisation.

Keeping in view the quantum and critical nature of these requirements it was decided to establish a Departmental Healthcare Delivery System because it will be cost effective for the organization, convenient both for patients and employer as well as can be regulated to avoid misuse.

WAPDA Medical Services with the MOTO of "CURE WITH CARE" is doing a commendable job in providing effective and efficient health care facilities through its network of hospitals and dispensaries in various parts of the country. These services are availed not only by WAPDA employees but are also being extended to the employees of various corporatised units of WAPDA including DISCO's, GENCO's & NTDC.

Mission Statement

To provide effective, efficient and patient responsive health care facilities, including preventive, diagnostic, therapeutic & rehabilitative medical facilities to departmental employees and their dependents as well as client organisations.

WAPDA Health Units

WAPDA Medical Services is providing these facilities to its beneficiaries through 12 regional groups consisting of 12 hospitals, 13 fortified dispensaries and 16 basic dispensaries spread all over the country. These units are functioning under the technical/financial control of Director General Medical Services for achieving the assigned outcomes.

Province	Hospitals	Fortified Dispensaries	Basic Dispensaries
Punjab	6	8	9
Sindh	3	2	7
Khyber Pakhtunkhwa	2	3	1
Balochistan	1	0	0

a. WAPDA Hospitals

Central Hospital at Lahore & 50 bed hospitals at Tarbela, Peshawar, Gujranwala, Faisalabad, Multan & Guddu are fully functional and providing in-house services in all major clinical disciplines. The new building of Hyderabad Hospital has been completed and the hospital shifted therein while Quetta hospital building is near completion and is likely to be commissioned soon.

Name of Hospitals

Lahore
Tarbela
Guddu
Peshawar
Quetta
Hyderabad
Rawalpindi
Multan
Faisalabad
Gujranwala
Mangla
Sukku

It is planned to build a big state of the art hospital of international standards at Islamabad for which a core group is working very hard. Meanwhile, the existing premises of Rawalpindi Hospital has been renovated and a full new block with ramp has been added to facilitate the patients.

Additional construction to house the added services for 20 bed hospital at Sukkur has been completed and will be inaugurated soon after furnishing and equipping. Renovation work at Mangla is also near completion.

b) WAPDA Fortified Dispensaries

The building repairs and additions/ alterations of Fortified Dispensaries at Warsak, RBC Tarbela, Jhang and Jamshoro are in progress to give a proper and decent outlook.

Name of Fortified Dispensaries

Chashma
D.I. Khan
Jamshoro
Sahiwal
Muzaffargarh
RBC, Tarbela
Barotha
Gujrat
Kasur
R.Y. Khan
Jhang
Dadu
Warsak

c) WAPDA Basic Dispensaries

Due to the shifting of WAPDA Hospital, Hyderabad to the newly built premises, the HESCO Dispensary has been merged into main 50 Bed Hospital setup. Consequently, the No. of basic dispensaries has reduced to 16.

Name of Basic Dispensaries

Islamabad
SPS, Faisalabad
Kotri
Sargodha
Karachi
Lakhra
Mirpur Khas
Nawabshah
Larkana
Shalamar, Lahore
Okara
Dargai
Sheikhupura
Sialkot
Bahawalpur
Bahawalnagar

Beneficieries

The facilities provided at these 41 health units are availed by more than 81,000 registered employees which include serving, retired and widows. The dependents of the employees are also entitled and with an average family consisting of six persons, there are nearly 4,86,000 patients who are benefiting from this system.

There is a large chunk of employees who, though drawing cash medical allowance, are nevertheless entitled to limited facilities of consultation, emergency treatment and investigations. These people also add on to the workload of our health units. Last year more than two million patients visited the WAPDA

Health Care delivery system, which means an average daily attendance of more than 6000 patients.

Category of Employees	Registered Employees
Serving	49617
Retired	23858
Widows	7734
Total	81209

Human Resource

Category	Sanctioned	Holding	Vacant
Specialists	132	96	36
General Doctors	269	262	7
Dental Surgeons	22	20	2
Nurses	311	260	51
Paramedics	1342	1069	273

New Inductions

WAPDA Medical Services has always strived to engage professionally sound and skilled human resource for efficient and smooth functioning of the Medical Units. Sufficient number of doctors is always required to cater the patients spread all across the country by providing comprehensive medical cover. During the year 2012-13, 6 specialists and 26 GDMOs have been appointed in WAPDA Medical Services. This is for the first time that sufficient number of doctors are now available in hospitals to provide round the clock rota duty cover.

Promotion of GDMOs, Pharmacist & Assistant Physiotherapist (BPS-17 to BPS-18)

WAPDA has well defined service structure for different cadres of doctors inducted as GDMOs, Specialists and Dental Surgeons in Medical Services. The services of hardworking and dedicated doctors are duly recognized through career progression system with established parameters regulating their promotions from one scale to other. In 2012-13, 14 Doctors, 01 Pharmacist and 02 Physiotherapists have been given promotion from BPS-17 to BPS-18.

Communication System Installation of Landline Telephones & Fax Machines in Fortified/Basic Dispensaries

Ever since the establishment of Fortified/Basic Dispensaries, there was no advanced, rapid and fast communication system which could enable the health unit staff to make instant and prompt reporting to the Regional Group Hospital as well as Medical Directorate. The effort to make arrangement of the essential facility has turned out fruitful and now almost all the health units are equipped with Landline Telephones and Fax machines resulting in close and timely contact within and outside their Region.

Affiliations

a. Lahore hospital attained the status of a teaching facility after its affiliation with Central Park Medical Complex (CPMC), Lahore. Last year final year class entered the hospital for training and thus one batch has passed out. A number of WAPDA consultants have become faculty members and are involved in teaching.

   The elevation of the hospital to the teaching status has resulted in a definite improvement in the contributions in the form of fully-loaded ambulances, Dialysis machines and IT equipment and aids. Plans are now afoot to install CT-Scanner in the near future.

b. WTHC, Lahore is also recognized by the Pakistan Medical and Dental Council (PMDC) for the purpose of approved House Officer Training Programmes in the fields of Surgery, Medicine and Ophthalmology.

c. The process to get the Reconstructive Surgery and Burn Unit department recognized by CPSP for postgraduate training has been initiated and moving swiftly in the right direction.

Community Service Activities

WAPDA Medical Services has always contributed its role in fulfilling the national obligations and in reaching out to the unfortunate affectees of natural disasters or epidemics.

a. Various WAPDA medical camps were held/organized during the last year, which included:-

b. Consultation/examination facilities to the affectees of Dengue Fever in Punjab at various stations. Free laboratory tests/medicines and indoor services amounting to lacs of rupees were provided to the patients who availed the services at these camps.

c. The Family Welfare Centre, established in WAPDA Hospital Complex, Lahore is registered as RHS-B Health Centre under Family Welfare

Planning Department, Government of Punjab. In this centre free medical consultation, supply of medicines relating to Family Planning facilities, Vasectomy & Tubal Ligation Operation facilities are also available. The Multan, Faisalabad, Muzaffargarh, Rawalpindi, Tarbela, Quetta, Hyderabad and Gujranwala intended RHS-B centres are in process of registration. These are serving not only the WAPDA employees but also common people from general public are getting awareness, guidance as well as material help, thus enjoying the relevant benefits. In other WAPDA Medical Units the establishment of Family Welfare Centre is also underway.

Work Load

Overall performance of WAPDA Hospitals / Dispensaries for the period July, 2012 to June, 2013 is summarized as under:-

Human Resource & Administration

- Changing trends in modern management have placed Human Resource at core position in an organization. It is established fact that organization does not but the human capital with diverse energies working therein matters. HR Directorate of WAPDA is an indispensable part of it that deals with the establishment matters of employees (BPS 1 to 20). The scope of this Directorate further widens with advices to Authority on different issues, handling of deputation cases, clarifications (other than Service Rules) and coordination between WAPDA and Ministry of Water and Power by submitting desired information.

- The Human Resource activities handled by this Directorate during the year 2012-13 are as under:-

i. Processing of recruitment of 05 personnel in contract and 38 on daily wages basis in various grades
ii. Induction of internees 11 Nos.
iii. Training of 39 officers/staff
iv. Promotion of 15 Nos. employees
v. Time Scale up-gradation 88 Nos. employees
vi. Adjustment of 04 surplus employees
vii. Processing of welfare, pension, reward, honoraria and long term advance cases etc.

O&M Directorate

O&M Directorate, WAPDA is mainly responsible for conducting O&M studies of WAPDA formations, compiling/publishing WAPDA Manpower Statistics Ready Recknoner bi-annually and conducting Service Review of WAPDA employees BPS-1 to 19 on completion of 20 years service.

O&M Studies

The following O&M studies were carried out and completed by the Scrutiny Committee of O&M Directorate during the year 2012-13:

- Creation of I.T Set up in the office of General Manager (Finance) Power

Services	Lahore	Other Stations	Total
OPD Patients attended.	4,48,959	16,47,054	20,96,013
Emergency/Casualty Attendance.	21,079	2,07,440	2,28,519
Investigations	5,73,433	10,89,904	16,63,337
(i) X-Ray X-Ray	30,160	40,742	70,902
(ii) E.C.G E.C.G	8,524	23,415	31,939
(iii) Lab. Tests Lab. Tests	5,27,065	10,06,750	15,33,815
(iv) Ultra Sounds Ultra Sounds	7,684	14,080	21,764
(v) Others OthersO	9,717	4,917	14,634
Total Admissions	9,501	24,719	34,220
No. of Surgeries (Minor/Major)	3,596	5,413	9,009
No. of cases referred out Hospitals and Specialists	9,656	63,040	72,696
Cardiac cases referred for interventional treatment to panel hospitals.	571	224	795
Antiviral treatment provided for Hepatitis B&C patients.	181	540	721
Cases referred for Renal Transplantation	9	0	9
Service items provided by Family Welfare Centres.	27,468	1,12,848	1,40,316

WAPDA Teaching Hospital Comlex - Lahore

- Creation of 6 posts of Finance Cadre in Power Station, Tarbela
- Creation of posts of Finance Cadre in Power Station, Chashma
- Creation of posts in the office of Chief Resident Representative, Karachi
- Creation of posts of Sr. Instructor, Steno-II & Class Attendant in WAPDA Administrative Staff College, Islamabad
- Creation of posts of Finance Cadre under General Manager Finance (Power) WAPDA
- Creation of three additional posts of Divers GD-I (BPS-17) at Power Station Mangla
- Up gradation of the post of Sr. Budget & Accounts Officer as Director (Accounts) office of Director General (Medical Services) WAPDA, Lahore
- O&M study regarding creation of additional posts for Monitoring, Survey & Hydrology office of General Manager (GBHP)
- Creation of 68 x Additional posts for Fire Fighting Section office of General Manager Tarbela Dam Project, Tarbela.
- Case for creation of 22 x additional posts of Chowkidars under Project Director (H&R) Lahore
- Retention of 243 Special Purpose Posts of Revenue and Security Staff for GBHP.
- Creation of additional 5 posts under Director (Labour & Welfare) WAPDA
- Establishment of I.T Directorate at WAPDA Administrative Staff College, Islamabad
- Additional Staff for Director (Pension) WAPDA
- Creation of 45 additional posts for WAPDA Hospital, Hyderabad
- Creation of 12 No. posts for Fire Fighting Vehicle Staff at Hydel Power Station Warsak

Human Resource Statistical Data

- Effective and efficient manpower planning and development is based on collection and analysis of information about available manpower resources. To achieve this objective, O&M Directorate collects Human Resource data of all formations of WAPDA and publishes WAPDA Manpower Statistics Ready Reckoner bi-annually. The booklet of Manpower Statistics contains all necessary reports of all categories of employees.

- The booklet provides opportunity to the Authority and other Directorates of WAPDA which deal with personal management policies of employees regarding appointments, transfers, postings and training etc.

Keeping in view the utilization of Ready Reckoner, O&M Directorate has always been trying to facilitate WAPDA formations in compilation of Data. In order to streamline and further improve the system, O&M Directorate has now launched a project for on-line HR data collection from all WAPDA field formations/departments/offices. It will help to eliminate the time required for data collection as correct/fresh/clean data will be available at every time for utilization in WAPDA HR Policy formulation and implementation.

Education Directorate

WAPDA is running 40 Educational Institutions comprising two degree colleges and 38 schools at various WAPDA projects throughout the country. These institutes are managed by 750 qualified teachers. More than 18600 students are receiving education in these schools and colleges.

Facilitations during the year

a. Authority is pleased to adopt 4-Tier formula in WAPDA Colleges Tarbela and Guddu as under:-
   - BPS-20 (Professors) 01%
   - BPS-19 (Associate Professors) 15%
   - BPS-18 (Assistant Professors) 34%
   - BPS-17 (Lecturers) 50%

b. Two nos. senior most female Trained Graduate Teachers have been promoted as Headmistress and posted in WAPDA Model High School Gomal Zam Dam Project D.I Khan and WAPDA Model High School Hub Dam Karachi.

c. Contract Service of 46 nos. Trained Graduate Teachers/OLT/Computer Teacher & Librarian were regularized on completion of two years satisfactory service.

d. Contract period of 10 nos. Trained Graduate Teachers was extended for another year.

Security Directorate

General

Security in an ongoing process and its requirements are directly proportional to its magnitude. WAPDA Security is an ever increasing outfit and its multi-directional duties compel it to guard avenues which occur as per new developments. In order to withstand such compulsions not only flexible and sharp approach is needed but implementation becomes round the year responsibility by carrying out rehearsals and exercises.

To act upon such a mandate Security Directorate WAPDA focused its attention on the following more pronounced avenues, which are summarized as:-

Security Directorate (General)

a. Training

To find time and muster manpower in a shift system of duties and over stretched security requirements leaves no time for training. An untrained or forgetful Security Staff is of no use to security. In order to overcome this aspect a very well coordinated effort was made at all project sites/installations to train men in fire power training, boat patrolling and communication skills. A special emphasis was made to cover up gaps by observations, patrolling, erecting of barriers creating obstacles and employing security measures at approaches. The repeated training exercise is a valuable tool for ensuring the safety of WAPDA employees, visitors, foreigners and assets. Special courses were conducted to train manpower at different schools of instruction. Mock exercises were conducted in Tarbela primarily to check the reaction of the Security Staff to any eventuality. Similarly, exercises are planned in all the projects to draw useful lessons and conclusions.

b. Ceremonial Duties

The performance of Security Staff generally remains un noticed in peace time until they perform high profile tasks or ceremonial tasks. The performance of security staff in the year 2012-13 under review added numerous colours in the performance of ceremonial duties. The special effects created on the Independence Day August 14, 2012-13 by introducing special flag hoisting ceremony, Weapons Drill and Parade with Band / Bugle were observed as the eye catching events.

c. Escort Duties

Interfering foreigners activities working for the WAPDA is one of the major activities of miscreants in prevailing security environments in the country. WAPDA Security

Force (WSF) as ever alert and responsive has been able to avert such attempts in totality so far. The shared concept of intelligence and close study of happenings around us are the main guidelines of security policy. To re- read security hazards and to readjust accordingly each time WAPDA Security Force was found prepared which thus hailed WAPDA Security Force in accomplishing Escort and Protection duties at the ceremonies of Munda Dam, Dargai and other installations. So far escort duties have been accomplished with complete safe and security.

d. Fire Fighting

Structural security encompasses effects. Fire fighting is an integral component of security and its performance under the review period was increasingly effective. The unfortunate incidents were contained by reacting so swiftly that none of the incident was allowed to convert from minor to major. In the history of fire fighting special award was given to the fire fighters by the Authority for their outstanding performance. The will to fight under extreme conditions by the fire fighting staff by risking their life even after being engulfed in fire hazards was a reflection of tremendous motivational factor. All fire incidents were fought to their best. The fire incidents in WAPDA House, Lahore were well addressed by fire fighting staff alongwith security staff which was much appreciated by Chairman WAPDA.

e. Necessary instructions received from time to time from Government of Pakistan and other law enforcement agencies are being strictly implemented besides updating our SOPs

In the recent past, the WAPDA Security Force has taken up the shape of highly organized and effective Security Force. The demonstrated results are the reflection of performance. However, a study is in hand to overhaul the Security Set up as per the changing security environments viz a viz creation of new networks and re-designing.

Labour and Welfare Directorate

Labour & Welfare Directorate is mainly responsible to assist the Authority for preservation of industrial peace in WAPDA. To achieve these objectives, this Directorate plans, coordinates, evaluates labour management relations through amicable settlement, human relations and motivation to the workers.

Labour & Welfare Directorate further maintains liaison between Authority, its officers/employees Collective Bargaining Agent as well as other agencies operating in WAPDA to resolve labour conflicts.

This Directorate has been able to control the labour situation effectively throughout Pakistan. Hence, Labour Management Relations in WAPDA remained cordial and noticeable progress was achieved towards promoting sense of security and belongingness amongst WAPDA employees.

A resume of major activities of this Directorate during (preceding financial year) is appended below:-

i. To determine CBA in WAPDA/Corporatized Companies NIRC conducted Referendum on 29th May, 2013. The task of coordination/ provision of facilities during referendum was assigned to this office which was completed successfully.
ii. Different Nominees of CBA were notified by this Directorate to perform duties of Shop Stewards in various offices.
iii. Various complaints/representations regarding individual grievances received from WAPDA employees were processed, genuine grievances got redressed and decisions intimated to all concerned.
iv. WAPDA employees pension cases, grant out of W.W.Fund, marriage grant, educational scholarship, grants to handicapped children of WAPDA employees and GLI cases of retired/deceased employees and widows of deceased employees were processed and got settled.

Different cases of Labour Unions in High Courts and NIRC were defended. Advices sought by different formations regarding labour laws were examined and replied accordingly.

Transport

Transport Directorate WAPDA is operating and maintaining 210 vehicles with a staff of 250.

Performance/Achievement of Transport Directorate During 2012-13

1. Community Service is provided on daily basis to 2,810 WAPDA/PEPCO/NTDC employees using 44 vehicles (buses/coasters/vans) on various routes in and around Lahore.
2. Transport facility is provided daily to 730 school/college going children of WAPDA /Companies employees using 19 vehicles (buses/coasters/vans).
3. 01 Toyota Corolla Car has been purchased to augment existing Transport.
4. 37 old/unserviceable vehicles of different WAPDA formations were inspected and recommended for auction.
5. 05 old/unserviceable vehicles of Transport Directorate were auctioned.
6. Appointment of 13 drivers (on contract basis) was made.
7. To enhance the driving skills of drivers, Transport Directorate at different occasions arranged lectures/presentations on Traffic rules and regulations by City Traffic Police, Lahore, through audio/video means. The presentations were very educative and informative which were attended by large number of employees of Transport Directorate.
8. Efforts have been made to boost up the repair, maintenance work Efficiency/Skills of Unit Repair Organisation (URO) of Transport Directorate, which has resulted into notable saving of expenditures.
9. Re-adjustment of 11 community (Large Vans) routes has been made which has resulted into notable saving of fuel/expenses.
10. Two Training Cadres have been run for Time Scale up-gradation of drivers.
11. In view of meritorious services rendered by the staff of Transport Directorate, 45 employees have been rewarded.

Property Management Cell

Property Management Cell was created by Authority during March, 2002 for title transfer of WAPDA properties and Grid Stations in its name and then allowing ownership rights to corporate entities. Uptill now about 70 percent of identified assets have been got title transferred to WAPDA. 06 DISCOs and 02-GENCOs have been allowed to get title transferred of WAPDA assets in their names. During this process, the working of Cell is outstanding, keeping in view the fact that in many cases, prolonged delays in transfer/mutation had resulted in dis-locating/dis-appearance of record/payment proof.

Career Management Cells

Career Management Cells deal with career planning, development, management of officers of WAPDA and its Satellite Entities to the defined limits. Transfers, promotions, up-gradation, deputations, Training within and outside country, assisting in acquisition of higher qualifications within criteria, formulation of career planning related policies on assignment, etc. of officers from BPS-18 to BPS-20, are also processed in these cells.

During the year under report, Career Management Cell (S&C) Directorate processed/finalized cases of promotion of 74, up-gradation of 116 WAPDA officers of different cadres. The Directorate arranged local and abroad training/inspection visits of 68 officers. 5 court cases were pursued out of which 2 have been decided in favour of WAPDA whereas 3 cases are still under process. Annual Confidential Reports of 124 officers of Grade-17 and above were completed.

Career Management (Power & Finance)

a. Career Management (P&F) Cell deals with career planning and HR matters of Grade 17, 18 & 19 of Hydel Generation & IT officers and BPS-18 & 19 officers of Finance Division WAPDA. Besides, maintaining ACRs of the Hydel, IT and Finance Division officers, it deals with transfers/postings as per criteria of "right man for right job".

b. Promotion/Time Scale Up-gradation to next scale, training (local/abroad), pre-shipment inspection of material abroad and deputation (local as well as abroad) of Hydel, IT & Finance Division officers are also taken care by Career Management (P&F).

c. The salient achievements of Career Management (P&F) Directorate during the year 2012-13 are as under:-

WAPDA Administrative Staff College

- One Promotion Board for Hydel Generation officers for promotion from (BPS-18 to 19) was conducted during February, 2013, 01 officer was approved for promotion.
- Two Promotion Boards for Hydel Generation officers for promotion from BPS-17 to 18 were conducted during November, 2012 and May, 2013. 24 officers were approved for promotion.
- One Promotion Board for IT officers for promotion from BPS-18 to 19 was conducted during April, 2013. 01 officer was approved for promotion.
- One Promotion Board for IT officers for promotion from BPS-17 to 18 was conducted during May, 2013. Three officers were approved for promotion.
- Two Time Scale Up-gradation Boards for IT officers for Time Scale Up-gradation from BPS-18 to 19 were conducted during October, 2012 and February, 2013. Two officers were approved for TSU.
- Two Boards for service regularization of Hydel Generation officers (BPS-17) were conducted during January, 2013 and March, 2013. Fifty seven officers were approved for service regularization.
- Two Boards for service regularization of IT officers (BPS-17) were conducted during January, 2013 and June, 2013. Two officers were approved for service regularization.
- One Promotion Board for Finance Division Officers for promotion from BPS-18 to 19 was conducted during March, 2013. One officer was approved for promotion.
- Two Time Scale Up-gradation Boards for Finance Division officers for TSU from BPS-18 to 19 were conducted during August, 2012 and March, 2013. Seven officers were approved for TSU.
- Three Hydel officers (BPS-19) were sent to attend Senior Management Course held during December, 2012 to February, 2013.
- Four Hydel officers (BPS-19) were sent to attend Refresher Course held during November, 2012.
- Fifteen Hydel & Finance Division officers (BPS-18) were sent to attend Middle Management Course (MMC) held during August-October 2012, November, 2012 to January, 2013, January-March, 2013 and April-May, 2013.
- Ten Hydel officers (BPS-18) were sent to attend Refresher Course (RC) held during May-June, 2013.

- Twenty nine Hydel officers (BPS-17) were sent to attend Junior Management Course (JMC) held during August-October, 2012, November, 2012 to January, 2013, January-March, 2013 and April-June, 2013.
- Ten Hydel officers (BPS-17) were sent to attend Sector Specific (Pre-promotion) Course (SSC) held during January-February, 2013.
- Twenty Hydel officers (BPS-17) on contract were sent to attend Jr. Induction Course (JIC) held during November-December, 2012 and March-May, 2013.
- One Hydel officer (BPS-18) was allowed move over from BPS-17 to BPS-18 w.e.f. 1st December, 1998 as per move over guidelines meant for the purpose.
- One IT officer (BPS-18) was sent on Local deputation with Power Information Technology Company (PITC) during June, 2013.
- Two Finance Division officers (BPS-17) were sent to PIDE, Islamabad to attend the Course on Project Preparation and Appraisal (PPA) held during 10-22 September, 2012.
- One IT officer (BPS-17) was sent to WASC, Islamabad to attend 4 weeks Basic Engineering Course for non Engineers held during September, 2012.
- Three Hydel Generation officers (BPS-18 & 19) were sent to China for witnessing shop test of 3 sets of Repaired Generator Rotor of Jinnah Hydropower Project during January-April, 2013.
- One Hydel Generation officer (BPS-18) was sent to China for pre-shipment inspection, witnessing Factory Acceptance Test (FAT) of 132/220 kV Current Transformer for Switchyard of Mangla Power Station during March, 2013.
- Two Hydel Generation officers (BPS-18 & 19) were sent to China for witnessing Factory Acceptance Test (FAT) of Turbine Spiral Case and Stay Ring for Neelum Jhelum Hydropower Project, Muzaffarabad during March, 2013.
- One Hydel Generation officer (BPS-17) was sent to Switzerland for foreign training of Main Feed Back Transducer for Digital Governors of Unit # 11-14 of Tarbela power Station during April, 2013.
- Two Hydel Generation officers (BPS-18 & 19) were sent to China for Pre-shipment/Factory Acceptance Test (FAT) of 107.5 MVA Single phase Generator Step-Up Power Transformer for Ghazi Barotha Power Complex during May, 2013.
- One Hydel Generation officer (BPS-17) was sent to Thailand & Cambodia for training on Meckong HYCOS Project during April, 2013.
- 362 ACRs of Hydel, IT & Finance Division officers (BPS-17, 18 & 19) were got cleared during, 2012-13.

Services & Estates Directorate

The Services & Estates Directorate is responsible for provision of services to the Authority offices and Directorates under Managing Director (Admn). It looks after the affairs of official/residential accommodation and single officers hostel at Lahore. It also assists the Authority in formulation of accommodation and telephone policies and ensures its implementation. The salient contributions of this Directorate are as under:-

- The Services & Estates Directorate has generated/collected an annual income of Rs.19 million approximately from commercial tenants.
- Boarding & lodging facilities were provided to the WAPDA/PEPCO officers (BPS-17 to 20) at single officers hostels in a befitting manner. Allotment of WAPDA residential accommodation to the officers/officials of WAPDA was made on merit.
- The allocation of office space was made at WAPDA House and Sunny View as per requirement on availability as per Authority's approved yardstick.
- Proper messing services were provided to the Authority, Senior Officers, VIPs and foreign delegates through WAPDA Officers Mess.
- The Services & Estates Directorate ensures provision of quality food at subsidized rates to WAPDA/PEPCO employees at WAPDA House and Sunny View Employees Canteens.
- 181 rent assessment reports of houses to be acquired for WAPDA employees were processed/ finalized during the year under report.

- Approximately 1500 house acquisition cases/ renewals were processed/finalized during the report year.

Central Stationery Store and Press

History
WAPDA Central Stores Stationery was established in 1962 and Printing Press in 1960. Since then, it is playing a vital role for providing stationery items and printing format to all WAPDA/PEPCO offices. On 1st December, 2011, WAPDA Printing Press and Central Stationery Store were merged as one unit and re-named as Central Stationery Store & Press.

Services
Central Store Stationery and Press is a service providing unit. It comprises of three Stores i.e. Paper Store, Forms Store and Stationery Store which deal with formations up to the level of Revenue Officers. Primary function of CSS & Press Directorate is to provide stationery/paper and printed material on competitive rates to all WAPDA/PEPCO formations all over the country by adding very nominal charges. All the stationery items/paper & press material is procured through office of Chief Engineer (Purchase & Disposal) PEPCO.

The sanctioned budget for the financial year 2012-13 was Rs.168,769,753 for the Directorate of CSS & Press. All the jobs/orders received from different formations of WAPDA/PEPCO were timely completed and handed over to the concerned formations on cheaper rates as compared to local market.

CSS & Press has been computerized and all materials are being issued through one window operation to save time and money. Now this office is receiving indents from various formations through Fax/Email and responding through same channels. This office has recovered old outstanding dues from various formations amounting to Rs.75,00,000/- upto 30th June, 2013.

Future Planning
CSS & Press Directorate is trying to launch its Web Page to provide information about stock position and other information regarding CSS & Press to the Indenting formation at their working places. This will further improve efficiency of this Directorate.

WAPDA Central Library
WAPDA Central Library is the main Library of WAPDA, situated at B-43 WAPDA House, Lahore. It offers excellent reading environment with latest material/services to its readers. All regular WAPDA employees are eligible to get membership of the Library without any charges and entitled to borrow two books at a time for a period of four weeks. WAPDA Central Library is an automated Library and its functions, like cataloguing, circulation are being performed by Computer.

Members - 1400
WAPDA Officers/Officials are being encouraged to avail the borrowing facility of books, besides to get membership of the Library to enhance their interest in reading the books.

Objectives and Goals
To provide material and services to WAPDA employees to meet their personal, educational and professional needs. Special emphasis on supplying current reading material and reference services to WAPDA professionals and to develop reading habits of WAPDA employees.

Library Resources

Books
During the financial year 2012-13, 205 books on different topics have been purchased and 58 books were received as donation, which have been added in the Library collection, now the total collection of books is more than 16000 books.

Magazines/Journals
The following 07 Technical and Non-Technical magazines/ journals were also subscribed for the readers of WAPDA Central Library.

i) Reader's Digest
ii) National Geographic
iii) Time
iv) Newsweek
v) The Economist
vi) Pakistan & Gulf Economist
vii) Herald Magazine

Reports

More than two thousand reports/studies of different WAPDA projects are also available for the consultation of WAPDA Professionals. List of some very important reports is given below:-

Feasibility Reports

- Ghazi Barotha Hydropower Project
- Kalabagh Dam Project
- Basha Dam Project
- Tarbela Dam Project
- Akhori Dam Project
- Command Water Management Balochistan
- Command Water Management Sindh
- Study of Economic Feasibility of Nuclear Power in Pakistan
- Pre-Feasibility Report of Bunji Hydropower Project

Completion Reports

- Mangla Dam Project
- Ghazi Barotha Hydropower Project
- Rawal Dam Project
- Simly Dam Project, Vol.III
- Link Canals
- Barrages
  - WASID Reports
  - P&I Reports
  - IBP Reports
  - ACOP Reports
  - GTZ Reports/Studies
  - IWASRI Publications
  - Tipton & Kalmbach (T&P) Reports
  - WAPDA Annual Reports (1959 – 2011-12)
  - Water and Power Resources of West Pakistan by Pieter Lieftinck for World Bank
  - PC-I, PC-II, PC-III
  - Mangla Raising Project Planning Report

Newspapers

The following six newspapers are being purchased in the Library and the retrospect record of "Daily Dawn" since November 2001 is also available in the Library:-

a) Dawn
b) The News
c) Express Tribune
d) Jang (Urdu)
e) Nawa-e-Waqt (Urdu)
f) Express (Urdu)

Services

Internet Facility

To keep our professionals up-dated, internet facility has been provided for latest information/knowledge. For this purpose three Computer Systems have been installed in separate kiosks.

DPE Papers

WAPDA Central Library is also the custodian of previous Departmental Examination Papers of different categories of WAPDA employees and employees from all over Pakistan visit the Library to get photocopies of papers. Relevant material for preparation of DPE Examinations is also made available for this purpose.

WAPDA Sports Complex, Lahore

WAPDA Sports Board

WAPDA is one of the largest organizations creating and developing remarkable sporting atmosphere within its units all over the country. WAPDA Sports Board was established in 1960 for promotion of sports in WAPDA with ultimate goal to uplift the National sports. It was affiliated with Pakistan Olympic Association in 1984. It has made worthwhile contribution towards promotion of almost all disciplines of sports at the National and international level.

Following sports infrastructure is available at WAPDA Sports Complex Kot Lakhpat, Lahore:-

- Hostel for Sports Persons (18 x Rooms)
- Ground/Stadium
  (Athletics, Baseball, Cricket, Football, Handball and other outdoor sports)
- Gymnasium (Seating Capacity 500 #)
  Badminton, Bodybuilding, Boxing, Gymnastics, Table Tennis, Volleyball & Weightlifting - All mat Games viz Judo, Karate, Kabaddi, Taekwondo, Wrestling & Wushu.
- Fitness Club
  Machines for Aerobic and Fitness Exercises-Power Sports and Weight Training
- Basket Ball Court
- Flood Lights
- Swimming Pool
  - 50m International Standard Swimming Pool
  - Facility of Warm up Pool
  - Seating Capacity - 300 x Persons

Performance of WAPDA Sports Board in Sports arena are detailed below:-

National Standing

Total 36 x Men and 20 x Women

Champion

Men

Bodybuilding, Cycling, Handball, Judo, Karate, Kabaddi (Circle), Powerlifting, Squash, Table Tennis, Tennis and Weightlifting (11 #)

Women

Athletics, Basketball, Handball, Hockey, Judo, Karate, Squash, Table Tennis, Tennis, Volleyball and Wushu (11 #)

Runners Up

Men

Athletics, Badminton, Baseball, Boxing, Cricket,

Hockey, Ju-Jitsu, Rowing, Machine Rowing, Swimming, Taekwondo, Tug of War Wrestling and Wushu (14 #)

Women
Cycling, Football, Ju-Jitsu and Taekwondo (4 #)

Third Position
Men
Basketball, Cricket and Water Polo (2 #)

Women
Swimming (1 #)

Others
Men
Chess, Football, Golf, Kabaddi (Asian), Netball, Rifleshooting, Rugby, Volleyball (8 #)

Women
Golf, Netball, Rifleshooting and Water Polo (4 #)

Award of Promotion/Cash Prize to Sports Persons
- 32 players/officials were granted promotion
- 203 players / officials were granted cash award of Rs.1.08 million.

Participation in International Competitions
- 180 players and officials of various sports disciplines were selected to represent Pakistan during various International Competitions.

International Achievements
- Mr. Saadi Abbas of GEPCO (WAPDA) won Bronze Medal during 11th Asian Karate Championship 2012 held in Uzbekistan
- M/s Muhammad Shafiq (GEPCO), Muhammad Siddique (GEPCO), Muhammad Khalil (FESCO) and Musharraf Javed (FESCO) were member of Pakistan Kabaddi Team secured Runners up position during 3rd Kabaddi World Cup 2012 held in India.
- M/s Waqas Sharif (GEPCO), Waseem Ahmad (LESCO) and Imran Shah (LESCO) were member of Pakistan Hockey Team secured Third position during Champions Trophy Hockey Tournament 2012 held in Australia.
- M/s Waqas Sharif (GEPCO), Waseem Ahmad (LESCO) and Imran Shah (LESCO) were members of Pakistan Hockey Team secured 1st position during Asian Champions Trophy Hockey Tournament 2012 held at Qatar.
- M/s Yawar Khan (LESCO), Haris Kamal (NTDC) and Amir Rasheed (FESCO) were members of Pakistan Basketball Team secured Runners up position during South Asian Basketball Championship 2013 held at Bangladesh.
- Mr. Asad Iqbal of LESCO (WAPDA) won Silver Medal during 21st Al Fajr International Indoor Athletics Championship 2013 held at Iran.
- Mr. Amir Atlas Khan of PESCO (WAPDA) won 17th Asian Individual Squash Championship 2013 held at Islamabad.

Organization of Sports Events
- Athletics, Karate, Volleyball and Swimming Competitions of 32nd National Games, 22-28 December 2012 at WSC, Lahore
- Prize Distribution Ceremony of 44th WAPDA Annual Inter Unit Sports Competitions, 7th May 2013 at WSC, Lahore
- 45th WAPDA Annual Inter Unit Football Competition, 25th May to 5th June, 2013 at Lahore
- 45th WAPDA Annual Inter Unit Swimming Competition, 15-17 June, 2013 at Lahore

32nd National Games 2012, Lahore
32nd National Games were held from 22 to 28 December 2012 at Lahore. WAPDA contingent participated in these Games. It is a matter of great honour that WAPDA won Quaid e Azam Trophy first time in the WAPDA sports history by winning 190 Gold, 83 Silver and 46 Bronze Medals (319 Medals) with 6230 Points. Detail is as under:-

WAPDA Endowment Fund for Sports
- Vision of Ex-Chairman WAPDA.
- To arrange regular source of financing to provide sports and education facilities to our youth together with an ultimate aim to enhance the medal tally of Pakistan in International competitions.
- Scheme launched in 2010.
- 73 youngsters have been selected in 1st Intake/Batch.

Disciplines	WAPDA		
	Gold	Silver	Bronze
Athletics	32	25	10
Baseball	1	0	0
Bodybuilding	8	2	0
Boxing	7	1	2
Cycling	16	4	3
Football	1	1	0
Gymnastics	7	3	1
Handball	2	0	0
Ju-Jitsu	19	0	0
Kabaddi	1	0	0
Karate	16	1	1
Rubgy	0	0	0
Rifleshooting	14	6	5
Rowing	6	5	4
Softball	0	0	0
Squash	2	0	0
Swimming	14	20	14
Table Tenis	7	3	1
Taekwondo	12	7	2
Tennis	3	1	0
Tug of War	1	0	0
Volleyball	2	0	0
W/lifting	5	2	1
Wrestling	7	0	0
Wushu	7	2	2
TOTAL MEDALS	190	83	46
POINTS	6230		

Players	Disciplines	Gold Medals		
		Individual	Team	Total
Ms. Raheela Bano	Cycling	6	3	9
Mr. Zahid Ali	Rifleshooting	2	4	6
Mr. Ghulam Muhammad	Swimming	4	2	6
Ms. Rabia Ashiq	Athletics	3	1	4
Mr. Sabir	Cycling	3	1	4
Mr. Abbas	Rifleshooting	1	3	4
Mr. Asim Qureshi	Table Tennis	1	3	4
Mr. Muhammad Afzal	Gymnastics	2	1	3
Mr. Khurram	Gymnastics	2	1	3
Ms. Kalsoom Hazara	Karate	1	2	3
Mr. Akhtar	Rifleshooting	2	1	3
Mr. Abdul Aziz	Swimming	2	1	3
Mr. Mazhar	Swimming	1	2	3
Mrs. Ghazala Basit	Table Tennis	-	3	3
Ms. Aysha Ansari	Table Tennis	1	2	3

- 59 youngsters have been selected in 2nd Intake/Batch.
- 42 youngsters have been selected in 3rd Intake/Batch
- Education & training allowance (Rs.2,000 + Rs.3,000) Rs.5,000.
- Coaching/training facilities at door step.

Rules Directorate

The core function of Rules Directorate is to promulgate Service Rules, issue Amendments and Clarifications and also to adopt the instructions of Government of Pakistan issued from time to time and issue amendments accordingly with the approval of Authority. The Directorate presently maintains following rules:-

a. Manual of General Rules (containing 14 different rules)
b. Service Rules Officers (23 cadres)
c. Service Rules Staff (24 cadres)
d. Guidelines for ACR (book)
e. Compendium of Important Instructions Volume I up to 1987
f. Compendium of Important Instructions Volume II up to 1991
g. Compendium of Important Instructions Volume III up to 2001
h. Compendium of Important Instructions subject wise updated and printed 2010-2012 as under:-

(1) Disciplinary Rules
(2) Conduct Rules
(3) Medical Rules
(4) Grant of Advances Rules
(5) Transport Rules
(6) Establishment Manual (Rules/Instructions)
(7) Compendium of Miscellaneous Instructions
(8) Compendium of WAPDA Secretariat/PEPCO

i. Transport Rules book (Reprint 2012)

This Directorate also takes up cases with various Ministries through DG (HR&A) for bringing WAPDA Rules at par with Federal Government. Rules Directorate also issues clarifications on Service/General Rules on receipt of references from various WAPDA formations.

During the year 2012-13, the progress of this Directorate has been as under:-

Amendments/Clarifications

a.	Clarifications	70
b.	Amendments	18
c.	Comments/Opinion	107

Public Relations Division

This division effectively continued to project WAPDA's achievements and activities through print and electronic media to enhance the organization's image. In addition, efforts were made to educate the public on the achievements and its role in nation building activities through publication of articles in newspapers as well as stories and executives participation in electronic media programme.

During the year, this division issued 365 press releases and clarifications to project WAPDA's activities and to alleviate misgivings created in public mind by certain news items published in the national and regional press. Projection through documentaries and talks on TV and Radio were organized. With a view to imparting information about WAPDA, press conferences of Chairman were arranged.

The division arranged publication of as many as 546 tenders, pre-qualification and other notices for various WAPDA formations in the national and regional newspapers of Pakistan during the year. In addition to this, this division also arranged display advertisements in connection with inaugural / ground breaking ceremonies of the Projects. Protocol was provided to a number of delegates from inland and abroad who visited WAPDA's completed and ongoing projects and WAPDA headquarters.

Publication of WAPDA Khabarnama, WAPDA Annual Report and Telephone Directory continued. Circulation of these publications was ensured inland and abroad to the interested readers.

CONSOLIDATED BALANCE SHEET (Water, Power and Co-ordination Wings)
AS AT 30TH JUNE, 2013

	Consolidated Amounts 30-06-2013 (Rs. in Millions)
Fixed Assets	
Operating Fixed Assets	217,047.074
Capital Works	
In Progress	260,953.651
Completed Works	134,902.804
Total Capital Works	395,856.455
Long Term Investments	189,833.162
Notes Receivables	7,956.918
Long Term Advances, Deposits, Prepayments & Deferred Costs	320.414
Total Fixed Assets	811,014.023
Current Assets	
Stock & Stores	3,036.050
Printing Work in Progress	1.943
Sundry Debtors	8,704.579
Endowment Fund for Sports	80.000
Advances	20,630.219
Other Receivables	109,963.493
Short Term Investments	2,890.881
Cash and Bank Balances	5,048.383
Total Current Assets	150,355.548
Total Assets	961,369.571
Capital / Contributions & Surplus	
Share Capital	83,660.796
Capital Reserves	340,990.114
Revaluation Surplus	51,075.402
Investment by Govt. of Pakistan	248,607.892
Contributions / Grants	74,572.869
Surplus up-to Previous Year	6,847.751
Surplus (Deficit) for the Year	(1,996.104)
	4,851.647
Total Capital / Contributions & Surplus	803,758.720
Non-Current Liabilities	
Long Term Loans and Bonds	95,106.558
Liability under Ijara Financing	1,196.078
Deferred Liability	14,489.342
Total Non-Current Liabilities	110,791.978
Current Liabilities	
Deposits	293.238
Creditors	3,835.185
Accounts Payables	34,279.401
Current Maturity of Loans & Bonds	6,577.530
Short Term Liabilities and Borrowings	1,198.745
Accruals and Other Liabilities	634.774
Total Current Liabilities	46,818.873
Total Capital & Liabilities	961,369.571

CONSOLIDATED BALANCE SHEET (Water, Power and Co-ordination Wings)
AS AT 30TH JUNE, 2013

	Water Wing	Power Wing	Co-ordination Wing	Consolidated Amounts
	30.06.2013 Rs.	30.06.2013 Rs.	30.06.2013 Rs.	30.06.2013 Rs. In Millions
Fixed Assets				
Operating Fixed Assets	12,385,000	216,194,337,000	840,352,453	217,047.074
Capital Works				
In progress	207,892,600,000	52,425,613,000	635,438,286	260,953.651
Completed Works	134,902,804,000	---	---	134,902.804
Total Capital Works	342,795,404,000	52,425,613,000	635,438,286	395,856.455
Long Term Investments	---	189,833,162,000	---	189,833.162
Notes Receivables	---	7,956,918,000	---	7,956.918
Long Term Advances, Deposits, Prepayments & Deferred Costs	---	320,414,000	---	320.414
Total Fixed Assets	342,807,789,000	466,730,444,000	1,475,790,739	811,014.023
Current Assets				
Stock & Stores	---	2,896,187,000	139,862,595	3,036.050
Printing Work in Progress	---	---	1,943,498	1.943
Sundry Debtors	874,236,000	6,337,770,000	1,492,572,884	8,704.579
Endowment Fund for Sports	---	---	80,000,000	80.000
Advances	371,051,000	19,904,432,000	354,736,132	20,630.219
Other Receivables	3,487,330,000	104,269,089,000	2,207,073,659	109,963.493
Short Term Investments	---	1,670,881,000	1,220,000,000	2,890.881
Cash and Bank Balances	1,005,028,000	3,963,730,000	79,624,732	5,048.383
Total Current Assets	5,737,645,000	139,042,089,000	5,575,813,500	150,355.548
Total Assets	348,545,434,000	605,772,533,000	7,051,604,239	961,369.571
Capital/Contributions & Surplus				
Share Capital	---	83,660,796,000	---	83,660.796
Capital Reserve	---	340,990,114,000	---	340,990.114
Revaluation Surplus	---	51,075,402,000	---	51,075.402
Investment by Govt. of Pakistan	248,183,059,000	424,833,000	---	248,607.892
Contributions/Grants	71,408,323,000	3,125,478,000	39,068,294	74,572.869
Surplus upto Previous Years	2,051,474,000	---	4,796,277,467	6,847.751
Surplus (Deficit) for the Year	(1,032,993,000)	---	(963,111,372)	(1,996.104)
	1,018,481,000	---	3,833,166,095	4,851.647
Total Capital/Contributions & Surplus	320,609,863,000	479,276,623,000	3,872,234,389	803,758.720
Non-Current Liabilities				
Long Term Loans and Bonds	23,668,641,000	71,437,917,000	---	95,106.558
Liability under Ijara Financing	---	1,196,078,000	---	1,196.078
Deferred Liabilities	---	14,489,342,000	---	14,489.342
Total Non-Current Liabilities	23,668,641,000	87,123,337,000	---	110,791.978
Current Liabilities				
Deposits	86,660,000	---	206,577,772	293.238
Creditors	3,723,614,000	---	111,570,632	3,835.185
Accounts Payables	456,656,000	30,964,992,000	2,857,753,627	34,279.401
Current Maturity of Loans & Bonds	---	6,577,530,000	---	6,577.530
Short Term Liabilities and Borrowings	---	1,198,745,000	---	1,198.745
Accruals and other liabilities	---	631,306,000	3,467,819	634.774
Total Current Liabilities	4,266,930,000	39,372,573,000	3,179,369,850	46,818.873
Total Capital & Liabilities	348,545,434,000	605,772,533,000	7,051,604,239	961,369.571

WAPDA WATER WING (WATER SECTOR PROJECTS / FORMATIONS)
STATEMENT OF ACCOUNTS AS AT 30TH JUNE, 2013

(Rs. in Million)

	As at 30-06-2013	As at 30-06-2012
ASSETS		
INFRASTRUCTURE DEVELOPMENT	342,795.404	314,407.279
On-Going Projects	207,892.600	188,679.869
Completed Projects	134,902.804	125,727.410
OTHER ASSETS	12.385	13.336
CURRENT ASSETS	5,737.645	2,823.800
Cash, Bank & Imprest Balances	1,005.028	1,414.517
Deposit & Advances	371.051	349.442
Sundry Debtors	874.236	366.675
Other Receivables	3,382.874	564.051
Clearing Account	104.456	129.115
TOTAL ASSETS	348,545.434	317,244.415
CAPITAL & LIABILITIES		
CAPITAL EMPLOYED	343,260.023	312,450.464
On-Going Projects	206,743.579	185,106.035
Completed Projects	136,516.444	127,344.429
CURRENT LIABILITIES	4,266.930	2,742.477
Sundry Creditor	3,723.614	1,969.137
Other Payables	371.857	476.658
Deposit Accounts	86.660	98.063
Clearing Accounts	84.799	198.619
OTHER RECEIPTS	1,018.481	2,051.474
TOTAL CAPITAL & LIABILITIES	348,545.434	317,244.415

(HYDROELECTRIC - NEPRA REGULATED BUSINESS)
STATEMENT OF FINANCIAL POSITION AS AT 30TH JUNE, 2013

	2013	2012
	(Rupees in thousand)	
RESERVES AND LIABILITIES		
Equity Interest		
Government of Pakistan's Investment	74,138,796	72,522,716
Reserves	79,491,505	88,489,646
	153,630,301	161,012,362
Revaluation Surplus	51,075,402	54,282,399
	204,705,703	215,294,761
Non Current Liabilities		
Loans and Borrowings	62,916,879	54,715,389
Deferred Grants	3,550,311	596,152
Deferred Liabilities	14,702,615	11,590,077
	81,169,805	66,901,618
Current Liabilities		
Creditors, Accrued and Other Liabilities	18,085,102	10,581,842
Liability against Assets subject to Ijarah	---	8,000,000
Accrued Interest	631,306	358,469
Short Term Borrowings	---	1,846,578
Short Term Liabilities	1,193,021	48,731,899
Current portion of Loans and Borrowings	5,850,854	5,189,035
	25,760,283	74,707,823
	106,930,088	141,609,441
	311,635,791	356,904,202
ASSETS		
Non Current Assets		
Property, Plant and Equipment	268,537,939	251,854,270
Long Term Advances and Receivables	296,457	324,425
Long Term Security Deposit	1,927	1,837
	268,836,323	252,180,532
Current Assets		
Stores and Spares Parts	2,896,187	2,626,951
Trade Debts	6,337,770	83,038,497
Advances and other Receivables	29,549,424	8,309,509
Short Term Investments	1,670,881	7,135,259
Cash and Bank Balances	2,345,206	3,613,454
	42,799,468	104,723,670
	311,635,791	356,904,202

(HYDROELECTRIC - NEPRA REGULATED BUSINESS)
INCOME STATEMENT FOR THE YEAR ENDED 30TH JUNE, 2013

	2013	2012
	(Rupees in thousand)	
Revenue	42,893,375	39,861,048
Cost of Electricity	20,325,629	19,172,865
Gross Margin	22,567,746	20,688,183
Operating Expenses	747,345	596,345
Operating Profit	21,820,401	20,091,838
Other Income	1,048,511	1,462,174
	22,868,912	21,554,012
Hydel Levies	6,831,345	6,840,443
	16,037,567	14,713,569
Finance Cost	4,115,051	4,738,822
Net Profit for the year	11,922,516	9,974,747

(HYDROELECTRIC - NEPRA REGULATED BUSINESS)
STATEMENT OF CASH FLOWS FOR THE YEAR ENDED 30TH JUNE, 2013

	2013	2012
	(Rupees in thousand)	
CASH FLOWS FROM OPERATING ACTIVITIES		
Net Profit for the Year	11,922,516	9,974,747
Adjustments for:		
Depreciation	7,931,617	8,412,657
Finance Cost	4,115,051	4,738,822
Ijarah Rental	1,505,963	1,614,809
Employee Benefits	5,614,373	4,540,680
Amortization of Grants	(136,308)	(639,647)
	19,030,696	18,584,987
	30,953,212	28,559,734
Working Capital Changes:		
(Increase) / Decrease in Current Assets:		
Stores, Spare Parts and Loose Tools	(269,236)	(199,715)
Trade Debts	76,700,727	(19,243,413)
Advances and Other Receivables	(21,239,915)	(5,465,988)
Increase / (Decrease) in Current Liabilities:		
Short Term Liabilities	(47,538,878)	9,339,214
Short Term Borrowings	(1,846,578)	(2,858,000)
Trade and Other Payables	7,503,260	6,638,935
	13,309,380	(11,788,967)
Cash Generated from Operations	44,262,592	16,770,767
Finance Cost Paid	(3,842,214)	(5,586,117)
Ijarah Rental Paid	(2,157,052)	(1,744,716)
Net Cash Generated from Operating Activities	38,263,326	9,439,934
CASH FLOWS FROM INVESTING ACTIVITIES		
Capital Expenditure Incurred on Property, Plant and Equipment	(24,295,030)	(15,281,824)
Redemption Sinking Fund	5,464,378	(5,666,766)
Long Term Advances and Receivables	27,968	(70,013)
Long Term Security Deposit	(90)	(60)
Net Cash used in Investing Activities	(18,802,774)	(21,018,663)
CASH FLOWS FROM FINANCING ACTIVITIES		
Proceeds from Interest Bearing Loans and Borrowings	13,035,126	15,611,142
Interest Bearing Loans and Borrowings Repaid / Transferred	(4,492,075)	(4,994,846)
Capital Inducted by GoP	1,616,080	2,342,744
Capital Reserve Redeemed	(24,127,654)	---
Employee Benefits Paid	(1,850,744)	(1,172,761)
Repayment against WAPDA Sukkuk - 1	(8,000,000)	---
Grants Transferred / Received	3,090,467	123,478
Net Cash Generated from Financing Activities	(20,728,800)	11,909,757
Net Increase in Cash and Cash Equivalents During the Year	(1,268,248)	331,028
Cash and Cash Equivalents at the Beginning of the Year	3,613,454	3,282,426
Cash and Cash Equivalents at the End of the Year	2,345,206	3,613,454

POWER WING CONSOLIDATED BALANCE SHEET
AS AT 30TH JUNE 2013

(Rupees in thousand)

	2013		2012	
	NEPRA Regulated Business	Other Business	NEPRA Regulated Business	Other Business
EQUITY AND LIABILITIES				
Share Capital and Reserves				
Share Capital	74,138,796	9,522,000	72,522,716	9,522,000
Capital Reserves	79,491,505	261,498,609	88,489,646	236,918,061
Revaluation Surplus	51,075,402	---	54,282,399	---
	204,705,703	271,020,609	215,294,761	246,440,061
Non Current Liabilities				
Interest Bearing Loans and Borrowings	62,916,880	8,521,038	54,715,389	7,747,716
Liability against Assets Subject to Ijarah	---	---	8,000,000	---
Deferred Grants	3,550,312	---	596,152	---
Deferred Liabilities	14,702,615	982,805	11,590,077	582,535
	81,169,807	9,503,843	74,901,618	8,330,251
Current Liabilities				
Other Payables	18,085,102	12,879,890	10,581,842	14,028,349
Accrued Interest	631,306	---	358,469	---
Short Term Borrowings	---	---	1,846,578	---
Short Term Liabilities	1,193,021	5,724	48,731,899	19,414,950
Current Portion of Loans and Borrowings	5,850,854	726,676	5,189,035	717,837
	25,760,283	13,612,290	66,707,823	34,161,136
	106,930,090	23,116,133	141,609,441	42,491,387
	311,635,791	294,136,742	356,904,202	288,931,448
ASSETS				
Non Current Assets				
Net Operated Assets	216,126,281	68,056	186,993,717	63,657
Capital Work in Progress	52,411,658	13,955	64,860,553	13,429
Investment in Subsidiaries	---	1,386,048	---	1,386,048
Investment in Associates	---	3,573,115	---	3,572,563
Long Term Investments	---	184,873,999	---	184,874,551
Notes Receivables	---	7,956,918	---	8,042,686
Long Term Advances and Receivables	296,457	21,845	324,425	724,668
Long Term Security Deposit	1,927	185	1,837	185
	268,836,323	197,894,121	252,180,532	198,677,787
Current Assets				
Stores, Spare Parts and Loose Tools	2,896,187	---	2,626,951	---
Trade Debts	6,337,770	---	83,038,497	---
Advances and Other Receivables	29,549,424	94,624,097	8,309,509	88,081,128
Short Term Investments	1,670,881	---	7,135,259	---
Cash and Bank Balances	2,345,206	1,618,524	3,613,454	2,172,533
	42,799,468	96,242,621	104,723,670	90,253,661
	311,635,791	294,136,742	356,904,202	288,931,448

POWER WING CONSOLIDATED INCOME STATEMENT
FOR THE YEAR ENDED 30TH JUNE 2013

	2013		2012	
	NEPRA Regulated Business	Other Business	NEPRA Regulated Business	Other Business
Sales / Services Income	42,893,375	461,418	39,861,048	424,439
Cost of Electricity	20,325,629	617,020	19,172,865	559,105
Gross Profit	22,567,746	(155,602)	20,688,183	(134,666)
Operating Expenses	747,345	49,087	596,345	42,589
Operating Profit	21,820,401	(204,689)	20,091,838	(177,255)
Other Income	1,048,510	2,631,812	1,462,174	3,133,708
	22,868,911	2,427,123	21,554,012	2,956,453
Hydel Levies	6,831,345	---	6,840,443	---
	6,037,566	2,427,123	14,713,569	2,956,453
Finance Cost	4,115,051	671,420	4,738,822	437,875
Net Profit for the Year	11,922,516	1,755,703	9,974,747	2,518,578

CO-ORDINATION WING FINANCIAL STATEMENTS FOR THE YEAR ENDED 30TH JUNE, 2013

	30-06-2013 Rs.	30-06-2012 Rs.
Tangible Fixed Assets		
Operating Fixed Assets	840,352,453	752,518,447
Capital Work in Progress	635,438,286	456,861,427
	1,475,790,739	1,209,379,874
Current Assets		
Stock & Stores	139,862,595	116,212,529
Work in Progress (Printing)	1,943,498	1,358,731
Debtors, Advances & Other Receivables	4,054,382,675	3,593,510,346
Endowment Fund for Sports	80,000,000	80,000,000
Short Term Investments	1,220,000,000	1,370,000,000
Cash and Bank Balances	79,624,732	62,001,569
	5,575,813,500	5,223,083,175
Total Assets	7,051,604,239	6,432,463,049
Equity/Contribution & Surplus		
Equity/Contribution	39,068,294	39,068,294
Surplus up-to Previous Year	4,796,277,467	5,371,641,021
Deficit for the Year	(963,111,372)	(575,363,554)
	3,833,166,095	4,796,277,467
Current Liabilities		
Deposits	206,577,772	96,206,617
Creditors and Accounts Payable	2,969,324,258	1,496,804,570
Accruals and Other Liabilities	3,467,819	4,106,101
	3,179,369,850	1,597,117,289
Total Equity and Liabilities	7,051,604,239	6,432,463,049

Ministry of Water & Power
Govt. of Pakistan Islamabad
(As on June 30, 2013)

Minister of Water & Power
Khawaja Muhammad Asif

Secretary, Water & Power
Anwar Ahmad Khan

Chairman WAPDA
Syed Raghib Abbas Shah

Senior WAPDA Managers
(As on June 30, 2013)

Member (Water)
Hasnain Afzal
(Addl. Charge)

CEO/Advisor on Mega Projects
Lt. Gen. (R)
Muhammad Zubair

GM(C&M) Water
Sherin Khan

GM (Hydro Planning)
Shoaib Iqbal

GM/PD (Neelum Jehlum Hydro Power Company) Muzaffarabad AJK.
Syed Ali Raza Shah
(Addl. Charge)

GM TDP Tarbela
Hazrat Umar

GM Ghazi Brotha
Feroz-ud-Din
(Addl. Charge)

GM (P&D)
Muhammad Ashraf Abid

GM(M&S)
Ghulam Ali Soomro
(Acting Charge)

GM(Central)Water
Riaz Ahmad Mughal
(Acting Charge)

GM(Basha Dam)
Shamshad Muhammad Khan
(Acting Charge)

GM(CDO) Water
Tanveer Hussain
(Acting Charge)

GM (Projects) North
Rashid Ali Khan
(Addl. Charge)

GM (Projects) South
Amir Bux Mirani
(Addl. Charge)

GM (P) NA
Brig. (R)
Muhammad Zareen
(Addl. Charge)

GM (TS)
Hasnain Afzal

GM (Fin) Water
Iftikhar Rafique

GM (LA&R)
Aftab Ahmad Asif
(On Deputation)

Advisor on DBD
Dr. Izhar-ul-Haq

Consultant Mega Dam
Abdul Khaliq Khan

Member (Power)
Rizwan Ahmad
(Addl. Charge)

GM (Coord.)
Fazal i Rabbi

GM(Hydel) Operation
Rizwan Ahmad

GM (Hydel) Dev.
Muhammad Amin Khalil

GM (Finance) Power
Najib Tariq
(Addl. Charge)

GM (Training)
Muhammad Khalid Mehmood
(Current Charge)

GM/PD UET Fsd.
Tahir Basharat Cheema

Member (Finance)
Syed Nazakat Ali Shah
(Addl. Charge)

GM (I&P)
Najib Tariq

GM (CCC)
Muhammad Hanif

GM(Fin)Coord
Syed Nazakat Ali Shah

DG (Finance) Water
Sajjad Ahmad

Chief Auditor
Ghulam Mustafa

Secretary WAPDA
Muhammad Imtiaz Tajwar

PSO to Chairman WAPDA
Brig. (R) Mukhtar Ahmad

Director (Sectt.)
Syed Liaqat Ali

Managing Director (Admin)
Naveed Akram Cheema

DG (HR & Admn)
Muhammad Zafar

DG (Services)
Muhammad Junaid Afzal

DG (Sports) WSB
Mian Riffat Mehmood

DG (CM) Water
Aziz-ur-Rehman

DG WASC Isd.
Riffat Ara Qureshi