WAPDA
ANNUAL REPORT
2022 - 2023

DIAMER BASHA DAM

DASU HPP

TARBELA 5th EXT. HPP

MOHMAND DAM

Water And Power Development Authority - Pakistan
www.wapda.gov.pk

بسم الله الرحمن الرحيم

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AUTHORITY

As on June 30, 2023

Engr. Lt. Gen Sajjad Ghani (Retd)
Chairman

Mr. Naveed Asghar Ch.
Member Finance

Mr. Jawaid Akhtar Latif
Member Water

Mr. Jamil Akhtar
Member Power

ACKNOWLEDGEMENT

Pakistan Water and Power Development Authority (WAPDA) was established through an Act of Parliament in 1958. It is an autonomous and statutory body under the administrative control of the Federal Government. WAPDA presents its Annual Report for the Financial Year (FY) 2022-23 in accordance with Section 21(1) of WAPDA Act 1958. The Report gives readers a detailed account of development activities undertaken by WAPDA over the last one year as well as future development of Water Sector Projects.

After its establishment, a number of ongoing Water Development Projects were handed over to it for completion and a little later in 1960, the task of developing and managing entire water resources for irrigation, drainage, prevention of water logging and salinity and reclamation of affected land also became its domain. On signing of the Indus Basin Treaty in 1960, the Organization was entrusted with the work of constructing sixteen components of historic Indus Basin Project (IBP) including two dams, each at Tarbela and Mangla, five Barrages, one gated syphon and eight inter-river link Canals. In addition to the IBP components completion, four other dams, one barrage and one lift irrigation scheme were executed.

The role of WAPDA in the field of arresting water logging and salinity aims at the life-saving action for Agriculture of Pakistan which remains backbone of the National Economy. Since its inception in 1958, WAPDA has executed more than 70 Salinity Control and Reclamation Projects (SCARPs) to cover an area of 18.32 million acres of the affected land for putting the waterlogged and saline acreage back into production.

During FY 2022-23, WAPDA continued harnessing water and hydropower resources in the country to achieve its goal to put Pakistan forward on the track of Social Economic Development. After successful completion & operation of Kachhi Canal (Phase-I), RBOD-I, RBOD-III, Golen Gol, Tarbela 4th Extension and Neelum Jhelum Hydropower Projects, WAPDA is continuously striving for completion of Dasu HPP (Stage-I), Diamer Basha Dam, Mohmand Dam, Kurram Tangi Dam (Stage-I), Tarbela 5th Ext. HPP, Nai Gaj Dam and Kachhi Canal (Remaining Works) Project. Completion of these Projects will help to address acute water shortage challenges in addition to generation of cheap and clean hydel electricity. WAPDA has also completed feasibility studies of Patan HPP, Chiniot Dam, Shyok Dam and Thakot HPP. Feasibility Study of Sindh Barrage Project is in progress. Moreover, feasibility studies of Murunj Dam, Shatung Nullah Diversion Project and Thar Canal Project are under process whereas detailed engineering design for Harpo HPP and Hingol Dam are ongoing. Review of feasibility study and preparation of detailed engineering CRBC (Lift Cum Gravity) Project is under process.

WAPDA is maintaining a network of Hydro-meteorological Station for collection of river flow and climate data from Upper Indus Basin to Sea and shares it with different formations in the form of daily water situation of the country for forecasting of availability and distribution of water among Provinces, flood warnings and operation of water infrastructure in the country. WAPDA is in a process to convert manual gauging stations to automated telemetric real time hydrometeorological system for prompt decision making. In this regard, real time water monitoring telemetry system at 07-key sites as a pilot project (IBIS) under Phase-I has been taken up by WAPDA. PC-I was prepared by WAPDA in consultation with all the stakeholders and was approved by CDWP in June, 2022.

WAPDA is indebted to all its development partners and appreciates the support provided by various local and global Organizations and Agencies that include Provincial and Federal Departments, World Bank, ADB, IDB, AFD, KfW, CIDA, Kuwait Fund, Saudi Fund, Government of China, China Exim Bank, Korean Investment Bank, OPEC, SFD, USAID, and JICA etc. WAPDA acknowledges the contribution made by its personnel, Consultants and the Contractors (Local/Foreign) who are devotedly working on various dams, operation and maintenance of the projects and up-gradation of Hydel Power Projects.

In line with its mandate, WAPDA is working hard to harness water and hydropower resources in the country. The idea is to generate affordable, clean electricity, which will provide relief to the consumers by bringing down the power tariff. The building of water storages will meet the water requirements besides playing their role for mitigation of flood hazards. A comprehensive account of activities undertaken by WAPDA is as follows:

Increasing Operational Efficiency

Hydel Power Stations operated by WAPDA produced 31,286 Million Kilowatt Hour (MkWh) net energy during FY 2022-23, which is 25.8 % 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 is also undertaking rehabilitation of its existing Hydel Power Stations to ensure their more reliable and sustainable operation for optimum generation. Rehabilitation of 22 Megawatt (MW) Jabban Hydroelectric Power Station was completed. Mangla Refurbishment Project Contract for Package I & VII (Units 1~6), Package-II (Refurbishment of Powerhouse Cranes), Package-III-a (Supply of Main Power Transformers Units 3~6), Package-III-b (Supply of Main Power Transformers Units 1~2), Package-IV-a (Supply of Turbine Inlet Valve), Package-V (Balance of Plant Mechanical), Package-VI+VIII (Balance of Plant Electrical and Control Systems) and Package-IX (Switchyard) have been awarded. Bidding process for Package-III- c (Supply of Main Power Transformers Units 9~10) has been started. The scheme envisages increase in total installed capacity of the Power Station from 1,000 MW to 1,310 MW through optimum utilization of additional water and higher head available after completion of Mangla Dam Raising Project. USAID has provided a grant of US $ 150 million for Up-gradation of Units 1~6 & 9~10 and other miscellaneous works in the first stage, whereas AFD has provided a loan of Euro 90 million for the Up-gradation of Units 1~4. After refurbishment, Units 5 & 6 handed over to WAPDA on April 01, 2022.

Overall Physical progress = 59 %.
Overall Financial Progress = 43.26 %.

Feasibility study and detailed design for Rehabilitation, Up-gradation and Modernization of Warsak Hydel 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. PC-I of the project has been approved by ECNEC amounting to PKR 22,254 million on July 9, 2015. For financing of the project, loan agreements have been signed amounting to Euro 130 million with AFD (France), KfW (Germany) and European Investment Bank (EIB) along with European Union Grant of Euro 4.5 million. Consultancy Services Agreement for construction supervision and project management has also been signed with M/s Warsak Rehabilitation Consultants (WRC). Contract agreement for civil works has been signed on April 12, 2021 with M/s Technicon. Access road to firefighting tank completed. Flexible wire mesh installation activities in the switchyard area for rock face protection works have been resumed. Core drilling / water pressure tests for post tensioned anchors in the power house are in progress. Thirty-one (31) core drilling holes have been completed so far. Crack repair works in the northern and southern stair case are in progress. Concrete and reinforcement works in the oil/water separator tank have been completed. Checkered plate fabrication is in progress at Technicon Workshop Peshawar. Physical Progress= 21.04% E&M Contract was signed with M/s GE Hydro & Sinohydro China JV on November 05, 2021. Generator Assessment tests of Unit No. 06 started on June 02, 2023 and are in progress. The E&M Contractor performed grounded resistance test and main crane certification test in the Powerhouse. Generator stator bar FAT has been performed from May 29 to June 12, 2023 in Switzerland under the surveillance of The Employer and the Engineer. Unit 5 & 6 Runner FAT has been performed from June7 to June 16, 2023 in China under the surveillance of The Employer and The Engineer Physical Progress = 15.07%. In the history of WAPDA, first experimental flushing of Warsak Reservoir was successfully carried out by WAPDA/NESPAK-GLM-HB Consultants w.e.f. July 19 to July 22, 2022.

Overall Physical Progress = 26.17%
Overall Financial Progress = 21.4%.

ECNEC in its meeting dated November 14, 2018, approved PC-I amounting to Rs. 4,050.365 million towards rehabilitation and capacity enhancement of Dargai Hydel Power Station from 20 MW to 22 MW. This project is being financed by AFD through soft loan of € 50 million which was signed on July 19, 2019. Consultancy services agreement was awarded to M/s Pakistan Engineering Services Pvt. Ltd in association with M/s Knight Piesold Consulting USA on December 16, 2020. Pre-qualification of Civil + E & M Contractors have been completed with four (04) Nos. of JVs notified as shortlisted. Detailed engineering design and tender documents have also been finalized and awaits Donor's NOL towards issuance to the pre-qualified bidders. Award of works contract is anticipated by December, 2023 with 36 months completion time.

CDWP in its meeting dated November 10, 2016, approved PC-1amounting to Rs.2188.835 million towards capacity enhancement of Chitral Hydel Power Station from 1 to 5 MW. This project is being financed by AFD through soft loan of Euro 50 million for credit facility agreement was signed on July 19, 2019. Consultancy services agreement was awarded to M/s Integration (Lead Firm) with JV Partners M/s Elan Partner and M/s Sanima Hydro and Engineering on October 20, 2021 with implementation period of 27 month. Pre-qualification of contractor is at advance stage. Activity 1A (E & S Studies) has been completed by consultant. Under

Activity 1B, preparation of detailed engineering design and tender documents is in progress.

Expression of Interest (EOI) for hiring the services of consultants for updating feasibility study, detailed engineering design and preparation of PC-I of Renala & Rasul Hydropower Stations has been published/ advertised through financing of AFD. Besides, special repair and maintenance of Tarbela Hydel Power Station is also being carried out under FARA/ USAID.

Development on Projects

WAPDA is engaged to enhance the available potential of hydel and water resources for Socio-economic uplift of the country. During FY 2022-23, the major development activities have been carried out on projects such as Dasu HPP (Stage-I), Mohmand Dam, Diamer Basha Dam, Kurram Tangi Dam Stage-I, Nai Gaj Dam, Kachhi Canal (Remaining Works) and Muzaffargarh T.P Link Canal Projects. Contract Agreement for Civil Works of Tarbela 5th Ext. HPP was signed on May 06, 2021 and E&M Works was signed on June 25, 2021, work is in progress. Federal Government assigned the responsibility to implement K-IV Greater Karachi Bulk Water Supply Project to WAPDA. Work is in progress at site for all 08 Contract Packages. The Pre-qualification process for procurement of EPC Contractors is in progress for Attabad Lake Hydropower Project.

Detailed engineering design / feasibility studies of different projects like Sindh Barrage, Chiniot Dam, Shyok Dam, Patan, Thakot, Murunj, Hingol, CRBC (L&G), Thar Canal etc. along with General Investigation in all provinces were also remained in progress by IWASRI, MONA and LIM Research Organizations.

Updating of Supplementary Environmental and Social Study (SES) of Indus River Reach between Ghazi Barrage and Khairabad Bridge has also been substantially completed. Moreover, feasibility study, detailed engineering design, tender documents and PC-I of Jacobabad, Shikarpur and Kashmore Drainage Project is under progress. Feasibility for construction of drainage network for Taluka Ubauro, Daharki, Khangarh, Mirpur Mathelo of District Ghotki is also under progress.

WAPDA Sports

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. Since the un-bundling of WAPDA entities, it has 15 Units namely PESCO, IESCO, GEPCO, LESCO, FESCO, MEPCO, HESCO, QESCO, NTDC, GENCOs, HYDEL Formations, Head Office, TESCO, SEPCO and Water Wing, who are represented on its Board. These unit teams participate in Annual Inter Unit Sports Competitions of 22 Men, 4 Women and 4 Officers events. Presently WSB is managing 65 (Men & Women) Teams consisting more than 2400 sports persons. WAPDA is National Champion of 34 Teams (17 Men, 17 Women) and Runners up of 22 Teams (13 Men, 9 Women). WAPDA is Runners up of Quaid-e-Azam Trophy during 34th National Games 2023 held at Quetta by bagging 109 Gold, 101 Silver and 80 Bronze medals.

WAPDA Endowment Fund for Sports (WEFS)

WAPDA Endowment Fund was established in 2010 with the prime objective to arrange financial support and provide sports facilities to the youngsters to improve the medal position of Pakistan in International competitions. Youngsters 12 to 16 years are enrolled in 8 sports disciplines (Athletics, Football, Hockey, Karate, Squash, Tennis, Weightlifting and Wrestling) and retained up to age of 18. They are being provided coaching / training facilities at door step and stipend of Rs.7,000/- per month. 300 youngsters have so far been enrolled in 5 intakes. Currently 70 youngsters are getting monthly stipend of Rs.7,000/- each. So far, WEFS youngsters won 21 Gold, 13 Silver and 11 Bronze Medals at International level and 252 Gold, 99 Silver and 68 Bronze Medals at National level.

Conclusion

WAPDA has planned to construct several multi-dimensional water storage dams during the next decade to meet the requirements of the country in both water and hydropower sectors with an ultimate object to put Pakistan on the track of development. The construction of these dams will not only help address acute water challenge but also produce cheap and clean hydroelectricity. These projects will not only be beneficial at the national level but will also be instrumental for development of remote and less developed regions of the country.

(Fakharuzzaman Ali Cheema)
Secretary WAPDA

FOREWORD

It is with profound pride that the Public Relations Division of the Water and Power Development Authority (WAPDA) presents the Annual Report for the fiscal year 2022-23. This comprehensive document serves as a testament to WAPDA's unwavering commitment to excellence, as mandated by the WAPDA Act of 1958. It showcases the Authority's achievements, challenges, future plans, and strategic initiatives. It is a valuable resource for anyone interested in Pakistan's Water and Power Sectors.

The authenticity and reliability of the information presented in this Report are of paramount importance. To ensure accuracy, clarity, and concision, the Report incorporates several tables, charts, and illustrations, providing a succinct overview of WAPDA's multifaceted activities. Editorial content has been carefully crafted to provide a comprehensive and valuable resource for policymakers, researchers, stakeholders, and the general public.

WAPDA's Water, Finance, and Power Wings have been functioning with enhanced efficiency, effectively fulfilling their designated responsibilities. The Authority has made remarkable progress in Water and Power Sector Projects during the reporting period, as meticulously highlighted in this Annual Report. These achievements have far-reaching impact on the Country's economic and social fabric, underscoring WAPDA's pivotal role for sustainable development. The Authority remains dedicated to its mission of providing sustainable water and power solutions, driving economic growth, improving the living standard of millions of Pakistanis, and contributing to the Country's socio-economic development.

In line with its strategic objectives, WAPDA has been focusing on enhancing its operational efficiency, improving project execution, and strengthening its financial management. The Authority has also been actively engaged in exploring new avenues for hydel energy to reduce the Country's reliance on fossil fuels. As WAPDA continues to move forward, it remains committed to its core values of transparency, accountability, and excellence.

The Public Relations Division wishes to place on record its appreciation for the efforts put in by all those who contributed for compilation and release of this Report. Their active participation, cooperation, and expertise were instrumental in its production. The Editorial Board welcomes constructive feedback and suggestions from readers, as their input is invaluable in assessing the Report's success and identifying areas for improvement.

Muhammad Abid Rana
Executive Editor

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OVERVIEW

Water Wing

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

Irrigation releases from three reservoirs Tarbela, Mangla and Chashma – registered constant trend. In aggregate 12.98 Million Acre Feet of water was released from storage of these reservoirs to meet irrigation indents of provinces, in the Fiscal Year 2022-23. Ghazi Barotha Hydropower Project, Mangla Dam Raising Project, Jinnah Hydropower Project, Satpara Dam, Golen Gol HPP, Tarbela 4th Extension HPP and Neelum Jhelum Hydropower Project are already under operation. Darawat Dam has been completed and its irrigation system handed over to Irrigation Department, Govt. of Sindh on October 27, 2018 and the remaining Dam part has also been handed over to Small Dams Organization Irrigation Department, Government of Sindh on December 04, 2020. Rainee Canal (Phase-I), work on remaining works of Kachhi Canal Project (Phase-I) having CCA 30,000 Acres commenced from July 2021 and construction activities are in progress. Gomal Zam Dam and its part (Waran Canal) has also been completed. Construction of main works of Dasu HPP Stage-I (2,160 MW) remained in progress. Kurram Tangi Dam (Stage-I) is under progress. Work on Lining of Muzaffargarh and T.P Link Canal Project is ongoing. Drainage Schemes RBOD-I and RBOD-III in Sindh & Balochistan have been completed since June 2020 and June 2021 respectively.

In addition to aforementioned projects, WAPDA is also working on Naulong Dam in Balochistan, Bara Dam and Tank Zam in Khyber Pakhtunkhwa which are under various stages of planning and implementation.

Mohmand Dam (Generation Capacity 800 MW, Live Storage 0.676 MAF and CCA 18,233 Acres) construction activities are in progress since September 2019. Nai Gaj recommenced w.e.f. October, 2021 and construction activities are in progress.

Regarding Diamer Basha Dam, PC-I for Dam Part amounting to Rs. 474,000 million has been approved by ECNEC on April 17, 2018. Subsequently after inclusion of 15 MW Tangir HPP, the revised cost of PC-I (Dam Part) amounting Rs. 479,686 million has been approved by ECNEC on November 14, 2018. PC-1 (Power Generation Facilities) amounting to Rs. 1,424.36 billion (FEC Rs. 715.88) was approved by ECNEC on April 06, 2023. Diamer Basha Dam (Generating Capacity 4500 MW and Live Storage 6.40 MAF) works on Main Dam Commenced w.e.f August 2020 and construction activities are in progress. Federal Government on September 23, 2023, assigned the responsibility to implement K-IV Greater Karachi Bulk Water Supply Project (260 MGD) to Ministry of Water Resources/WAPDA. Work is in progress at site for all 08 contract packages.

Contract Agreement for Civil Works of Tarbela 5th Ext. HPP (generation capacity 1,530 MW) was signed on May 06, 2021 & E&M works was signed on June 25, 2021; work is in progress. For installation of Telemetry System for Real-time discharge monitoring at 27 key sites on Indus Basin Irrigation System (IBIS) Contract Agreement for Consultancy Services signed on June 20, 2023 and consultants mobilized on June 26, 2023. Review of Feasibility Study, Procurement of EPC Contractor and Contract Management & Administration of Attabad Lake HPP (Generation Capacity 54 MW) is in process through consultants since June 30, 2022. The Prequalification process for procurement of EPC contractors is in progress.

Consultancy Services for detailed engineering design preparation for tender documents and construction supervision of Harpo HPP is under progress by the consultants. Feasibility study of Sindh Barrage is in progress.

Feasibility studies of Patan HPP (2,400 MW), Chiniot Dam (Live Storage Capacity 0.85 and Generation Capacity 80 MW) and Shyok Dam (Live Storage 5.5 MAF and Generation Capacity 640 MW) and Thakot HPP (4,714 MW) have been completed. Work on Feasibility Study of Bhimber Dam (2 MW) and detailed engineering design of Tank Zam Dam (25.4 MW) will be initiated after approval of PC-II.

Updating of Supplementary Environmental and Social Study (SES) of Indus River Reach between Ghazi Barrage and Khairabad Bridge has also been substantially completed. Feasibility Studies of Murunj Dam (Gross Storage Capacity 0.45 MAF, CCA 88,856 Acres and Generation Capacity 6 MW), Shatung Nullah Diversion Project and Thar Canal Project (CCA 111,816 Acres) are under process whereas inception report for Hingol Dam (Live Storage Capacity 0.816 MAF, CCA 65,000

Acres and Generation Capacity 1.37 MF) Detailed Engineering Design has been finalized. Feasibility Study, Detailed Engineering Design, Tender Documents and PC-1 of Jacobabad, Shikarpur and Kashmore Drainage Project is under progress. Feasibility for construction of Drainage Network for Taluka Ubaura, Daharki, Khangarh, Mirpur Mathelo of District Ghotki is also under progress. Chashma Right Bank Canal (Lift cum Gravity) (Canal Capacity 2,557 Cusecs, CCA 295,902 Acres), Consultants mobilized at size on July 01, 2021 for review of Feasibility Study, preparation of detailed engineering design, Bidding Documents and PC-I. ECNEC approved the PC-1 on October 07, 2022.

POWER WING

Operation & maintenance of existing 21 No. Hydel Power Stations were carried out in FY 2022-23. WAPDA Hydel Power Stations generated as many as 31,286 MkWh during FY 2022-23. WAPDA is fully committed to its mandate of development of more hydropower resources in the country for reliable, cheap and environment friendly electricity to the consumers.

Sat Para Power Complex in GB (17.4 MW) & Neelum Jhelum (969 MW) are not included in the Generation License of WAPDA Hydroelectric, while operation & maintenance is being carried out by WAPDA.

WAPDA is also undertaking rehabilitation of its existing Hydel Power Stations to ensure their more reliable and sustainable operation for optimum generation. Rehabilitation of 22 Megawatt (MW) Jabban Hydroelectric Power Station was completed. The following Rehabilitation projects are under progress:

Mangla Refurbishment Project

Mangla Refurbishment Project Contract for Package I & VII (Units 1~6), Package-II (Refurbishment of Powerhouse Cranes), Package-III-a (Supply of Main Power Transformers Units 3~6), Package-III-b (Supply of Main Power Transformers Units 1~2), Package-IV-a (Supply of Turbine Inlet Valve), Package-V (Balance of Plant Mechanical), Package-VI+VIII (Balance of Plant Electrical and Control Systems) and Package-IX (Switchyard) have been awarded. Bidding process for Package-III-c (Supply of Main Power Transformers Units 9~10) has been started. The scheme envisages increase in total installed capacity of the Power Station from 1,000 MW to 1,310 MW through optimum utilization of additional water and higher head available after completion of Mangla Dam Raising Project. USAID has provided a grant of US $150 million for Up-gradation of Units 1~6 & 9~10 and other miscellaneous works in the first stage, where AFD has provided a loan of Euro 90 million for the Up-gradation of Units 1~4. After refurbishment Units 5 & 6 handed over to WAPDA on April 01, 2022. Overall Physical progress= 59.0%. Overall Financial Progress=43.26 %.

Warsak 2nd Rehabilitation Project

Feasibility study and detailed design for Rehabilitation, Up-gradation and Modernization of Warsak Hydel 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. PC-I of the project has been approved by ECNEC amounting to PKR 22,254 million on July 9, 2015. For financing of the project, Loan Agreements have been signed amounting to Euro 130 million with AFD (France), KfW (Germany) and European Investment Bank (EIB) along with European Union Grant of Euro 4.5 million. Consultancy Services Agreement for construction supervision and project management has also been signed with M/s Warsak Rehabilitation Consultants (WRC). Contract agreement for civil works has been signed on April12, 2021 with M/s Technicon. Access road to firefighting tank completed. Flexible wire mesh installation activities in the Switchyard area for rock face protection works have been resumed. Core drilling / water pressure tests for post tensioned anchors in the power house are in progress. Thirty-one (31) core drilling holes have been completed so far. Crack repair works in the northern and southern stair case are in progress. Concrete and reinforcement works in the oil/water separator tank have been completed. Checkered plate fabrication is in progress at Technicon Workshop Peshawar. Physical Progress= 21.04% E&M Contract was signed with M/s GE Hydro & Sinohydro China JV on November 05, 2021. Generator Assessment tests of Unit No. 06 started on June 02, 2023 and are in progress. The E&M Contractor performed grounded resistance test and main crane certification test in the Power house. Generator stator bar FAT has been performed from May 29 to June 12, 2023 in Switzerland under the surveillance of The Employer and The Engineer. Unit 5 & 6 Runner FAT has been performed from June7 to June 16, 2023 in China under the surveillance of The Employer and The Engineer Physical Progress = 15.07%. In the history of WAPDA, first experimental flushing of Warsak Reservoir was successfully carried out by WAPDA/NESPAK-GLM-HB Consultants w.e.f. July 19 to July 22, 2022.

Overall Physical Progress = 26.17%
Overall Financial Progress = 21.4%.

Dargai Rehabilitation Project

ECNEC in its meeting dated: November 14, 2018,

approved PC-I amounting to Rs. 4,050.365 million towards rehabilitation and capacity enhancement of Dargai Hydel Power Station from 20 MW to 22 MW. This project is being financed by AFD through soft loan of € 50 million which was signed on July 19, 2019. Consultancy services agreement was awarded to M/s Pakistan Engineering Services Pvt. Ltd in association with M/s Knight Piesold Consulting USA on December 16, 2020. Pre-qualification of Civil + E & M Contractors have been completed with four (04) Nos. of JVs notified as shortlisted. Detailed Engineering Design and Tender Documents have also been finalized and awaits Donor's NOL towards issuance to the pre-qualified bidders. Award of works contract is anticipated by December 2023 with 36 months completion time.

Chitral Capacity Enhancement Project

CDWP in its meeting dated: November 10, 2016, approved PC-1amounting to Rs.2188.835 million towards Capacity Enhancement of Chitral Hydel Power Station from 1 to 5 MW. This project is being financed by AFD through soft loan of Euro 50 million for credit facility agreement was signed on July 19, 2019. Consultancy services agreement was awarded to M/s Integration (Lead Firm) with JV Partners M/s Elan Partner and M/s Sanima Hydro and Engineering on October 20, 2021 with implementation period of 27 month. Pre-qualification of contractor is at advance stage. Activity 1A (E & S Studies) has been completed by consultant. Under Activity 1B, preparation of detailed engineering design and tender documents is in progress.

Expression of Interest (EOI) for hiring the services of consultants for updating feasibility study, detailed Engineering design and preparation of PC-I of Renala & Rasul Hydropower Stations has been published/advertised through financing of AFD. Besides, special repair and maintenance of Tarbela Hydel Power Station is also being carried out under FARA / USAID.

Performance at a Glance 2022 - 2023

(Rs. In Million)

Sector	Subject	2021 - 2022	2022 - 2023
Water Sector Development	Public Sector Development Programme (PSDP)	38,250,094	---------
	Government of Pakistan Grants	35,039,337	74,639.357
	Cash Development Loans	_____	
	Development Partner's Contributions	3,210,757	1,393.674
Power Sector Development	**Total Capital Expenditure on Capital Work in Progress during FY 2022-23**	**161,054**	**76,033.031**
	Self-Financing ----------	64,171	63,985.094
	Government Grants ----------	29,284	43,627.403
	Cash Development Loan ----------	---------	---------
	Local Loan ---------	20,000	20,000
	Foreign Loan ---------	47,598	98,433.778
Water Operation	**Water Release from Reservoirs (Million Acre Feet)**		
	Mangla	5.93	4.28
	Tarbela	6.95	6.57
	Chashma	2.33	2.13
	Total	**15.21**	**12.98**
Power Operation	Installed Generating Capacity (MW)	8420	8420
	Hydel Generation (GWh)	28,903	31,286
	Power Sales Revenue Bill Net	98,711	74,793
	Average Power Sale Rate	3.42	2.39

WAPDA House - Lahore

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 corporatized into independent companies. This shifts 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 65 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 through

its implementation divisions including North, Central, South and Northern Areas in addition to project specific zones including Mangla, Neelum Jhelum, Mohmand Dam, Diamer Basha Dam and Dasu Hydropower Projects. These zones cover, in general, Khyber Pakhtunkhwa, Punjab, Sindh and Balochistan, Gilgit-Baltistan and AJ&K. The activity of Water Wing involves execution of water storage Dams conveyance canals development of hydropower projects, Salinity Control & Reclamation Projects (SCARPS) and research in water sector. Chief Engineers and Projects 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). Apart from project offices, there are other offices including Hydro Resources Management (HRM), Technical Services (TS), Hydro Planning, Coordination & Monitoring (C&M) and Central Design Office (CDO) which provide various technical services to different projects.

Hydro Resources Management (HRM) is responsible for the management of water resources throughout the country. This office performs various tasks like monitoring, collection, evaluation and publishing of hydro-meteorological data for planning, development and operation of water resources projects; coordination with federal/provincial flood management and reservoir operation authorities; forecasting of water availability for distribution of water among provinces; annual, periodic and special inspections of water sector projects; evaluation of proposals submitted by consultants, reviewing PC-II & PC-I for various projects and additional assignments assigned from time to time etc.

Technical Services (TS) provides technical advisory services on different water resources and hydropower projects.

Central Design Office (CDO) is responsible for providing one window design services for projects such as dams, power houses, irrigation and drainage networks, flood protection, roads and buildings, providing technical support to the field formations of WAPDA (Water Wing), GENCO, NTDC, DISCOs etc. during the implementation/construction of the new projects and remedial measures/trouble shooting for already completed projects reviewing of detail designs, tender/construction drawings, technical specifications implied/used by Consultants appointed for study of WAPDA Projects, imparting training to Water Wing drafting staff required for the departmental promotion and establishing drafting standards, schedule of rates and verification of non-scheduled rates etc.

Hydro Planning Organization (HPO) is responsible for planning and Feasibility Studies of hydropower & water resources projects in the country. HPO at present has taken up hydropower projects at various stages of study having a total capacity of over 20,000 MW.

The Office of Coordination & Monitoring Water provides streamlined information of Water Wing to the Government functionaries and Ministries. This office also has the responsibility of Human Resource Management & Administration to all WAPDA Water Wing office.

Power Wing

WAPDA Power Wing is now responsible for operation and maintenance of the Hydel Power Stations under generation license granted by NEPRA in the name of General Manager (Hydel) Operation after-de-bundling of WAPDA. The electricity produced from these Power Stations is delivered to NTDCL Grid System and invoices are raised to CPPAG according to the Tariff approved by NEPRA.

Rehabilitation/ Refurbishment of old Hydel Power Stations is also planned and implemented to enhance the reliability and life of power plants. WAPDA is also responsible to associate and monitor the designs and erection/commissioning of future hydroelectric power stations and other Electrical & Mechanical Equipment.

Power Wing is also providing technical and management trainings to its employees for capacity building at WAPDA Administrative & Staff College Islamabad, WAPDA Engineering Academy Faisalabad and Hydel Training Centre Mangla. This facility is also extended to employees of ex-WAPDA entities (NTDCL/DISCOs/GENCOs), AJK Hydro Board, Gilgit Baltistan and Power Stations in private sector. A separate establishment also exists in the Power Wing for Purchase & Disposal of unserviceable or surplus materials/items in all WAPDA formations.

All the financial matters of Power Wing are managed by General Manager (Finance) Power under the control of Member Power.

Presently, the total installed capacity of 21 No. WAPDA Hydel Power Stations is 8490 MW which is about 21% of the total system capacity of 45,662 MW from all sources. The Net Electrical Output is about 31,286 GWh per annum.

Finance Wing

Finance is headed by Member Finance responsible

for all budgetary, financial and accounting matters. Member Finance oversees the financing functions of WAPDA and leads as the administrative head of WAPDA Audit, Accounts, Finance and Cost Cadres. Member Finance supervises the revenue generation and financing needs of all the offices of WAPDA.

Authority Fund

The Authority Fund consists of the following:

- Loans and grants obtained from the federal and provincial governments
- Bonds proceeds
- Loans obtained by the Authority
- Foreign aids and loans obtained from Development Finance Institutions on lent to WAPDA
- All other sums obtained by Authority

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.

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Raised Mangla Dam and Reservoir

WATER WING

Water Development
Indus Basin Settlement Plan
Tarbela Dam
Diamer Basha Dam Project
Land Acquisition & Resettlement LA&R
Dasu Hydropower Project
Mohmand Dam Hydropower Project
Technical Services Division
Hydro Resources Management (HRM)
Central Design Office (Water)
Hydro Planning Organization
Neelum Jhelum Hydro Electric Project (NJHEP)
Water Divisions
Central
South
North
Northern Areas

Tarbela Dam Spillway & 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 Moonsoon 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 98 Million Acre Feet (MAF) out of 142 MAF (Post Tarbela Average) 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 48 Million Acres (MA). The country have a large cultivable land base of 86 Million Acres (MA). Hence, the irrigated land base at present corresponds to 55.30 percent of the total cultivable area 86 MA. Around 50 MAF is pumped from groundwater. Direct rainfall contributes less than 15 percent of the water supplied to crops.

With increasing population, Pakistan is heading fast towards a situation of water shortage and threat of famine. Per capita surface water availability was 5,260 Cubic Meters per year in 1951, which has reached to alarming value of 837 Cubic Meters per capita in 2023. The position is worsening and with rapidly increasing population, this may further drop to about 821 Cubic Meters by 2025 representing acute water short conditions. The minimum water requirement to avoid food and health constraints due to being a water short country is 1,000 Cubic Meters per capita per year. Pakistan has thus reached the stage of acute water shortage, where people fight for every drop of water. This calls for rapid development of additional water resources to bring the potential over 20.30 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, about 5 MAF or 28 percent of live storage has been lost up to year 2023. Hence, more water storage for timely and adequate irrigation releases to maximize crop production has become even more important.

WAPDA's role in the field of controlling water logging and salinity aims at the life-saving action for Pakistan's agriculture which remains backbone of the national economy. During past 65 years, WAPDA has executed Salinity Control and Reclamation Projects (SCARPs) covering million of acres of the affected land to put the water logged and saline acreage back into production.

Salient Features of Completed Projects

Project	Cost Rs. (Million)	Technical Data	Objectives
Chablat Kas Lift Irrigation Scheme Completed in 1962	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 Completed in 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 Earthfill 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-Jhelum • Taunsa-Panjand • 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 Siphon comprise a total Length of over three miles (16,926 ft.) 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 at providing River Control for Diverting Water from three Western Rivers to the three Eastern Rivers.

WAPDA Completed the following Water and Hydropower Projects during 1963 Todate

Project	Cost Rs. (Million)	Technical Data	Objectives
SCARPs Completed from 1963 to 2002	---	More than 70 SCARPs Completed which reclaimed 18 Million Acres Land	To enhance Cropping Intensity in various Areas of Khyber Pakhtunkhwa, Punjab and Sindh.
Simly Dam Completed in 1982	643	Type: Earthen Embankment Dam Height: 260 ft. Length: 1,027 ft. Reservoir Capacity 28,750 Acre ft.	Supply of Drinking Water for Islamabad.
Pehur High Level Canal Completed in 2002	US $ 163 Million	Length of Canal: 20.64 km Canal Capacity: 1,000 Cusecs Command Area: 101,000 Acres	Irrigation of 101,,000 Acres of District Swabi, Khyber Pakhtunkhwa.
Chashma Right Bank Canal Completed in 2003	17,097	Length of Canal: 274 km Canal Capacity: 4,879 Cusecs Command Area 606,000 Acres	Irrigation of about 606,000 Acres (366,000 Acres in Khyber Pakhtunkhwa & 240,000 Acres in Punjab) of Land.
Ghazi Barotha Hydropower Project Completed in 2004	96,957	Barrage: Gate controlled Weir Maximum Discharge Capacity: 1,631,600 Cusecs Length of Power Channel: 52 km Power Channel Capacity: 56,500 Cusecs Reservoir Capacity: 50,300 Acre ft. Installed Capacity: 1,450 MW	Generation of 6,500 Million Units of Renewable and Environment Friendly Electricity.
Mirani Dam Completed in 2007	5,811	Type: Concrete Face Rock Fill Dam Height: 127 ft. Length: 3,080 ft. Reservoir Capacity: 302,000 Acre ft.	Irrigation of about 33,200 Acres of the Land with average Cropping Intensity of 85% in District Kech, Balochistan.
Sabakzai Dam Completed in 2009	1,961	Type: Rock & Earth Fill Dam Height: 114 ft. Length: 1,300 ft. Reservoir Capacity: 32,700 Acres ft.	Irrigation of about 6,875 Acres of the Land of District Zhob, Balochistan.
Greater Thal Canal (Phase-I) Completed in 2009	6,482	Length of Main Canal: 35 km Length of Branch, Distributaries & Minors: 105 km Canal Capacity: 8,500 Cusecs Command Area: 355,000 Acres	Irrigation of about 355,000 Acres of Land in Bhakkar and Layyah Districts of Punjab.
Mangla Dam Raising Completed in 2011	96,853	Additional Storage = 2.88 MAF Additional Power = 644 GWh	To regain Reservoir Capacity Lost due to Sedimentation to enhance Annual Generation of Electricity.
Khan Khwar Hydropower Project Completed in 2012	10,733	Height: 98 ft. Length: 14,895 ft. Installed Capacity: 72 MW	Generation of 306 Million Units of Renewable and Environment Friendly Electricity.
Satpara Dam Completed in 2013	6,191	Type: Earth Fill Height: 128 ft. Length: 560 ft. Reservoir Capacity: 93,000 Acre ft. Installed Capacity: 17.3 MW	Irrigation of about 15,563 Acres Area of Skardu, Gilgit Baltistan Generation of 105 Million Units of Renewable and Environment Friendly Electricity.
Allai Khwar Hydropower Project Completed in 2013	17,234	Height of Dam: 107 ft. Length of Headrace Tunnel: 7,762 ft. Installed Capacity: 121 MW	Generation for 463 Million Units of Renewable and Environment Friendly Electricity

Project	Cost Rs. (Million)	Technical Data	Objectives
Jinnah Hydropower Project Completed in 2013	13,545	Installed Capacity: 96 MW Annual Energy: 688 Gwh	Generation of 688 Million Units of Renewable and Environment Friendly Electricity.
Duber Khwar Hydropower Project Completed in 2013	24,674	Height of Dam: 105 ft. Length of Headrace Tunnel: 17,201 ft. Installed Capacity: 130 MW	Generation of 595 Million Units of Renewable and Environment Friendly Electricity.
Rainee Canal (Phase-I) Completed in 2014	20,534	Length of Main Canal: 110 km Length of Branch, Distributaries & Minors: 128 km Canal Capacity: 5,155 Cusecs Command Area; 113,690 Acres	Irrigation of about 113,690 Acres of Land in Districts Ghotki of Sindh.
Gomal Zam Dam Completed in 2013	20,626	Type= RCC Curved Gravity Height = 437 ft. Length = 758 ft. Reservoir Capacity = 1.14 MAF Installed Capacity = 17.4 MW	Irrigation of about 191,139 Acres of Land and Generation of 90.9 Million Units of Renewable & Environmental Friendly Electricity
Darawat Dam Completed in 2014	11,767	Type = Concrete Gravity Height = 151 ft. Length = 1,004 ft. Reservoir Capacity = 0.12 MAF	Irrigation of about 25,000 Acres of Land
Kachhi Canal Project (Phase-I) Completed in 2017	80,352	Canal Capacity: 6,000 Cusecs Command Area; 72,000 Acres	Irrigation of about 72,000 Acres of Land in Districts Dera Bugti, Balochistan.
Golen Gol Completed in 2018	29,077	Weir Height: 12 m Length of Headrace Tunnel: 3.8 km Installed Capacity: 108 MW	Generation of 442 Million Units of Renewable and Environment Friendly Electricity.
Neelum Jhelum Completed in 2018	506,809	Dam Height: 60 m Dam Length: 160 m Twin Tunnel Length 19.6 km each (Total 39.2 km) Installed Capacity: 969 MW	Generation of 5,150 Million Units of Renewable and Environment Friendly Electricity.
Tarbela 4th Ext. Completed in 2018	122,977	Modification of Tunnel 3 & 4 Intakes Construction of new Powerhouse of 1,410 MW Demolition of Existing Outlet Structure for T3	Generation of 3,840 Million Units of Renewable and Environment Friendly Electricity.
RBOD-I Completed in 2020	17,505.018	Gross Command Area (GCA): 1.28 Million Acres Culturable Command Area (CCA): 1.141 Million Acres	To provide out-fall facilities to existing & proposed drainage units including rehabilitation of existing drainage network and to improve environmnental conditions in Mancha & Hamal Lakes. This work will also increase agricultural production in an area of 1,278,273 Acreas.
RBOD-II Completed in 2021	10,804.540	Gross Command Area (GCA): 709,436 Acres Culturable Command Area (CCA): 678,954 Acres	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. Conservation of Hamal and Mancher Lakes and environment condition will improve over Gross Commanded Area (GCA) of 0.709 Million Acres.

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, and 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 siphon and eight inter river link canals. Remodeling of three existing link canals formed part of this project to convey water of the Western Rivers of 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 the 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 of 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 Mangla Dams, Chashma Barrage and Chashma-Jhelum Link Canal which remain with WAPDA for operation and maintenance (O&M) purposes.

In the year 2001, WAPDA prepared and got Govt. approval for a 25 years programme for the development of water and power resources of Pakistan. The basic objective of this programme was to optimally develop water resources to meet the future water requirements of the country and to meet its power needs.

The Vision 2025 Programme envisaged implementation of 72 storage and hydropower projects in three phases. The programme offered an ambitious plan for realization of additional storage potential of about 65 MAF and installed capacity of 40,000 MW by 2025. In its first phase, the construction of 6 dams, 14 hydropower projects and three canals have been accomplished.

The demand for both water and hydropower shall logically increase corresponding to the growth of population and the pace of development in the country as well as environmental change and living habits.

The 2023 population census has shown present population as 241 million persons. For estimation of food demand by the year 2050, we may take the average growth rate population figure of about 365 million persons which means an increase of 50% above the present population.

Additional food and energy demand will be met through construction of additional reservoirs, conservation of water through canal lining, adopting high efficiency irrigation system and demand side management.

MANGLA DAM

Mangla Dam was constructed in 1967 across River Jhelum about 60 miles South-East of the Federal capital, Islamabad. The project is one of the largest 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 the dam was kept 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. during 2004-2009.

The length of Main Dam (including Intake Embankment) after raising is 10,300 ft. to 11,150 ft. and maximum height above core trench has increased from 454 ft. to 484 ft. The gross and live capacities of the Mangla reservoir after raising are 7.387 Million Acre Feet (MAF) and 7.355 MAF respectively as per hydrographic survey-2017. Since first impounding in 1967, sedimentation has reduced the gross storage capacity of reservoir to the extent of 1.392 MAF. The 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 up to Maximum Conservation Level (MCL) 1242.00 ft. SPD level at 1800 Hrs. dt: August 17, 2023 and the reservoir remained filled at 100% storage up to

Mangla Spillway in Operation

September 05, 2023 with a corresponding maximum storage capacity of 7.387 MAF. During draw-down period in 2022-23, the reservoir attained Minimum Level of 1070.00 on June 03, 2022 and did not reach revised Dead Storage Level (i.e. 1050 ft. SPD). Peak inflow of 123,000 cusecs was recorded on July 28, 2022 at 1500 hrs. Total rainfall at Mangla was recorded as 25.869 inches during the Hydrological Year (April-2022 to March-2023) and the main spillway was operated for 31 days during the Hydrological Year (April-2022 to March-2023).

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 2021-22 and 2022-23 is shown in the following table:

Level of Mangla Reservoir (on 15th of each Month) (Ft.SPD)

Month	July 2021 to June 2022	July 2022 to June 2023
July	1162.80	1126.70
August	1202.50	1170.60
September	1191.85	1192.95
October	1180.50	1179.05
November	1168.40	1146.40
December	1127.45	1123.95
January	1131.65	1122.25
February	1145.60	1124.10
March	1069.50	1100.10
April	1085.00	1109.30
May	1085.40	1118.00
June	1070.00	1143.00

Description	July 2021 to June 2022	July 2022 to June 2023
Average Inflows (Cusecs on MDB)	22,675	25,293
Average Outflows (Cusecs on MDB)	25,076	21,537
Through Turbines (Cusecs on MDB)	23,226	20,604
Energy Generation (MkWh)	4283.14	3889.784

Project Storage Releases and Power Generation

IRSA made 4.28 MAF of storage releases for irrigation purpose during July 22- June 23 against 7.54 MAF during July-21 to June-22. Mangla Power Station generated 3889.784 MkWh of electricity during the year i.e. 11.21% less than the last year generation (i.e. 4283.14 MkWh). Project Water Storage Releases and Power Generation up to June 30, 2023 are given in the table below.

Pre-MDRP Water Release & Power Generation

Year	Storage Releases (MAF)	Gross Generation (MkWh)
1967-68 to1999-2000	151.90	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
Total	**194.48**	**183,551.72**
Average	**4.629**	**4,370.28**

Post- MDRP Water Release & Power Generation

Year	Storage Releases (MAF)	Gross Generation (MkWh)
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
2013-14	6.90	5,876.07
2014-15	7.54	6,496.38
2015-16	7.75	6,864.40
2016-17	8.10	5,347.57
2017-18	7.44	4,141.86
2018-19	5.29	3,860.85
2019-20	4.75	4686.36
2020-21	7.54	5405.24
2021-22	5.93	4283.14
2022-23	4.28	3889.78
Total	**84.63**	**71244.12**

Monitoring and Surveillance

Instrumentation

Total 1120 instruments were originally installed at the time of construction of Mangla Dam Project within and in the vicinity of project structures to check the pore water pressure and settlement of the fill / foundation and lateral displacement. During raising of Mangla Dam, 179 more instruments were installed. The functional instruments showed normal behavior during the year 2022-23.

Seepage & Geology

The boiling points present in sand stone beds of main dam, intake and sukhian dam were closely monitored in respect of seepage intensities and found no significant change. The seepage through chambers, artesian wells, drainage wells and seepage points at (CH: 105+50 & 237+50) remained normal as compared to last year. This section communicates the data to concerned quarter on regular basis as per given schedule.

Seismicity

Mangla Dam Project is located in active seismic environment. Two types of seismic networks have been installed in 50 km radius around Mangla Dam to monitor the seismic and tectonic activity of the region (Map Enclosed). Strong Motion Accelerographs Network comprising seven numbers state of the art digital accelerographs installed in 2006 at different locations remained operational during the year under report. Telemetry Micro Seismic Network comprising of eleven seismic field stations installed during 1993 got malfunctioned at Central Recording Station Mangla since August 2019 due to lightning strike/ electrical surge and is un -repairable due to non-availability of essential spares in the market as per representatives of Dr. A.Q Khan Laboratories Rawalpindi who were undertaking the repair efforts. However, Up-gradation / Replacement of existing Micro Seismic Network and 10 Nos. additional SMA's is under process through T-5 HPP.

During the reported period 14 significant seismic events were recorded by the Strong Motion Accelerograph Network. Out of these, one earthquake (March 21, 2023) having intensity IV was felt at the project and subsequently Blue Drill was performed at the project as per Earthquake Drill Manual. However, no abnormalities were observed as a result of these events. Seismic parameters of the event of March 21, 2023 are given below.

Date - Time	Tuesday, March 21, 2023 at 19:47 Hours (PST)
Magnitude	6.5 on Richter Scale
Location	36.55 N, 70.96 E
Depth	Approx. 200 Km
Region	Hindukush Region (Afghanistan Tajikistan Border) (about 200 Km NW from Mangla)
Intensity At Mangla	IV (MMI Scale)
Acceleration At Mangla	0.036 'g' (At Central Recording Station) 0.021 'g' (At Sukhian II) 0.013 'g' (At Dam's Crest) 0.012 'g' (At Chechian) 0.027 'g' (At Chechian) (Design Values of Mangla: OBE = 0.14 g , MCE = 0.4 g)
Earthquake Drill	Blue Drill (As per Earthquake Drill Manual)

O&M (Civil)

Physical Inspection

Periodic and routine patrolling of main components of the project comprising main dam, in take structure, Sukian dyke, Jari dam, bong escape, main & emergency spillways, kakra dam were carried out as per O&M manuals. Drainage networks have been cleared for safe passage of storm water. Rain water chute along Bong Canal is cleared for safe passage of storm water. Main drains of seepage chambers have been cleared. Wild growth has been removed from upstream and downstream slopes of the dam, powerhouse, and switchyard and under high tension transmission lines. Watch and ward in project area were carried out vigilantly. Routine maintenance

and repair of residential and non-residential buildings of three colonies was carried out. Mangla Fort and WAPDA Rest House were maintained.

Field staff was deputed to check the encroachments in the project area and encroachment cases are being reported to concern Administration for strict action. Close liaison and coordination were made with District Management of Mirpur and Jhelum to stop encroachment activities & lifting of earth material from reservoir/river area.

Transport
Operational and maintenance tasks for the Mangla Dam Project are managed using both light vehicles and heavy machineries. Regular maintenance for these vehicles and heavy machinery is conducted based on the specified requirements and the resources at hand. The disposal if aging vehicle and machinery is currently in progress following standard operating procedures (SOP). Additionally, to address any urgent operational and maintenance needs, the procurement of new vehicles and machinery is underway.

Miscellaneous Works
The following works have been completed during 2022-23.

- Improvement of Drainage Network, Water Supply / Sewerage System at Mangla Fort
- Rehabilitation / Placing of Cooble Boulder at Sukian D/s Shoulder and Disturbed Slope
- Silt Clearance and Construction of Retaining Wall at Jari Dam
- Slope Protection Fort Hill at Kabootar Pahari and Intake Area
- Carpeting and Patch Work of Road from Main Gate to Headworks
- Construction of Road Shoulders of Approach Road to Left Side of Main Spillway
- Changing of Hand Rail at Different Structures of Main Spillway

Security
Mangla Dam and Small Hydel Power Stations are being safeguarded by security staff with extreme dedication and devotion. Mobile and foot patrolling is being carried out round the clock. All VIPs and foreign experts were provided with security cover. Utmost preventive remedial measures were adopted to ensure foolproof security.

MRP project is under progress and foreigners are working with the project. WAPDA security force is providing them security at the project.

Security staff detailed for monitoring and reporting the excavation and extraction activities from River Jhelum bed. Further communicating to WAPDA Mangla administration / Local administration of Mirpur (AJK) and Jhelum (Punjab) for further legal course of action.

Public Relations
Briefings were arranged for visitors approved by Member (Power) WAPDA coming from WAPDA Engineering Academy Faisalabad, WAPDA Staff College Islamabad, other WAPDA formations, VVIPs and the visitors from local consultants of various projects. Students of educational institutions visiting Mangla Dam as part of their instructional and recreational tours imparted information and valuable technical knowledge about this project.

MANGLA POWER STATON

With the total installed capacity of 870 MW from 08 No. Units (Unit No. 1, 2, 7-10 of 100 MW each and Unit No. 5 & 6 of 135 MW each), Whereas Unit No. 3 & 4 are shutdown w.e.f April 20, 2022 for Refurbishment activities under Mangla Refurbishment Project. The Power Station has been one of the major contributors to the National Grid during the year. The maximum load of 960 MW and maximum daily generation of 22.944 MkWh was recorded on various dates. The energy generation from the station during the year 2022-23 was recorded 3889.784 MkWh. Total generation since commissioning is 254795.845 billion units (kWh) up to June 30, 2023. Brief operational data of 2022-23 is given here-under

Net Electrical Output	3889.784 MkWh
Cumulative Generation	254795.845 MkWH
Maximum Monthly Generation	602.600 MkWh (October 2022)
Maximum Daily Generation	22.944 MkWh (October12, 2022)
Maximum Load Attained	960 MW (October 10, 2022)

* Currently reduced to 870 MW as Unit No. 3 & 4 are under shutdown for their Refurbishment / Up-gradation.

Major Works

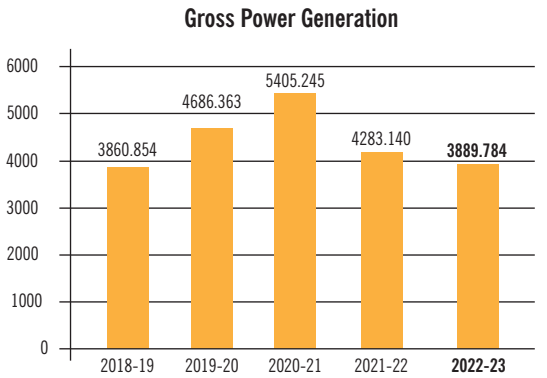
- Two yearly maintenance of Unit# 1 & 8 along with associated equipment was carried out, according to the prescribed schedule.
- Unit 3 & 4 were under shutdown w.e.f April 20, 2022 for refurbishment activities.
- 138 MVA, 220/132 kV Interconnector Transformer No. 01 remained under PTW w.e.f. 0915 Hrs dated November 16, 2022 to 1405 Hrs dated November 20, 2022 for its annual maintenance and energized at 1620 Hrs dated November 20, 2022 on the instructions of NPCC.
- 138 MVA, 220/132 kV Interconnector Transformer No. 02 remained under PTW w.e.f. 1020 Hrs dated November 22, 2022 to 1310 Hrs dated November 27, 2022 for its annual

maintenance and energized at 1440 Hrs dated November 27, 2022 on the instructions of NPCC.

- 138 MVA, 220/132 kV Interconnector Transformer No. 03 remained under PTW w.e.f. 0930 Hrs dated November 10, 2022 to 1315 Hrs dated November 14, 2022 for its annual maintenance and energized at 1547 Hrs dated November 14, 2022 on the instructions of NPCC.
- 7.5 MVA, 132/11 kV Station Transformer No. 01 remained under PTW w.e.f. 1235 Hrs dated March 07, 2023 to 2000 Hrs dated March 09, 2023 for its annual maintenance and energized at 1015 Hrs dated March 10, 2023 with the consent of RCC.
- 7.5 MVA, 132 kV Station Transformer No. 02 remained under PTW w.e.f. 1000Hrs dated March 13, 2023 to 1410 Hrs dated March 15, 2023 for its annual maintenance and energized at 1728 Hrs dated March 15, 2023 with the consent of RCC.

Project Power Generation

Mangla Power Station generated 3889.784 MkWh of electricity during the year. Project Power Generation up to June 30, 2023 are given in the table.



Power Generation (1967-68 to 2022-23)

Year	Gross Generation (MkWh)
1967-68 to 1979-80	37153.656
1980-81	3877.586
1981-82	4090.225
1982-83	4917.614
1983-84	4162.509
1984-85	3884.608
1985-86	4637.649
1986-87	5937.215
1987-88	6039.647
1988-89	5307.066
1989-90	5621.307
1990-91	5738.182
1991-92	5944.036
1992-93	5780.092
1993-94	5022.527
1994-95	6809.768
1995-96	6977.291
1996-97	5665.634
1997-98	6103.717
1998-99	4778.531
1999-20	3184.766
2000-01	2799.951
2001-02	3398.891
2002-03	5363.172
2003-04	5058.941
2004-05	4218.534
2005-06	5442.938
2006-07	6150.909
2007-08	4687.333
2008-09	4797.425
2009-10	4772.396
2010-11	6107.630
2011-12	4799.246
2012-13	4713.188
2013-14	5876.071
2014-15	6496.382
2015-16	6864.402
2016-17	5347.565
2017-18	4141.859
2018-19	3860.854
2019-20	4686.363
2020-21	5405.245
2021-22	4283.140
2022-23	3889.784
Total	**254795.845**

Progress of Mangla Dam Raising Works

Contracts under MDRP	Name of Project	Unit	Physical Target For 2022-23 (%)	Actual Achievement for 2022-23 up to 30.06.2023 (%)	Physical Target Fixed for 2023-24 (%)	Remarks
Construction of Saddle Embankment (MDR-02)	Mangla Dam Raising Project	01 No.	-	-	-	Already Completed
Construction of Power House Bypass Road & Bridge on Bong Canal (MDR-06)		01 No.	-	-	-	-do-
Construction of Office & Camps for WAPDA, & Consultants (MDR-07)		01 No.	-	-	-	-do-
Construction of Main Works (MDR-10)		01 No.	-	-	-	Completed - Recovery of Rs. 111 million against DP-1330 disputed by the contractor. Contract will be concluded after resolution of dispute.
Construction of Dhangali Bridge (MDR-21A)		01 No.	-	-	-	Already Completed
Construction of VTI in New City (MDR-22)		01 No.	-	-	-	-do-
Construction of Kharak Dyke (MDR-23A)		01 No.	-	-	-	-do-
Construction of Panyam Dyke (MDR-23B)		01 No.	-	-	-	-do-
Construction of Primary and Secondary Roads in New City Mirpur (MDR-24)		01 No.	98.74	98.74	100	TOC Issued. Declaration of Default under Sub-Clause 49.4 certified by MJV on March 19, 2019. After approval of 2nd Revised PC-I, WAPDA will proceed further accordingly in the said matter.
Construction of Roads including Water Supply and Sewerage Works in Sectors of New City (MDR-25)		01 No.	94.00	94.00	100	TOC Issued. Declaration of Default under Sub-Clause 49.4 certified by MJV on March 19, 2019. After approval of 2nd Revised PC-I, WAPDA will proceed further accordingly in the said matter.
Construction of Remaining Works of Roads including Water Supply and Sewerage Works in Small Towns Near Islamgarh & Chaksawari (MDR-26A)		01 No.	99.50	99.50	100	Contract terminated by the contractor. After approval of 2nd Revised PC-I, WAPDA will proceed further accordingly in the matter.
Construction of Remaining Works of Roads including Water Supply and Sewerage Works in Small Towns Near Dudial & Siakh (MDR-27A)		01 No.	-	-	-	Already Completed
Construction of Remaining Works of Public Buildings (Package-1) in New City (MDR-28A)		01 No.	-	-	-	-do-
Construction of Remaining Works of Public Buildings (Package-2) in New City (MDR-29A)		01 No.	-	-	-	-do-
Construction of Intake Works of Transmission Main and Distribution Mains for New City (MDR-32)		01 No.	87.50	87.50	100	Contract terminated by the contractor. After approval of 2nd Revised PC-I, WAPDA will proceed further accordingly in the said matter.
Construction of Water Treatment Plant in New City (MDR-33)		01 No.	-	-	-	Already Completed

Progress of Mangla Dam Raising Works

Contracts under MDRP	Name of Project	Unit	Physical Target For 2022-23 (%)	Actual Achievement for 2022-23 up to 30.06.2023 (%)	Physical Target Fixed for 2023-24 (%)	Remarks
Construction of Sewerage Trunks and Sewerage Treatment Plants for New City (MDR-34)	Mangla Dam Raising Project	01 No.	90.00	90.00	100	Contract terminated on Feb 06, 2020 by the employer. After approval of 2nd Revised PC-I, WAPDA will proceed further accordingly in the said matter
Construction of Remaining Works of Public Building in Small Towns Near Islamgarh and Chaksawari (MDR-35A)		01 No.	95.21	95.21	100	Contract terminated by the contractor. After approval of 2nd Revised PC-I, WAPDA will proceed further accordingly in the said matter
Construction of Remaining Works of Public Building in Small Towns Near Dudial and Siakh (MDR-36A)		01 No.	86.12	86.12	100	Contract terminated by the contractor. After approval of 2nd Revised PC-I, WAPDA will proceed further accordingly in the said matter
Electrification in New City (MDR-37)		01 No.	-	-	-	Already Completed
Electrification in Four Small Towns at Islamgarh, Chaksawari, Dudial & Siakh (MDR-38)		01 No.	-	-	-	-do-

Current Status

- 2nd Revised PC-I of the project was discussed in CDWP meeting held on May 03, 2023, wherein it was decided that project will be closed within approved scope of work under PC-I. Further, a committee under the convenorship of Addl. Secretary MoPD & SI was constituted for resolving the lingering issues of project.
- After detailed deliberations and several meetings with all stakeholders of the project, committee furnished their recommendations, which have been presented and discussed during CDWP meeting held on May 08, 2024. CDWP recommended the project to ECNEC at a rationalized cost of Rs.102,004.13 million with following recommendations:
  (a) An amount of Rs.1.0 billon for completion of remaining works and enhanced compensation amount of only Rs. 4.36 billion decided by Supreme Court of AJK in favor of affectees in 388 cases will be transferred to Govt. of AJ&K after approval of 2nd Revised PC-I.
  (b) Barakas Nullah will be taken up through PC-II including optional study and considering the design discharge of the emergency spillway and Rohtas Dam.
  (c) Surplus land will be de-awarded/auctioned after suitable advice from law division. Ministry of Water Resources led the matter.
  (d) Ministry of Finance will keep an allocation for payment to the affectess in case, undecided court cases are decided in favor of affectees. Same allocation may be deducted from the development budget.
  (e) Ministry of Water Resources will take up the matter of removal of encroachments with concerned organization for proper disposal of flood water through emergency spillway.
  (f) Project wing of Planning Commission will review the consultancy arrangement of all the mega projects and will present a report to the CDWP.
  (g) Ministry of Water Resources will lead the matter with WAPDA and AJ&K regarding reconciliation of unspent amount available with LAC and revenue being generated by MDHA.
  (h) Project will be closed and a PC-IV will be submitted to the Planning Commission.
  (i) Authorization of the project will be subject to the submission of updated rationalized 2nd Revised PC-I including updating of relevant tables through IPAS.
- Following the decision/recommendation of CDWP Committee, Ministry of Water Resources, Government of Pakistan Islamabad has constituted Inquiry committee under the convenorship of Chairman FFC regarding

reconciliation of funds. Committee conducted consecutive series of meetings on April 04, & 29, 2024, and June 13, 2024. The report of committee is still awaited.

MANGLA WATERSHED MANAGEMENT PROJECT

Mangla Watershed Management Project, WAPDA is an on-going Scheme which was launched in 1960 during the construction of Mangla Dam, it was realized that the erosion hazard in the catchment area was of alarming nature and the high sediment inflow to Mangla reservoir would rapidly deplete its water storage capacity. It was therefore considered that comprehensive watershed management measures be taken in the catchment area of Mangla Dam to control the rate of soil erosion, and inflow of sediment into reservoir to prolong its useful life

Location of the Project

Project area falls in the district of Rawalpindi, Jhelum of Pakistan and Muzaffarabad, Mirpur, Kotli, Bagh & Rawalakot of Azad Jammu & Kashmir

Objectives / Benefits of the Project

- To Prolong the useful life of Mangla Reservoir by Applying Watershed Management Techniques
- To Increase Forest and Agriculture Development
- To Increase Sub-soil Water and Reduce run off to Control Floods
- To Up-grade Socio Economic Conditions of the Resident Population
- Environmental Protection
- Poverty Alleviation

Watershed Measures

- Survey & Planning
- Nurseries
- Afforestation
- Soil Conservation Structures
- Engineering Structures
- Improvement of Cultivated Land
- Extension Services

Achievement of the Project

- The rate of sediment load into Mangla reservoir originally assessed by the consultants was 42,000 to 60,000 AF per annum.
- The design life of reservoir determined by the consultants was 100- 110 years.
- The average sediment inflow reported by the Mangla Dam Organization upto 2017 is 27288 AF per annum.
- Due to Watershed Management Techniques, the life of Mangla reservoir has enhanced upto 215 years (Excluding its Raising).

MANGLA REFURBISHMENT PROJECT

Mangla Power Station is located on River Jhelum at Mangla 10 km from Mirpur and 30 km from Jhelum City in the Power Zone of IESCO. Mangla Power Station equipped with ten (10) generating units have a total installed capacity of 1000 MW and the Power Station is playing a pivotal role in supplying low-cost energy to the National Grid.

WAPDA hired the services of MWH – NESPAK JV as consultants to carry out Feasibility Study due to availability of additional water storage after Mangla Dam Raising to determine the most viable option being technical as well as economical for Up-gradation / Refurbishment of the existing Units of Mangla Power Station. The consultants have recommended an upgrade to 1310 MW from 1000 MW as it satisfies all the objectives of Scope of Work without any substantial modification and also proved to be more viable in the financial terms.

Project Phasing

Phase 1 & 2

Adequate items are included in the list of works of

Detailed Annual Plan

Item	Name of Project	Unit	Total Quantity	Physical Targets for 2022-23	Actual Achievement for 2022-23	Physical Targets Fixed for 20223-24	Remarks
Raising of Plants	Mangla Watershed Management Project, WAPDA	Nos. (In Million)	0.172	0.172	0.088	0.130	49% Targets achieved up to June 30, 2023.
Afforestation (Planting of Plants)	-do-	Acre	261	261	261	250	100% Targets achieved up to June 30, 2023.
Engineering Structures i) Pucca Spillway ii) Silt Trap Storage iii) Wire Wall,Wire Gabion & Spurs	-do-	No	07	07	07	46	100% Targets achieved up to June 30, 2023. Installation of 01 No. Electric Pump and 01 No. Transformer at Mangla Nursery excepts Engineering Structure Works

Note: Physical targets are being fixed as per availability of R&M Budget

Phase-I to enable Units 5 ~ 6 to obtain maximum power output upon completion of all elements of these Units. Consideration has also been given to the long lead times in equipment deliveries or equipment that is required at the site early. The following contract Packages are in Phase I & II.

Package-I
Supply, Installation and Refurbishment of Units 5 and 6 Turbine, Generator, Governor, Excitation System and Minor Civil Repairs

Package-II
Powerhouse Cranes Refurbishment and Up-gradation

Package-III
Supply of Power Transformers for eight Units, 6 at 220 kV, 2 at 132 kV (2 to be refurbished).

Package-IV
Supply, Installation and Refurbishment of Turbine Inlet Valves of Units:1~10.

Package-V
- Supply, Installation and Refurbishment of Mechanical Equipment and Allied Civil Works for the following:
- Intake Gate Seals, rebuild Hydraulic Cylinders
- New Intake Trash Racks
- Tunnel Surveys
- Tunnel Repairs
- Modified Cooling Water System for all Units
- Station Common Mechanical Equipment Upgrade/Replacement (Pumps, Piping.)

Package-VI
Supply, Installation and Refurbishment of following Electrical Equipment:
- Installation of Main Power Transformers.
- New Isolated Phase Bus (IPB) for eight Units and Generator Circuit Breakers (GCB) for three Units.
- Demolish Old, Furnish and Install new Station Service System
- Modify or Revise Power House to Switchyard Line Conductors

Package-VII
Supply, Installation and Refurbishment of Units 1-4 Turbines, Generator, Governor, Excitation System and Minor Civil repairs.

Package-VIII
Plant Control System, Station Instrumentation, Interface to Governor and Excitation Controllers, HMI for Control Room

Package-IX
- Switchyard Control and Protection System (Substation AUTOMATION System).
- Main Switchyard Component Revisions, and Install Earthling Revisions

Phase 3
The following Contract Packages are in Phase III.

Package-X
Supply, Installation and Refurbishment of Units 7 and 8 Turbine, Generator, Governor, Excitation System [Contract Execution to be scheduled so that first Unit is delivered and Contractor ready to mobilize approximately when Units 1~4 are completed].

Package-XI
Supply, Installation and Refurbishment of Units 9 and 10 Turbine, Generator, Governor, Excitation System.

Salient Features

Name of Project:	Mangla Refurbishment and Up-gradation Project
Location:	Mangla, Mirpur Azad Jammu and Kashmir
Approval of PC-1 By ECNEC	December 31,2013
Total Cost of PC-1 in US Dollars	483.558 Million
Total Cost of PC-1 in PKR	52224.307 Million
Commencement Date	2015-16
Expected Date of Completion	2027-28
Donor Agency:	United States Agency for International Development (USAID) Agreement signed between WAPDA and USAID on 15.08.2013 Credit Facility Agreement between AFD & EAD, GoP, signed on 20.07.2017
Total Committed Grant Amount	US $ 150.00 Million (USAID) Grant Euro 90 Million (AFD) Loan
Total Capacity of Power Station after Completion of Project	1310 MW after Refurbishment / Up-Gradation
Consultants	M/s MWH-NESPAK (MRP JV) Contract Closed Scope: Feasibility, Design, Preparation of Tender Documents, Evaluation of Bids & Award of Contract for Package 1~9. M/s MWH-NESPAK-ACE (MRPS JV) Running Contract Scope: For Supervision of Awarded Contracts for Units: 1~6 & Units 9~10

Consultancy Cost	Rs. 1011.63 Million (MRP JV) Contract Closed Rs. 1317.74 Million (MRPS JV) Running Contract Amendment No. 2 to CSA is in process.
Progress Achieved: Package I &VII	PC-I amounting to PKR 52,224.31 Million (US $ 483.56 Million) was approved by ECNEC on 31.12. 2013. ● Contract was awarded to lowest evaluated bidder i.e. M/s Alstom France, Now M/s GE Hydro France at a cost of PKR 10810.713 Million on 29.08.2016. The Refurbishment and upgradation work on first two units (5-6) have been completed. Unit No. 05 & 06 commissioned on 28.02.2022 and handed over to WAPDA on 01.04.2022 Both units are under DLP w.e.f 01.04.2022 to 31.03.2025. Refurbishment work on next two Units 3-4 is in progress. Physical Progress:90.0% Financial Progress: 64.90%
Package II	● Contract for Package-II (Power House Cranes Refurbishment) was awarded to M/s Zirva-ISIK-Petrocon JV on 10.11.2015. The refurbishment work on cranes has been completed in November, 2017. Physical Progress: 100% Financial Progress: 100%
Package III-a	● Contract for Package III-a (Power Transformers Units: 3～6) has been awarded to M/s Chint Electric Co. Ltd. China on 11.03.2016. All Power Transformers have delivered at site on 29 .12. 2017. Physical Progress: 100% Financial Progress: 100 %
Package III-b	● Contract for Package III-b has been awarded to M/s Baoding Tianwei Baobian Electric Co. Ltd China for Supply of power Transformers for unit 1-2, GMHD-03b at a total cost US $ 2,711,600, signed on 19.07.2021. Delivery for Transformer unit 1-2 likely to be completed in August 2023. Physical Progress: 93% Financial Progress: 27.28%
Package IV-a	● Contract for Package-IVa (Supply of Turbine Inlet Valves for Unit 1-6) has been awarded to M/s Kokusai Commerce Co. Ltd. Japan [nominated Contractor of Hitachi-Mitsubishi Corporation Hydro, Japan, and Original Equipment Manufacturer (OEM)] on 11.03.2016. All refurbishment components of TIVs Units 1～6 a/w accessories have delivered at site on 18. 07.2017. Physical Progress: 100% Financial Progress: 100 %
Package V	● Package V (Balance of Plant Mech): The contract has been awarded to M/s Zhejiang Orient Co. Ltd on 19.06.2019. Order to Commence has been issued to Contractor on 13.12.2019. Design, manufacturing and delivery of equipment is in progress. Installation of new equipment on Unit 5-6 is completed. Installation Testing and commissioning of new equipment is in progress Physical Progress: 88.4% Financial Progress: 42.48%.
Package VI＋VIII	● Package VI＋VIII (Balance of Plant Electrical ＋ Power House Control System) has been awarded to M/s Sino hydro on 08.01.2019. The contractor mobilized on site on 16.10.2019. Design, manufacturing and delivery of equipment is in progress. Physical Progress: 45.2 % Financial Progress: 40.12 %
Package IX	● Package IX (Switchyard Control System) has been awarded to M/s CAMC China on 17.09.2018. Work is in progress. Design, manufacturing and delivery of equipment is in progress. Installation of new equipment is in progress. Physical Progress: 91.2% Financial Progress: 56.72 %
Package XI	● Contract has been awarded to M/s GE Hydro France at a cost of 11922.908 Million PKR on 10.01.2023. Order to commence has been issued to contractor on 02.02.2023 and the work is in progress. Initial design for unit 9 &10 has been completed & Detail design for Unit 9～10 likely to be completed in August 2023. Physical Progress: 5.5% Financial Progress: 14.18 %

SMALL HYDEL POWER STATIONS (PUNJAB)

Five Small Hydel Power Stations (Punjab) 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 have collectively generated 145.504 million Units during the year 2022-23. The repair & maintenance work of all the Generating Units along with station auxiliaries were carried out satisfactorily during the year. The detail of activities performed at each station is as follows:

HYDEL POWER STATION RASUL (Distt. M.B.DIN)

The annual generation parameters of the Power Station having total installed capacity of 22 MW (02 Units of 11 MW each) is as follows:

Net Electrical Output FY: 2022-23	54.288798 MkWh
Maximum Monthly Generation during March, 2023	7.609333 MkWh
Maximum Daily Generation on March18, 2023	0.312000 MkWh
Maximum Load Attained on March 18, 2023	13.0 MW
Cumulative Generation up to June 30, 2023	5568.912365 MkWh

Brief description of Major Works carried out during the year 2022-23

- Annual Maintenance of Unit No. 1 & 2 carried out during annual canal closure as per prescribed check sheet.
- Inspection of all Protective relays was carried out by team from o/o SE, SHPS Mangla.

Rehabilitation Activities

- In house feasibility study for rehabilitation of HPS Rasul has been completed by o/o GM (Hydro) Planning.
- Expression of Interest (EOI) for hiring the consultant to carry out review / updating of In-house feasibility study, detailed engineering design including environmental and social impact assessment and management plan, preparation of Tender Documents and PC-I of the project was published and 6 No. firms submitted their proposals. Evaluation of proposals is under process.

HYDEL POWER STATION SHADIWAL (Distt. Gujrat).

The annual generation parameters of the Power Station having total installed capacity of 13.5 MW (02 Units of 6.75 MW each) are as follows:

Net Electrical Output FY: 2022-23	32.445353 MkWh
Maximum Monthly Generation during April, 2023	3.400700 MkWh
Maximum Daily Generation on November 20, 2022	0.128300 MkWh
Maximum Load Attained on May 29,2023	6.5 MW
Cumulative Generation up to June 30, 2023	2745.335826 MkWh

Brief description of Major Works carried out during the year 2022-23

- Annual Maintenance of Unit No. 1 & 2 carried out during annual canal closure as per prescribed check sheet.
- Inspection of all Protective relays was carried out by team from o/o SE, SHPS Mangla.
- Rehabilitation / Repair of 01 No 5 MVA Power Transformer
- Replacement of Cables of Main Excitor in Unit # 02
- Replacement of Field Circuit Breaker of Unit # 01
- Construction of 01 # Cat-II & 02 Cat-IV Residences

Rehabilitation Activities

In July 2022, the case was initiated to undertake feasibility study rehabilitation of HPS Shadiwal. In this regard the following activities have been carried out during the year 2022-23.

- A team of multi-disciplinary engineers from office of the GM (Hydro) Planning Sunny View Lahore visited on September 27, 2022.
- Related documents / data / drawings requested were provided to o/o GM (Hydro) Planning WAPDA.
- Topographic Survey of HPS Shadiwal was carried out as deposit work by o/o GM (Hydro) Planning WAPDA.

HYDEL POWER STATION NANDIPUR (Distt. Gujranwala)

The annual generation parameters of the Power Station having total installed capacity of 13.8 MW (3 Units of 4.6 MW each) are as follows:

Net Electrical Output FY: 2022-23	36.131411 MkWh
Maximum Monthly Generation during June, 2023	4.7161 MkWh
Maximum Daily Generation on June 04, 2023	0.1876 MkWh
Maximum Load Attained on June 04, 2023	8.5 MW
Cumulative Generation up to June 30, 2023	3016.3425 MkWh

Brief description of Major Works carried out during the year 2022-23

- Annual Maintenance of Unit No. 1, 2 & 3 carried out during annual canal closure as per prescribed check sheet.
- Inspection of all Protective relays was carried out by team from o/o SE, SHPS Mangla.
- Installation of 08 No. Surface Coolers at Unit No.1.

Rehabilitation Activities

In July 2022, the case was initiated to undertake feasibility study for rehabilitation of HPS Shadiwal. In this regard the following activities have been carried out during the year 2022-23.

- A team of multi-disciplinary engineers from office of the GM (Hydro) Planning Sunny View Lahore visited on September 29, 2022.

- Related documents / data / drawings requested were provided to o/o GM (Hydro) Planning WAPDA.
- Topographic Survey of HPS Shadiwal was carried out as deposit work by o/o GM (Hydro) Planning WAPDA.

HYDEL POWER STATION CHICHOKI (Distt. Sheikhupura)

The annual generation parameters of the Power Station having total installed capacity of 13.2 MW (3 Units of 4.4 MW each) are as follows:

Net Electrical Output FY: 2022-23	30.922274 MkWh
Maximum Monthly Generation during April, 2023	3.733220 MkWh
Maximum Daily Generation on June 04, 2023	0.155190 MkWh
Maximum Load Attained on June 03, 2023	9.00 MW
Cumulative Generation up to June 30, 2023	2556.67459 MkWh

Brief description of Major Works carried out during the year 2022-23

- Annual Maintenance of Unit No. 1, 2 & 3 carried out during annual canal closure as per prescribed check sheet.
- Inspection of all Protective relays was carried out by team from o/o SE, SHPS Mangla.

Rehabilitation Activities

In July 2022, the case was initiated to undertake feasibility study for rehabilitation of HPS Shadiwal. In this regard the following activities have been carried out during FY-2022-23.

- A team of multi-disciplinary engineers from office of the GM (Hydro) Planning sunny view Lahore visited on September 22, 2022.
- Related documents / data / drawings requested were provided to o/o GM (Hydro) Planning WAPDA.
- Topographic Survey of HPS Shadiwal was carried out as deposit work by o/o GM (Hydro) Planning WAPDA.

HYDEL POWER STATION RENALA (Distt., Okara)

The annual generation parameters of the Power Station having total installed capacity of 1.1 MW (5 Units of 0.22 each) are as follows:

Net Electrical Output FY: 2022-23	1.744547 MkWh
Maximum Monthly Generation during April, 2023	0.208890 MkWh
Maximum Daily Generation on April 04,2023	0.010170 MkWh
Maximum Load Attained on April 16,2023	0.50 MW
Cumulative Generation up to June 30, 2023	98.041250 MkWh

Brief description of Major Works carried out during the year 2022-23

- Annual Maintenance of Unit No. 1, 2, 3 & 4 carried out during annual canal closure as per prescribed check sheet.
- Inspection of all Protective relays was carried out by team from o/o SE, SHPS Mangla.
- Completion of De-silting Work of Power Channel of HPS Renala
- RE- babbiting of Turbine Bearing of Generation Units of HPS Renala

Rehabilitation Activities

- In house feasibility study for rehabilitation of HPS Renala has been already completed by o/o GM (Hydro) Planning.
- Expression of Interest (EOI) for hiring the consultant to carry out review / updating of In-house feasibility study, detailed engineering design including environmental and social impact assessment and management plan, preparation of Tender Documents and PC-I of the project was published and 6 No. firms submitted their proposals. Evaluation of proposals is under process.

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) was established in 1968 to take care of foreign currency requirements. The balance amount available from Indus Basin Development Fund (IBDF) was diverted to TDF 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.

Benefits

The average annual storage releases (1975-2023, 49 Years) of Tarbela reservoir are 8.129 MAF (10.03 BCM) for irrigation depending upon the requirements of irrigated agriculture. About 22 million acres (8.91 Million Hectares) of agricultural land in all provinces is receiving water from Tarbela storage. During the entire operation period up to June 2023, total 398.298 MAF (491.5 BCM) water has been released.

Adding to it, about 565.717 billion units of electricity including Tarbela 4th Extension HPP has been generated.

Survey and Hydrology

The detail of progress is as under:

Hydrology

Reservoir operation was carried out during the period with the following data recorded:

- Total Inflow = 58.138 MAF
- Total Outflow = 54.579 MAF
- Total Releases from Storage = 6.578 MAF
- Rainfall at Tarbela = 37.23 Inches

The reservoir touched its maximum conservation level i.e.1,550 ft. a.m.s.l. on 20 August, 2022.

Sedimentation Survey

Annual Sedimentation Survey of Tarbela reservoir including Haripur Basin & Brandu River was conducted during the month of Sept–Oct, 2022. Computation of data and drawings are completed.

Incoming sediments during the year are estimated to about 0.081 MAF. Reduction in gross and live storages are estimated as follows:

Storage	1974 (MAF)	2022 (MAF)	Reduction (MAF)
Gross	11.62	6.493	5.127 (44%)
Live	9.679	5.809	3.870 (40%)

The Hydrographic Survey 2022 shows that, the elevation of pivot point is 1400 ft. a.m.s.l. and it is located at a distance of 3.78 miles from Main Embankment Dam.

Annual Sedimentation Report for the year 2022 completed and sent to concerned quarters. Suspended sediment sampling data through Power Outlets of Tarbela & GBHP i.e. its collection / processing continued throughout the year.

Horizontal & Vertical Movement Observation Survey Horizontal as well as Vertical Movement Observation Survey of Tarbela Dam Project continued throughout the year.

General/Special Surveys

- Annual Sedimentation / Hydrographic Survey of Tarbela Reservoir
- Hydrographic Survey / Sounding of Auxiliary, Service Spillway, T-5 Plunge Pools & Dhal Dara Weir Channel
- Water Edge & Dry Portion of Spillways along with T-5
- X-section of Main Dam & Aux. Dam No.1 U/s Riprap
- Survey for Cadastral Mapping of WAPDA Land, TDP
- Power House Transformer Deck Points, Aux. Spillway Protection Slab, Gate Shaft Wall Points of Tunnel (1-4). (Vertical)

Harbour

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

- Hydrographic / Sedimentation Surveys
- Sounding Survey of Plunge Pool of Spillways, T-5 & Dhal Darra Weir Channel
- Survey of Intake Area
- Conducting Raids against Illegal Fishing on the request of Fisheries and Security Departments
- Security Patrolling in Tarbela Reservoir and Ghazi Barrage Pond against Illegal Fishing and Movement of Boats

Tarbela Hydel Power Stations

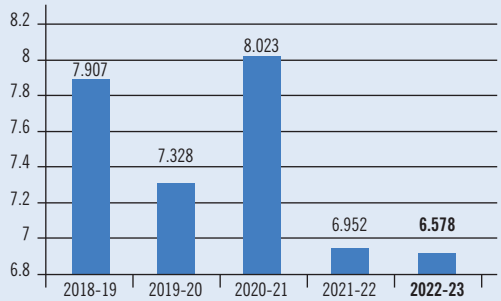
Water Storage Releases and Power Generation of Tarbela Dam

Detail of Water Storage Releases and Power Generation are as under:

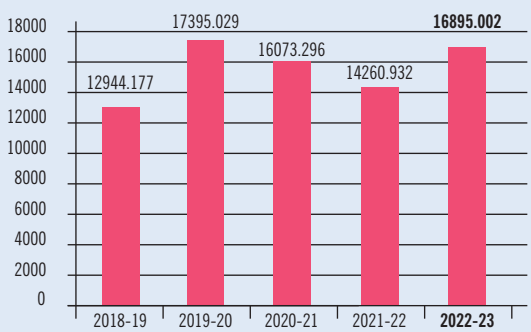
Tarbela Dam Releases and Gross Generation

Year	Releases (MAF)	Gross Generation (MkWh)
1975-1980	41.020	11354.500
1980-1985	49.500	28262.240
1985-1992	57.820	68998.260
1992-1996	29.280	56498.810
1996-2007	95.194	160805.405
2007-2010	24.723	42804.627
2010-2011	7.517	16002.692
2011-2012	7.232	14109.118
2012-2013	7.998	14769.025
2013-2014	8.312	15198.103
2014-2015	8.594	14810.332
2015-2016	8.397	15983.831
2016-2017	8.063	15179.476
2017-2018	7.860	13371.673
2018-2019	7.907	12944.177
2019-2020	7.328	17395.029
2020-2021	8.023	16073.296
2021-2022	6.952	14260.932
2022-2023	6.578	168,95.002
Total	**398.316**	**565,716.528**

Tarbela Dam Releases (MAF)



Tarbela Dam Gross Generation (MkWh)



Dams & Structures Section

Dams

Activities at/near Main Embankment Dam (MED)

- Marking for stocking of Riprap Material at MED crest to replenish u/s slope carried out as per S.E (D&S) detail visit of MED crest from right to left Abutment of dam. Total 126 locations having disturbed Riprap marked & Riprap material will be stocked at these locations with the help of heavy machinery of Base Workshop for its replenishment as per stock availability. This work remained pending due to T-4th Ext: HPP project activities at T-3 & T-4 raised Intake works.
- Filling, dressing and compaction of soil in depressions at MED crest shoulders at (RD 90+00 & RD 92+00) carried out.
- Shifting of Riprap Material at MED crest to replenish Riprap at u/s slope with the help of heavy machinery of Base Workshop started and is in progress on intermittent basis during the month under report.
- Dismantling of bent & dented guardrails and installing of new one at RD: 22, 33, 44, 78, 90 & 92 of Dam crest shoulders carried out as per DSO Annual Recommendations-2022.
- Shifting of Riprap Material at MED crest to replenish Riprap at u/s slope with the help of heavy machinery of Base Workshop remained in progress on intermittent basis during the month under report. Replenishment work started with Base Workshop Crane (18 Ton) and suspended due to non- availability of Crane Operator as proper placing of material could not done by the temporary operator.
- Defective guardrails along with unused Santary Post dismantled and removed from Dam crest at RD: 42+00.
- Shifting of Riprap Material at MED crest to replenish Riprap at u/s slope with the help of heavy machinery of Base Workshop started and carried out.
- Installation & fixing of door, window frame and White Washing of Santary Post at MED crest at RD 42+00 started & is in progress.
- Rehabilitation & opening of choked drain holes at Instrument Houses d/s slope of MED as per Annual DSO Team Recommendations -2022 started & is in progress.
- Refurbishment & dressing of Riprap Material at u/s slope of MED started with the help of heavy machinery of Base Workshop and is in progress as per Annual DSO Team recommendations -2022.
- Cutting of wild growth and small trees at MED toe and r/s Abutment drain from RDA-22 Adit Portal area towards Contractual Ditch started and carried out.
- Installation & fixing of door, window frame and White Washing of Santary Post on MED crest at RD 42+00 carried out
- Refurbishment & dressing of Riprap Material at u/s slope of MED with the help of 10 Ton Crane of Base Workshop and manual labors carried out as per Annual DSO/ 6th Periodic Inspection Team recommendations.

Cut Slopes (Tunnel # 1 ~ 4) Outlet Area @ R/S of MED

- Cleaning and removing of wild growth from cracks on horizontal surface & repair of cracks with CSM Mortar & SBR Latex from berms El: ± 1400 towards berm El: ± 1200 started & carried out as per DSO Annual Recommendations 2022.
- RCC drains work at berm El + 1400' & 1500' for drainage of seepage water & parapet wall at berm El: 1400' cut slope area, MED right abutment work carried out by contractor M/s Samin Gul & Brother Ghazi.

Activities at/near Auxiliary Dam No. I & II (AD-II & I)

- Visual inspection of u/s and d/s slopes of both dams carried out and no abnormality observed.
- Repainting of RD's at AD-I & II crest railings started & carried out.
- Filling and compacting of small ditches and cavities at crest d/s shoulder side of AD-II carried out as per DSO Annual Recommendations- 2022.
- Cleaning of road along with both sides of road shoulders from crests of AD No. I & II along with Auxiliary Spillway deck slab to Tarbela Monument area carried out.

Structures

Activities at/near Service & Auxiliary Spillways

- Panel marking at Chute Slab of Service Spillway with epoxy paint (Chemfloor 241) started & carried out.
- Cleaning of expansion joints for pouring of epoxy sealant at Approach Slab of Auxiliary Spillway carried out.
- Repairing of concrete cracks & cavities at u/s left Abutment of Auxiliary Spillway with epoxy Chemdur-42 LP & Chemdur-31 started and carried out as per recommendations of DSO Annual -2021 Inspection Team.
- Repairing of cracks & joints at left Abutment of d/s wall of Auxiliary Spillway with epoxy Chemaflex 276 & Chemseal 105 N carried out as per Annual DSO-2021 Recommendations.

- Repairing of cracks & cavities at buttress slab d/s of flip bucket of Auxiliary Spillway with epoxy Chemdur-42 LP started & carried out as per Annual DSO -2021 Recommendations.
- Cutting of wild growth at r/s cut slope of plunge pool area of Auxiliary Spillway started & carried out.
- Auxiliary Spillway operated 1st time at 1300 hours on dated 27 July, 2022 during current high flow season.
- Service Spillway operated 1st time at 1530 hours dated 24 August, 2022 during current high flow season.
- Cleaning of Service Spillway deck slab carried out.
- Inspection of Service Spillway chute slab carried out after 1st operation & no abnormality observed.
- Cleaning of slided material from Auxiliary Spillway d/s both sides of drain by Base Workshop Machinery carried out.
- Repairing of door & chowkat of Instrument House at Auxiliary Spillway Control Room building carried out.
- Rep air of cracks, cavities & patch work at Buttress Wall & Flip Bucket of Service Spillway with epoxy Chemseal 105-N, NS Grout, Chemdur 31 & SBR Latex started & is in progress as per DSO recommendations 2021.
- Repair of steel door & fixing of sliding bolt at Auxiliary Spillway Control Room Building Gate started & carried out.
- Laying of PCC concrete (1:2:4) at left Abutment u/s of Auxiliary Spillway to stop water ingress & providing gentle slope started & carried out as per DSO Annual Inspection team recommendations-2022
- Repair of cracks, cavities & patch work at Buttress Wall, Flip Bucket, SSDA-1 gallery at RD: 1+97 & Flip Bucket Gallery portal area of Service Spillway with epoxy Chemseal 105-N, NS Grout, Chemdur 31 & SBR Latex carried out as per DSO Annual recommendations-2021.
- Repair of cracks and filling with epoxy XP Injection at RD: 1+90, 1+70 & 1+20 in SSDA-1&2 Galleries started & carried out as per DSO Annual recommendations-2022.
- Repair of damaged concrete patch & cracks at deck slab d/s parapet wall with epoxy Chemseal 105 N, Chemrite Grout NS, cement mortar & SBR Latex started & carried out as per DSO Annual recommendations – 2022.
- Cleaning of sliding material and filling of area behind newly constructed wall for proper diversion of drainage flow at L/R sides of Flip Bucket of Service Spillway carried out as per Annual DSO team recommendation-2022.
- Cleaning of chute slab of Service Spillway from trash carried out. While cleaning of trash from chute slab of Auxiliary Spillway started and is in progress.
- Installation & fixing of steel frame with gates & barbed wire for safety at L/R sides of Flip Bucket of Service Spillway carried out.
- Cleaning of chute slab of Auxiliary Spillway from trash material carried out.
- Cleaning & filling of Auxiliary Spillway expansion joints and repair of cracks at chute slab with epoxy Hypercoat PU-40, Chamdur 31, Chamaflex 276, Chamrite Grout NS, SBR Latex & paking rod carried out as per Annual DSO Team recommendations -2022.
- Concrete copping on top surface of Butress slab at l/s area of Flip bucket of Service Spillway carried out.
- Dismantling of old concrete drainage pipe and refixing of new one after providing proper slope at R/S area of Flip Bucket of Service Spillway started and carried out.
- Cleaning and painting of Flip Bucket R/L side galleries portal area of Service Spillway started and carried out.
- Repair of cracks at bottom of Platforms of monkey ladder at Bay No. 04 to 09 of d/s side of Gate Piers of Auxiliary Spillway with epoxy Chemfloor 241 carried out as per Annual DSO team recommendations-2022.
- Cleaning and removal of slide material e.g. boulders and fine material from R/S area of Flip Bucket of Auxiliary Spillway carried out as per Annual DSO team recommendations -2022.
- Construction of stone pitching wall & placing of concrete for leveling to divert drainage flow at r/s area of Flip Bucket of Auxiliary Spillway started & carried out.
- Cleaning, leveling & concreting (1:2:4) for providing proper slope & to divert drainage water of r/s area of Flip Bucket of Auxiliary Spillway started & carried out as per DSO annual team recommendations 2022.
- Cleaning of Deck slabs of the both Spillways carried out.
- Cleaning of Service & Auxiliary Spillways buttress Slab from slide material carried out with the help of Base Workshop Machinery.
- Panel marking at Chute Slab of Service Spillway with epoxy paint carried out.
- Cleaning of Deck slabs of the both Spillways carried out.
- Installation & fixing of gates & fence for safety at flip bucket l/s & r/s area of Auxiliary Spillway carried out.
- Filling & repairing of floor cracks at ASDA- 1, 2 &3 Adit Series of Auxiliary Spillway with epoxy Chemseal 105 N, Repair Mortar SF &

SBR latex started & carried out as per annual DSO Inspection Team Recommendation-2022.
- Filling & repairing of horizontal cracks at D/S face of Flip bucket wall of Auxiliary Spillway with epoxy Chemdur 31, Chamrite ground NS & SBR Latex started & is in progress as per annual DSO Inspection Team Recommendation 2022.
- Repair of spalled concrete at ASDA-3 Adit Series of Auxiliary Spillway with concrete (1:1.5:3) & SBR latex stated & carried out as per annual DSO Inspection Team Recommendation 2022.
- Rehabilitation of weep holes bracket at ASDA 1 & 3 Adit Series of Auxiliary Spillway started & carried out as per annual DSO Inspection Team Recommendation 2022.
- Rehabilitation of electric system at ASDA 2&3 Adit Series and installation & fixing of LED light 50 watt at ASDA- 2 & 3 Adit Series portal areal of Auxiliary Spillway carried out.
- Filling / repair of expansion joints at SSDA-1 & 2 connecting galleries of Service Spillway with epoxy Chemseal KR & packing rod started & carried out.

Tarbela Power Station

Inspection of roof & expansion joints for rainwater leakages carried out by Superintending Engineer (D&S), Director (TDMO), R.E (Mechanical) TPS, AXEN (D&S) & Sub Engineer (D&S) on dated May 04, 2023

Tunnels (Activities at/near Tunnel No. 5)

Tunnel No. 5 was operated for the 1st time on 10 February, 2022 at 1600 Hrs during this year.

Maintenance of Field Water Supply System

- Field water supply system remained in operation and routine repair & maintenance of pipe lines, pumps, motors, starters & main switches carried out during the year under report.
- Repairing of main water supply pipeline of Base Workshop, Fire Brigade Office, FC Camp to Cheema / Ameer Posts, Cut Slope Area (T-1~4), Security Watch Tower No. 7, Gulzari Security Barrack, MED Crest, D&S Field Office, D&G Field Store/Office Building, Monument area, Gate Shaft Plaza (T-1~4), SSW deck slab, Dhal Tank, D&G p/station and Model Tank carried out during the year under report.
- Installation & laying of 2"? pipeline near Model Tank started & carried out.
- Repairing changing of Ball bearing 6411 & shaft work of Centrifugal Pump (150 HP) started & carried out at D&G Pumping Station by D&S Mechanic Pumps.
- Repairing of water supply line gate valve (1½" ?) at T-5 Chowk carried out.
- Flushing & repairing of G.I (2" ?) pipeline to Harbor area started & is in progress.
- Repairing of broken (2½" ?) pipeline near Service Spillway Right side area of Deck Slab started & carried out.
- Installation & laying of G.I pipe (¾" ?) and repair of old line at TDMO site office started & carried out Repairing of 60 HP Submersible pump (Connecting Shaft Repair) & lowering of pump with Base Workshop crane carried out.
- Installation & fixing of ball value (1"?) at Auxiliary / Spillway to Harbor pipeline for flushing & air release at AD-1 carried out.
- Laying, fixing & welding of G.I pipeline 1"? at MED crest near Gate Shaft T(1 ? 4) started & carried out.
- Fixing of ½" ? Bib cock at Monument area carried out.
- Shifting, laying, welding & fixing of water supply pipeline (4" ?) from D&G to Dhal Tank for 60 HP submersible pump started & carried out.
- Repairing of Centrifugal Pump (50 HP) at LAA-2 & MED Pumping Stations started & carried out
- Threading, laying & fixing of pipe (4" ?) for suction at LAA-2 water tank started & carried out.
- Rectification of transformer link fault carried out at D&G Pumping Station.
- Repairing of Centrifugal Pump (50 HP) at LAA-2 & MED Pumping Stations started & carried out
- Threading, laying & fixing of G.I Pipe (4" ?) for suction at LAA-2 water tank started & carried out.
- Electric connection for 50 HP Pump Motor carried out at MED Pumping Station by Field Electrical crew.
- Repairing of Centrifugal Pump Motor & replacement of ball bearing 6212 at D&G Pumping Station carried out.
- Relocation of 2"? G.I water supply pipeline at cut slope (T-1 ? 4) berm El:±1500 carried out by D&S field crew due to construction of R.C.C drain through contractor.
- Repair of electric panel / starter box at MED Pumping Station carried out.
- Welding of 5"? G.I Pipeline at D&G Pumping Station carried out.
- Pedestal supports & welding works of 4" ? G.I Pipeline near Main Dhal water tank started & carried out.
- Fixing of ½" ? gate valve at pipeline of Base Workshop carried out.
- Dismantling of bibcock connection at RD

43+00 of MED crest carried out, to stop water drops at dam shoulders to avoid increase of unnecessary wild growth.
- Repair of 4 core cable of Turbine Pump at D&G Pumping Station carried out.
- Repairing of Centrifugal Pump & Motor (50 HP) i.e. base plate, ball bearing, over hauling & greasing at LAA- 2 Pumping Station started & carried out.
- Fixing of Bibcock at Auxiliary Spillway deck slab & Gate Valve for Fire Brigade Pipeline at D&G Pumping Station carried out.
- Repair of Electric Panel of (50 HP) Submersible Pump carried out at D&G Pumping Station.
- Lowering & fixing of (50 HP) Submersible Pump carried out at D&G Pumping Station after necessary repair with the help of BWS Crane.
- Submersible Pump (60 HP) installed at D&G Pumping Station lifted up for repair from local market.
- Construction of walls for chain pulley system at D&G Pumping Station Rooms started & carried out.

Activities at/near Adits / Galleries
- Routine maintenance work i.e. cleaning of walls, floors, portals and other related areas, lightening & ventilation system in right / left abutment Adits and Spillways Galleries carried out.
- Cleaning and up-keeping of Adits / Galleries networks is continued on daily basis to provide easy and safe access to Monitoring and O&M Staff.
- Rehabilitation of weep holes bracket from RD's 0+00 to 5+00 at LDA-3 Adit started & carried out.
- Cleaning of stairs portion of SSDA 1 & 2 galleries started & carried out.
- Fixing of Gauge plate at RAA-2 portal started & carried out under supervision of Geology Section.
- Fixing of G.I wire gauze at RDA-21, RAA-2, RDA-22, RGA-11 Adits & Service Spillway galleries gates for protection from Bats and other animals started & carried out.
- Red oxide paint on wire gauze installed at gate of RAA-2, RGA-11, RDA-22 & RDA-21 Adits carried out.
- Dewatering work at LDA-3 Adit (T#5 Pump Shaft) carried out up to El: 1376' (24 ft.) and then suspended as per directions of the Inspection Team comprising of Director (TDMO), SE (D&S), JE. Geologist (TDP), JE. (TDMO), Director (Civil) T-5th, XEN (Civil) T-5 and T5C Consultant. Pumps along with cables, pipes etc. shifted to D&S Field Office Store from LDA-3 Adit.
- Rehabilitation of weep holes bracket at LDA-3 Adit carried out.
- Electrification / Rehabilitation work at Right Abutment, Left Abutment, Auxiliary Spillway & Service Spillway Adits / Galleries started & carried out.
- Making & fixing of wooden plug at some drain hole at ADGA-1 (RD: 0+50) carried out as per instructions of TDMO, Directorate.
- Electrification / rehabilitation work at LDA-3, LAA-1 & 2 Adit series & Auxiliary Spillway galleries started & carried out.
- Electrification / rehabilitation work at ASDA-4, LAA-1 & 2 Adit series & RDA-22 started & carried out.
- Nomenclature and marking / repainting of RD at LAA-2 Adit series carried out as per DSO Annual Recommendation-2022.
- Removing and dismantling of rusted / scrap Victaulic Pipe from RAA-1 Adit series started and carried out.
- Repair / filling of cracks with epoxy XP injection at LGA- 3 (RD 1+30) and LGA -5 (RD 2+75) Adit series started and carried out as per DSO Annual Recommendations-2022.
- Electrification and other rehabilitation works at LAA-2, LAA-1 Adit series and Auxiliary Spillway Adit series started and carried out as per of Annual DSO Team Recommendations - 2022.
- Electric fault rectified at RDA-22 inside RAA-2 Adit series by the D&S electrical crew.
- Rehabilitation of weep holes at LDA-3, AD2DA1, ASDA-2 Adit series carried out and RAA-2, ASDA-1 started & is in progress as per Annual DSO Team Recommendations -2022.
- Rehabilitation of weep holes at ASDA-3 Adit series carried out as per Annual DSO Team Recommendations-2022.
- Installation and fixing of 1"? PVC pipe for exposed cable at Service Spillway Flip Bucket gallery carried out.
- Plugging of weep hole at (RD 1+85) ASDA-4 adit series carried out as per request of TDMO & Geology Section TDP.
- Fixing of discharge measurement gauge plate at LDA-3 adit portal area carried out.
- Electrification and other rehabilitation works at RDA-21,2,3,5, RGA-11 & 12, of right abutment adits & Auxiliary Spillway adits carried out as per Annual DSO Team Recommendations-2022.

Activities at/near (T-1-4) & T-5 Gate Shaft Plaza
- Cleaning & filling of expansion joints of Gate Shaft Plaza with packing rod & epoxy Chemflex 276 & Chemseal Black carried out as per Annual DSO-2021 Recommendations.
- Repairing of cracks & cavities under fishplates of Gantry Crane of Gate shaft plaza with epoxy

Chemdur -42 LP, cement, sand mortar & SBR Latex carried out as per recommendations of DSO Annual-2021 Inspection Team.
- Removal of slided material from access road drain to Gate Shaft Plaza started by Base Workshop Machinery & carried out.

Tarbela Dam Model & Monument Area
- Cleaning of Model water tank started & carried out.
- Herbicide spray to eradicate wild growth at Monument Area carried out.
- Cleaning, filling & spreading of sand on newly laid tuff tile joints at Monument Area Island carried out.
- Painting & white washing of curb wall stones at Tarbela Dam Model Chowk & Monument area started & carried out.

Activities on Permanent Access Road (PAR)
- Cutting of wild growth on both side road shoulders and roadside drains from Mehran to Auxiliary Check Post, T-5 Chowk towards outlet area and AD-I to MED P/Station carried out.
- Cleaning of PAR road surface by removing small gravels etc. from Mehran to Auxiliary Check post carried out on intermittent basis for safety of running vehicles.
- Removal of slide material at PAR road shoulders from Mehran to Auxiliary Check Post carried out with heavy machinery of Base Workshop.
- Cleaning of l/s shoulder of PAR from mud / excavated material from Kokarchua to Auxiliary Check Post started & carried out as per instruction of Worthy Chief Engineer (Civil) TDP.
- Cutting, breaking & concreting in drain bed for providing gentle slope for rainwater flow near Auxiliary Check Post at RD: 290+00 carried out.
- Cleaning slide material on PAR near Kokarchua Village with help of Base Workshop machinery at RD 145+00 carried out.

Earthquake Blue Drill Data
- Earth Quake event occurred on dated March 21, 2023 at 2147 Hrs. Yellow Drill initiated & carried out on March 22, 2023 and observed no abnormality
- Blue Drill initiated at site due to earthquake event occurred on May 28, 2023, checked all structures & dams and no abnormality found.

Misc: Activities of Field Office
- Electric fault at dam site area rectified by PESCO Team.
- Cleaning of drain & cutting of wild growth at Harbor building area started & carried out.
- Replacing of 200-kVA transformer due to short circuit & connecting new link unit assembly at field office started & carried out by PESCO Team along with D&S Staff.
- Running & testing of Gunite Machine mounted truck at D&G Workshop carried out.
- Muddy Water samples collected from Power House Buildings (Power Units 1 to 17) in current flood season & handed over to S&H residency as per request of TDMO.
- Repairing of discharge measurement point at ASDA-2 Portal Area with epoxy chemdur 32, chemrite grout NS & SBR latex carried out which was damaged due to sliding of boulders during Spillway operation at current high flow season.
- Running and testing of Truck Mounted Gunite Machine from D&G Workshop to Monument & back to D&G Workshop carried out.
- Filling of pot holes & patches with bituminous material at MED crest, PAR from monument towards Base Workshop carried out by T-4th Ext. HPP contractor.
- Joint inspection of Draft tube of unit No.11 carried out on December 21, 2022 by Director (TDMO), R.E (Mechanical) TPS, J.E (D&S / TDMO) & TDMO Field Staff.
- Fabrication & making of door / windows frame with grill for Santry Post at MED crest RD (42+00) carried out.
- Repair of steel cage for placing of Riprap carried out at D&S Field Office.
- Rehabilitation work for foundation of SMA hut at MED started & is in progress as per request of Seismology Directorate.

Drilling and Grouting Section (D&G Workshop)

Repair Work of Machinery / Equipment
- Routine checking, starting & service of D&G Machinery i.e. Flygt submersible pumps (Bibo-10), Cranes, Air compressors, Generators, Drilling Rigs, Hyster fork lifter and pumps etc. carried out on intermittent basis by mechanical and electrical crew during the year under report.
- Repairing works of main gear box of drilling rig B0-NR 505,dismentlling of small boom service changing of brass bush, overall bearing changing & seals repairing , Drilling Rig B1A-195 main gear box, boom supporting jack seal, brass bush and holding clamps repairing works, water tanker ADA-8152 lower clutch cylinder defect, pressure valve defect & diesel line defect repairing works, water tanker ADA-8153 water body defect removal & Diesel pump defect removal works ,Hyster / Fork lifter Diesel lift pump defect repairing work, filter changing &

overall service, Air Compressor Ro-60.250 PSI Air Pressure Pipe repairing, Air control valve repairing works ,filter Change and complete service, bush cutter/Grass cutter machine starting issue / clutch repairing, clutch dori repair / changing works, hand diesel filling pump repairing work, changes 2 Nos. bearing of electric motor of Water supply pump of MED Pumping Station, handy dandy machine service & repairing work, wheel barrow tyre repairing / changing, drilling rig B1A -196 Main gear box rotation pipe repairing work & prepared 02 No. Hydraulic pipes DN-10 for gear box, preparation of 02 No. hubs for holding clamps, Coles crane 18 Ton shifted to Base Workshop for repair, changed 01 No. clutch slave cylinder at workshop, Dymo Core Drilling Machine gear repairing and service, Jones Crane 12 Ton 03 No. up & down lever cable changing, cleaning/ scrapping of old surface, replacement of seals of head cover and painting work of 06 No. NP Pontoons, Air Compressor 5055 starting trouble repairing, Service of Diesel Generator 94 kVA, Electric Air Compressor defect removal work & gauge repairing / replacement ,electric Grinder defect removal work, electric Hacksaw Machine water pump defect repairing, blade changing work and other minor mechanical repairing works of various machinery carried out as a routine jobs.

- Repairing of 01 No. main electric panel of exhaust fan of RDA-22 Adit & changing of defective overload relay, overhead crane 5 ton capacity main electric panel repairing, magnetic contactor repairing, charging/maintenance of 06 No. batteries of D&G Machinery, checking/ maintenance of 05 No. Flygt submersible pumps (Bibo -10), repair of electric Air Compressor Motor ,Spray Pump Motor repair, Electric battery charger volt meter defect removed, the electric supply & maintenance of laboratory rooms, installation of new ceiling fans, replacement of unserviceable bulb holders and bulbs of care taker room and workshop store rooms, fitting/installation of electric motor (110 kW) of D&G Pumping Station after necessary repair, repair/maintenance of 01 No. start delta starter carried out.
- Over all maintenance and repair work of D&G Workshop Electric Supply System are carrying out as a routine job.

Field/General Activities

- Air compressor 5054 shifted to Auxiliary Dam 1 for flushing of water supply line to Harbor Office and Security Check Post and shifted back after completion of work.
- 02 No. Weep holes drilled in ASDA-1 Adit Series as per DSO annual report requirements 2022. And 04 No. in ASDA-3
- Necessary repair and cleaning of Workshop Shed Roof rainwater drains carried out.
- Repair work of drainpipe at different places at RDA-3 Adit in RAA-1 Gallery carried out.
- Cleaning / Roding of choked drain holes of cut slope area of right abutment (T-1 to 4) started between elevations 1500 ft. to 1200 ft. level as a routine job. The detail is as under:

Deposit Works

Clearing / Opening of Choked Drain Holes in Spillway Gallery at GBHP Project

- Sub Engineer D&G along with field staff visited GBHP Powerhouse Complex Barotha Attock for inspection of Drainage System issues of spillway gallery and penstock area on December 16, 2023 as per request of the Chief Engineer/ PD GBHP, WAPDA Hattian.
- Clearing / Roding / opening of 276 No. choked holes having different depth and dia at different locations e.g. Main Entrance of Spillway, Stilling Basin Area, Trough area of Gallery, Weir area of Gallery, Transition and Buffer Block area of Gallery of GBHP Powerhouse Complex carried out from 08 May, 2023 to 11 May, 2023 as a deposit work by D&G Crew.
- Most of the choked drain holes cleared except few one for which alternate solution has been advised.

Dewatering Works at NJHPC

05 Nos. Flygt Submersible Pumps (Bibo -10) along with 05 Nos. control panel and other complete

Berm Elevation A.M.S.L (Ft.)	Total No. of Drain on Berm Cleared	Maximum Depth of Drain Holes (Ft.)	Minimum Depth of Drain Holes (Ft.)
1450	27	62	05
1425	03	61	10
1400	33	63	03
1375	05	60	03
1350	32	103	03
1325	02	60	44
1300	23	103	04
1250	27	103	04

accessories loaded on truck and shifted from D&G Workshop to NJHPC Muzafarabad for dewatering of Tailrace Tunnel of NJHPC Powerhouse as a deposit work. Handed over the pumps to NJHPC authority for dewatering purpose and crew shift back to TDP. After completion of their work, the pumps along with accessories shifted to Dasu HPP for dewatering.

DASU HPP Dewatering Activities (Deposit Work)
Dewatering Pumps shifted back from NJHPC to Dasu HPP and some pipes / accessories from TDP to as per direction of the Chairman WAPDA, and dewatering work at outlet of Diversion Tunnel B (DTB) of Dasu HPP started on September 10, 2022 and continued day night shift up to September 23, 2022. Dewatering Pumps (Bibo-10) along with electric control panels, electric cables, rubber pipes and other complete accessories shifted back from Dasu HPP to TDP through private truck after successful completion of dewatering works.

TPS Deposit Work

- Air Flushing of choked drain holes of TPS-2 at B-4 level of Power Units (11 to 14) completed by D&G Crew as a deposit work. Air Compressor along with accessories shifted back from Power House to D&G Workshop.
- D&G Crew along with equipment's and other accessories shifted from D&G Workshop to NJHPC, Muzaffarabad on January 10, 2022 to carry out drain holes flushing work on the request of NJHPC Management.
- Roding and air / water flushing of about 340 Nos. drain holes (42/62 MM dia, Average Depth 20 M each) in drainage Adit No. 01, 02, 03 & Main Gallery Invert holes carried out.
- D&G Crew shifted back (a/w Accessories & Equipment) from NJHPC, Muzaffarabad to TDP on dated January 29, 2022 after successful completion of works.

Dumping of PCCL Scrap at D&G Yard
Dismantled Scrap of T5th HPP out let concrete structure, shifting work started 35 dumpers shifted to D&G yard, remaining is in progress on direction of GM & PD TDP.

Khanpur Dam Site Visit

Joint Inspection carried out on February 17, 2022 by the Chief Engineer (Civil) TDP, S.E (D&S), Jr. Engr. (TDMO) for Sluice Tunnel bulging issues and to propose methodology for necessary repair / remedial works. Detail report along with recommendations were conveyed to XEN, KDP for consideration of DSO for further necessary implementation purpose.

TARBELA DAM MONITORING ORGANIZATION

General

- Performance of the three embankment dams and their abutments, spillways, tunnels, Dhal Dara weir, and civil structures of Powerhouse generally remained satisfactory as per visual inspection and data collected through instrumentation. In year 2022, the Minimum Operating Level (MOL) of reservoir was El: 1402 ft. a.m.s.l and the reservoir was depleted up to El: 1392.14 ft. on February 22, 2022. Sediment delta pivot point observed at its centerline profile, remained at a distance of 3.78 miles upstream from MED at El: 1400 ft.
- The reservoir attained maximum pool level of ±1550 ft. on August 20, 2022. As per hydrographic survey 2022, the live storage has reduced from initial 9.679 MAF to 5.809 MAF, while gross storage has reduced from initial 11.620 MAF to 6.493 MAF. The inflows during the year 2022 were 58.138 MAF against the annual average of 64 MAF.
- The performance has to be evaluated based on comparison of collected instrumentation data in 2022 with 2021. Reservoir stayed at maximum reservoir level of 1550 ft. for forty-two (42) days in 2022, while in 2021 it stayed at maximum level for one (01) day only and therefore all the seepage and instrumentation data of the year 2022 has been compared with that of the year 2020 as reservoir stay was 26 days in 2020.
- Annual Inspection-2022 of Tarbela Dam Project was conducted by the Engineers of Dams Safety Organization, WAPDA, Sunny View, Lahore, in September, 2022.

Main Dam

- The performance of upstream blanket remained normal as per available instrumentation data during the year 2022. Aging effect of about 49-year-old instruments has been considered while evaluating the performance. At high reservoir level, contractual ditch remained filled with water due to impounding of Ghazi Barrage and Powerhouse Tailrace water level. There was no flow from the relief wells in the contractual ditch.
- The pressures in the punctured tube of gauges P4-54, P4-56 & P4-65 located in the sinkhole affected core zone at MB Section of MED showed fluctuation with reservoir level. The gauges P4-54, P4-56 and P4-65 showed lesser values as compared to year 2020. The wire loops, which repaired in year 2017, remained

intact in year 2022 and no physical subsidence reported nearby. New piezometers at MB Section, installed in 2006, had not shown any abrupt change but only affected by changes in reservoir level and Tarbela outflows or Barrage Pond levels. The other sections of MED also showed stable behavior during 2022 impounding.

Left Abutment of Main Dam

Generally, the performance of left abutment remained normal during the impounding of reservoir in year 2022. Almost all the piezometers had responded to the reservoir fluctuations without any abrupt change in pore pressure values while seepage in LAA-2 system showed decrease in 2022 as compared to that in year 2020.

Right Abutment of Main Dam

- In the light of the Panel of Experts recommendations, during Third & Fourth Periodic Inspections, the grouting works under a phased programme since 1996 had been carried out in RGA-3 & RGA-5 for strengthening of grout curtain to lower down the pore pressures near the core/rock contact area. The grouting operations completed in the year 2012.
- Performance of grout curtains and drainage curtains, in various adit systems, remained satisfactory. Slight decrease in seepage at RAA-1 system and decrease at RDA-22 and RAA-2 systems observed as compared to that in year 2020 at similar reservoir level of 1550 ft.
- The outlet cut slope protection works continued to perform well. No abnormal cracks observed at the berms.

Auxiliary Dams

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 available information did not show any fluctuations in the washed zone both during reservoir filling and draw down cycle of 2022. Physical inspections during low reservoir period did not reveal any sink at the upstream face at El. 1,500 ft., where depression of sinkhole was expected due to physical movement in the core. The water levels recorded by T.I. casings, downstream of the axis of Auxiliary Dam-I, were slightly lower in 2022 as compared to previous year 2020.
- At XB Section of Auxiliary Dam-I, the performance remained satisfactory. The pore pressures showed minor increase at some piezometers. The water levels recorded by T.I. casings, downstream of the axis of Auxiliary Dam-I, were slightly less in 2022 as compared to previous year 2020.
- At the right abutment of Aux. Dam-1, the pore pressures in some piezometers, in horizon at El. +1300 ft. and +1320 ft. showed decrease as compared to previous year 2020. In the abutment foundation, seepage remained constant. Pore pressures remained normal in the area downstream of the toe.

Auxiliary Dam-2

The performance of foundation of Auxiliary Dam-2 generally remained satisfactory. The recorded foundation pore pressures were slightly lower as compared to 2020. Seepage also showed slight decrease during 2022.

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.

Structures

Service Spillway

The overall performance of service spillway remained satisfactory. At same reservoir level pore pressures in 2022 were slightly higher than the year 2020 on left, right side and middle portion of the spillway. Performance of grout curtain and drainage curtain remained satisfactory in terms of considerable pore pressure drop, between upstream and downstream of curtains. The total collected seepage in the drainage networks was comparatively less as compared to 2020. The behavior of the plunge pool protection works remained satisfactory, during 2022.The service spillway operated for 1.5 hours with maximum discharge of 88500 cusecs on August 24, 2022.

Auxiliary Spillway

The overall performance of Auxiliary Spillway structure remained satisfactory. Pore pressures under the main structure were generally slightly higher at left, right side and middle portion in 2022 as compared to observed in 2020. The total collected seepage have slightly decreased in 2022 as compared to observed in 2020 at same reservoir level 1550 ft. In 2022, the spillway operated for 655.89 hrs. with a maximum discharge of 264600 cusecs on August 26, 2022. Overall performance of plunge pool protection works remained satisfactory.

Dhal Dara Channel and Weir

The Dhal Dara Channel continued to erode at high flows while almost stable for low flows. The remedial

works performed for hydraulic improvement at Dhal Dara Weir continued to perform satisfactorily. Repairs done in 2011 on left corner of left bay have again showed some erosion impression. At the backside of the right-side protection wall, cavity formed due to high flows in 2010 flood and backfilled during the low flow period and was still intact.

Tunnels
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 684.66 hrs. from February 10, 2022 to 11 July, 2022. Tunnel was operated at a maximum discharge of 81,500 cusecs on July 10, 2022.

Seismic Study
The Tarbela Micro Seismic Network comprises of ten Nos. remote field Seismic Stations installed in and around Tarbela Dam Project (TDP) and Northern Areas.

For Seismic, safety of the project structures, round the clock Seismic Monitoring at Tarbela Dam & other Hydropower Projects of Northern Areas was successfully continued during the year 2022-23. The earthquake data from remote field stations was processed, analyzed and catalogued through state-of-the-art Antelope and Geodas Softwares. Strong Motion Accelerographs installed at different structure of the project remained operational during the period 2022-23. Earthquake events about 2,424 were recorded within 450 km area around Tarbela Dam Project during the period under report. During this period, 05 earthquake events were felt at the project, with "Yellow Drill "being initiated for one earthquake occurring on March 21, 2023, The particulars are listed below. However, no abnormality observed in the project structures.

Nucleus Clearance Cell
The Tarbela Resettlement Organization set up on July 01, 1967 was closed on June 30, 1985. Nucleus Clearance Cell was established on July 01, 1985 as per ECNEC Decision, to clear the outstanding liabilities of the Court Cases. No award was announced during the year under report.

Court Cases
There are 85 No's Court Cases under trail in various Courts of Pakistan, including 01 No. in Supreme Court of Pakistan. 03 No. in Islamabad High Court, 02 Nos. in Peshawar High Court Peshawar, 20 Nos. in Peshawar High Court Abbottabad Bench, 01 No. in Peshawar High Court Mangora Bench, 01 No. in Lahore High Court Rawalpindi Bench, 03 Nos. in FST Islamabad, 52 Nos. in lower Courts at Multan, Haripur, Topi, Swabi, Ghazi, Mansehra and Chechawatni.

TARBELA 4th EXTENSION HYDROPOWER PROJECT UNITS 15 – 17 (1,410 MW)

Tarbela has 3,478 MW installed power generation capacity on Tunnels 1, 2 & 3. Tunnel 4 (T4) was originally intended for irrigation releases only, the Consultants for units 11~14 proposed use of T4 for power generation in 1993 with installed capacity of 960 MW (02 units of 480 MW) with average annual energy output of 1.9 billion units. Detailed Design Study conducted in June 2010 under World Bank financing, proposed installation of 3 Units of 470 MW each (1,410 MW capacity).

Civil Works
- The contract of Civil Works, Modification of Tunnels 3 & 4 Intakes; Design, Supply, Installation and Testing of Penstock and Construction of Power House, was awarded to M/s Sinohydro Group Ltd. China (re-named as M/s Power Construction Corporation China) on

Date	Origin Time (PST)	Mag. (M)	Intensity at Tarbela (MMI)	Location Lat.(N) Lon.(E)	Depth (Km)	Distance from Tarbela (Km)	"g" Value at Seismology Office 0.07
March 21, 2023	21:47:25	6.7	VI	36.18 70.90	214	288 NW	0.07

Location of SMA	L Component "g"	T Component "g"	V Component "g"	Resultant "g"
Auxiliary Dam 1 Crest	0.073	0.124	0.029	0.147
Auxiliary Dam 2 Crest	0.049	0.064	0.030	0.086
Auxiliary Dam 2	0.021	0.020	0.012	0.031
MED MC Crest	0.052	0.036	0.024	0.068
MED MD Crest	0.054	0.068	0.027	0.092
Powerhouse	0.023	0.021	0.013	0.034
Right Bank Colony	0.022	0.010	0.009	0.026
Seismology Office	0.056	0.051	0.034	0.07

Tarbela 4th Extension Hydropower Project

Salient Features

Installed Capacity	:	1,410 MW (3 x 470 MW)
Rated Head	:	109 m
Annual Energy Generation	:	3,840 GWh
Design Discharge	:	1,318.3 m3/s
Annual Capacity Factor	:	31%
EIRR	:	30.6%~33.4%
FIRR	:	17%
Physical Progress	:	99.97% against 100%
Financial Progress	:	95.773%
Commissioning Dates	:	March 02, 2018 (1st Unit), 30.06.2018 (2nd Unit) & 22.10.2018 (3rd Unit)

Status of PC-I

Original PC-I of the Project as approved by the ECNEC on August 16, 2012 was for Rs. 83.6 billion with FEC Rs. 65.8 billion. PC-I of the project was revised in 2019 with cost of Rs. 122.977 billion (FEC 60.700.00 Billion) which approved by ECNEC on January 06, 2020.

Financial Arrangements

World Bank Loan & Credit obtained to meet the cost of the project. Detail of loan is as under;

Description	IBRD Loan (Mill. US$)	IDA Credit (Mill. US$)
Agreement signed	400.00	440.00
Cancelled (02-06-2016)	---	115.00
Cancelled (01-07-2022)	---	30.40
Utilized	400.00	294.60

WAPDA Share/equity : US$ 88.90 million

Design & Implementation of the Project

- JV of Mott MacDonalds Ltd. UK and Coyne-et-Billier, France in association with MM Pakistan & ACE are Design as well as Implementation Consultants of the project.
- M/s SMEC Int Pty. – Australia, is assigned as Monitoring & Evaluation Consultants for monitoring, assessment and evaluation of project benefits.

September 09, 2013 at a cost of Eq. US$ 263 million. The work commenced on October 29, 2013 with completion in February 2019. Ground-breaking of the project was performed by the then Prime Minister of Pakistan on February 26, 2014.

- Powerhouse Works including Penstock, Switchyard, Control Building, Intakes and Low Level Outlets are complete. Only Outstanding Works as per Punch Lists are in progress.
- The T4 and T3 Intakes raising works including removal of Rock Barrier up to El. 426 meter completed on April 17, 2022 within the IRSA provided timeframe.
- Change of T3 & T4 existing Trash Racks with new Trash Racks of robust design is scheduled during the year 2024.

E&M Works

The contract for E&M Works of the project consisting of Design, Supply, Installation, Commissioning and Testing of Electro-Mechanical Equipment, was awarded to Consortium of M/s Voith Hydro of Germany and Shanghai on February 14, 2014 at the cost of Eq. US$ 293 Million with commencement date as March 31, 2014.

The works under E&M Contract are complete. Trouble Reports are being rectified by Contractor as per procedure. Provision of additional equipment for T4 Power House, is in process.

Commercial Operation of all the three (03) units (15, 16 & 17), has been going on successfully since March 2018.

Up-Gradation of Tarbela 500/220 kV Existing Switchyard

The contract for Design, Manufacturing, Supply, Installation, Testing and Commissioning of equipment at Tarbela 500/220 kV existing Switchyard (Contract T4HP/ICB-102) was signed between WAPDA and M/s ETERN-CCCE-HEI Consortium China on March 21, 2016 for Eq. US$ 27 Million. The work commenced on June 1, 2016 and 100% progress achieved on March 31, 2020.

Generation from T4 Hydropower Units

Since commissioning, the T4 Units remained under commercial operation as per IRSA Indent / NPCC Demand. Year-wise generation of T4 Units is as under:

Generation Year	MkWh
2018	1,422.94
2019	4,741.88
2020	4,987.19
2021	3,551.90
2022	3,550.16
2023	4,460.69
Total Generation since Commissioning	**22,714.76**

TARBELA 5th EXTENSION HYDROPOWER PROJECT (1,530 MW)

Location

Tarbela Dam Project is located on the Indus River. Left bank Irrigation Tunnel i.e., Tunnel 5 (T5) was constructed under Tarbela Dam Project in 1976, to provide a low-level outlet for additional irrigation supplies when Tarbela Reservoir is at low level. To meet increasing energy demand and to provide sustainable hydropower the conversion of Tunnel 5 from Irrigation Tunnel to Power Tunnel has been necessitated. The annual energy generation from T5 Project will be 1424 GWh.

Salient Features

Tunnel 5 (Already Constructed)			
Purpose	Irrigation		
Type	Concrete/Steel Lined		
Length	3675 ft.		
Reservoir			
Gross Storage	11.620 MAF (Original)		
	6.756 MAF (Reduced)		
Live Storage	9.679 MAF (Original)		
	5.88 MAF (Reduced)		
Proposed T5 Powerhouse			
Generation Capacity	1,530 MW (Three Units of 510 MW each)		
Annual Energy	1,424 GWh		
EIRR	21.7%		
Execution by	**WAPDA**		
Project Benefits			
● Provide Safety against Sediment Delta			
● More flexibility for Power Generation			
● Ensure Irrigation Releases from Reservoir			
● Generation of 1424 GWH Annual Energy			
Scope of Work			
● Modification of Tunnel 5, Construction of Intake, Powerhouse, Tailrace and related Civil Works, Plus Design, Supply, Installation and Commissioning of Penstocks			
● Design, Supply, Installation, Commissioning and Testing of Electro-Mechanical Equipment			
Consultants			
M/s Mott. MacDonald Ltd. UK. with sub consultants AF Consult, MM Pakistan & Technical Resource Services Pvt Ltd.			
Contractor			
Civil Works:	M/s Power Construction Corporation of China Ltd. (PCCCL)		
E&M Works:	JV of M/s Harbin Electric International and M/s Harbin Electric Machinery Ltd China.		
TL Works:	M/s NETRACON		
	Civil Works	**E&M Works**	
Commencement Date/ Effective Date:	August 09, 2021	August 23, 2021	
Completion Date/ Date of Commissioning:	May 31, 2027 (As per Revised Schedule)	Unit # 18 Commissioning Date July18, 2025. Unit # 19 Commissioning Date August 17, 2025. Unit # 20 Commissioning Date September 17, 2025. (As per Revised Schedule)	
Financing Arrangements			
● World Bank + AIIB	=	US$ 690 Million	
● WAPDA	=	US$ 108 Million	
● NTDC	=	US$ 09 Million	

Status

<table>
<tr><th>Project Component</th><th>Status</th></tr>
<tr><td>CSC Consultant</td><td>
● Contract signed with M/s MMP on April 13, 2019 and Notification for commencement of work issued on same day.
● Consultants Mobilized on April 15, 2019.
● Amendment – 1 to the Consultancy Services Contract signed on November 24, 2022 after approval by WAPDA Authority (MoM November 23, 2022)
</td></tr>
<tr><td>Civil Works</td><td>
Commencement Date: August 09, 2021
Overall Physical Progress up to June 2023: 12.23 %
<table>
<tr><th>Area</th><th>Activity</th><th>Unit</th><th>Total</th><th>Actual (Estimated) Up to June 2023</th></tr>
<tr><td>Intake</td><td>Excavation</td><td>m³</td><td>1,331,000</td><td>890,900</td></tr>
<tr><td>Penstock</td><td>Excavation</td><td>m³</td><td>1,237,886</td><td>1,018,552</td></tr>
<tr><td>Powerhouse</td><td>Excavation</td><td>m³</td><td>1,632,632</td><td>1,632,437</td></tr>
<tr><td>Tailrace Culvert</td><td>Excavation</td><td>m³</td><td>446,000</td><td>331,912</td></tr>
<tr><td>Switchyard</td><td>Excavation</td><td>m³</td><td>251,249</td><td>29,984</td></tr>
</table>
Intake Works:
- Lowest Excavation Level achieved was El. 441 M (started from El. 510 M)
- Intake Pit was flooded on June 28, 2023 when reservoir level crossed EL: 455 M
- Installation of 543/1250 strand anchors was completed.
- Total Sealing Concrete Quantity completed 736 M3/18,500 M3.
Penstock / T5 Outlet Area:
- Lowest Excavation Level achieved was El. 328 M at Penstock Area and El. 372 M at T-5 Outlet Area.
- Demolition of existing LLO in progress. Demolition quantity achieved 8550 M3/13000 M3
- Access road laid up to CH 0+543. Desilting and Dewatering of Tunnel from CH0+540 onwards in progress.
- Lighting Arrangements from CH0+475 to CH0+500 installed in the Tunnel.
Power House:
- Lowest Excavation Level achieved was El. 312 M (started from EL. 455 M)
- Total (303/636) Nos. of strand anchors have been stressed.
- Drilling for grouting in erection bay area started on July 02, 2023.
Tailrace Culvert:
- Lowest Excavation Level achieved was El. 326 M (started from EL. 335 M)
- Total Poured Concrete Quantity was 5,920 M3/40,620 M3.
- Rockfill Coffer Dam:
- Excavation was completed.
- Rock filling for Coffer Dam at Ch 0+000 to Ch 0+353 was completed up to EL: 362 M.
- Extending of geomembrane along with adjacent fill works with sand and cushion materials at Ch=0+000 to Ch 0+353 was completed.
- Removal of temporary stocks of excavated materials from the waterway were majorly removed prior to operations of Service Spillways.
- Riprap/Boulders placement along the rock fill completed portion at upstream from Ch=0+080 to 0+160 M was continued.
- Construction of Survey marker for monitoring of Coffer Dam movement was in progress.
Switchyard:
- Excavation achieved up to June 2023 was 29,984 M3/251,250 M3
Project Duration:
- Powerhouse: 37 Months,
- Overall Works: 59 Months
</td></tr>
<tr><td>E&M Works</td><td>
- Contract Agreement signed on June 25, 2021.
- Effective Date: August 23, 2021
Design of following Power house and switchyard equipment were in final stage up to June 2023 with Project Manager:
- Control Building of 500 kV Switchyard Layout Plan
- PAX Communications Schematic Diagram
- Technical information regarding Transformers in T5 Switchyard
- Mechanical Auxiliary System
- 500 kV Disconnector
- Turbine and Generator ITP Rev. C for Approval
- Auxiliary Power System Single Line Diagrams
- Revised DN 7500 MIV Mechanical Drawing and Calculation
- 500 kV Tubular Busbar Datasheet
- Revised Technical Data and Electromagnetic Calculation of Generator
</td></tr>
</table>

Project Component	Status
	- 500 kV Post Insulator Cantilever Strength Calculation - Isolated Phase Busbar (IPB) - Draft Tube Gate - Hydraulic Profile of Draft Tube and Spiral Case of Turbine - First Embedded Parts and Pit Liner Drawing - Draft Tube Cone and second Embedded Parts Drawing - Embedded Parts of the Oil, Water and Air Pipelines and Spiral/Stay ring pressure test equipment drawing - Stay Ring Drawing - Bridge Crane ITPs - Direct Lightning Stroke Shielding
	Completed Manufacturing of Equipment/Parts: - Pier Nose - Draft Tube Elbow and Cone - First and second Embedded Parts - Embedded Piping - Man-door for Draft Tube
	Ongoing Manufacturing of Equipment/Parts: - Stay Ring - Spiral Case - Pit Liner
	Change Proposal 01 & 03 b regarding 11 kV overhead Connection from Powerhouse to Switchyard, Interconnector between T (1-4) & T5 Switchyards and EOT respectively, submitted by the contractor, which are under review of the consultants.
	Change Order 02 regarding Interconnector between T (1-4) & T5 Switchyards approved by the Authority and conveyed to M/s HEI.
	1st Shipment of Embedded Piping arrived at site.
	2nd Shipment Letter of Authorization issued.
	3rd & 4th Shipment Authorization Letter is under review.
Transmission Line (NTDC)	- NTDC signed Contract with M/s NETRACON on July 21, 2022 - M/s NETRACON had completed survey of the site and land acquisition was in progress. - Layouts and Designs were under preparation. - Contractor's submitted signed EAR Insurance Policy was reviewed and commented upon. - The contractors submitted details for establishment of L/C of Conductors was vetted.

KHANPUR DAM PROJECT

Description of the Project

Khanpur Dam Project (KDP) was commissioned in 1984 as a multi-purpose project aimed at supplying water for irrigation as well as for municipal use. The project is located in District Haripur of Khyber Pakhtunkhwa at a distance of 50 km North of Islamabad. Khanpur Dam is a 167 feet high earth and rocklfill dam built on Haro River, which is a small tributary of the Indus River.

The main project features comprise a Main Embankment Dam, Check Dam, one Right Saddle and one Saddle Dam on the left, a Gated Spillway and an Irrigation System. The main dam is an earth and rock fill embankment. Khanpur Reservoir currently has a live storage capacity of 79,662 Acre-feet (w.r.t Invert Level of the Canal Outlet Structure at El: 1902 ft. SPD) The spillway of Khanpur dam has five radial gates each having dimensions of 40 ft. by 35 ft., with a maximum discharge capacity of 166,000 cusecs. The maximum and minimum conservation level of reservoir are 1982 ft. and 1910 ft. (SPD).

Catchment Area

Haro River rises in the hills of Moshkpuri at an elevation of 9,258 ft. 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 3,500 ft. 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 that 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. Left Bank Canal (LBC) at its tail delivers water to Sang Jani Raw Water Reservoir, which is being operated and maintained by Capital Development Authority (CDA) Islamabad. From Sang Jani Raw Water Reservoir,

CDA supplies water to Islamabad and Rawalpindi after treatment.

The lengths 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, Districts Attock and Rawalpindi of Punjab is over 36,470 acres. Both Left & 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 carrying out O&M of Khanpur Dam only.

The beneficiaries of Khanpur Dam Project include:

Irrigation

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

Municipal/Industrial

1. Project Management Organization (Defense)
2. Heavy Industries Taxila (Defense)
3. Fecto Cement Industries
4. University of Engineering & Technology Taxila
5. Capital Development Authority (CDA)

In the year 2022-23, Khanpur Reservoir supplied 109,458.16 Acre-feet of water to all the beneficiaries, including 44,332.20 Acre-feet for irrigation and 65,125.96 acre-feet for municipal use.

Operation & Maintenance (O&M) Activities

The collection, processing, and preliminary analysis of instrumentation data was executed throughout the year on monthly basis, and report were transmitted to Dam Safety Organization on a regular basis for further evaluation. Moreover, data from project monitoring (Instrumentation) has been digitized and shared with DSO via email. Routine settlement surveys and visual inspections of embankments and appurtenant structures were also conducted.

Following are a few major maintenance works carried out during 2022-23 at KDP:

- Collection & Processing of Instrument Data
- Removal of Seasonally Wild Vegetation from Embankments and other areas of Khanpur Dam Project
- Reservoir Operation to Supply Water through Canals to all the beneficiaries. Maintenance Works of Dam Structures as per findings of DSO
- Maintenance and Repair (M&R) of Vehicle & Machinery
- Minor Repairs to Residential and Non-residential Buildings on a Departmental Basis
- Demarcation of WAPDA Land by construction of RCC Burjies along the periphery of Khanpur Dam
- Procurement of General items including Survey and Monitoring Instrument, Office and Rest House Furniture, Computer along with complete accessories, installation of 10 Nos. CCTV Cameras, Installation of Latest Exchange, and other Allied Equipment / Appliance through shopping procedure under World Bank Loan allocated for Tarbela T4th Project
- Preparation of Revised PC-I for installation of Telemetry System on Left Bank Canal of Khanpur Dam Project
- Annual Inspection by DSO carried out at Khanpur Dam Project

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 (refer Location Map). The proposed RCC dam would have a maximum height of 272 m, and impound a reservoir of about 8.1 Million Acre Feet (MAF), with live storage of 6.4 MAF. 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 up to 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. 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.

In addition the present peak demand of electricity in country, 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.

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 Cofferdams
Reservoir		
	Gross Storage	8.1 MAF (10.0 BCM)
	Live Storage	6.4 MAF (7.9 BCM)
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	Diamer Basha 18,097 GWh/Year

GOP's Approvals

- PC-I (Dam Part) amounting to Rs. 474 billion has been approved by ECNEC on April 17, 2018. Subsequently after inclusion of 21 MW Tangir HPP the revised cost of PC-I (Dam Part) amounting to Rs. 479.686 billion approved by ECNEC on November 14, 2018
- ECNEC on April 17, 2018 while approving PC-I (Dam Part) of Diamer Basha Dam Project directed that the project should be executed in the company mode. In this regard, Letter of incorporation of Diamer Basha Development Company (Pvt.) Ltd. has been issued on January 15, 2019 by SECP.
- 2nd Revised PC-I (LA&R) of DBDP amounting to Rs.174.700 billion approved by ECNEC on September 10, 2021.
- PC-I (Power Generation Facilities) amounting to Rs. 933 billion has been submitted to Ministry of Water Resources on September 17, 2021 which has been recommended by CDWP on June 04, 2022.

Project Benefits

- Adding cheap electricity of 18,100 GWh through a clean renewable source to the National Grid annually
- Additional electricity of approximately 2,520 GWh at existing projects including Tarbela, Ghazi Barotha, Jinnah & Chashma
- Additional electricity of approximately 7,500 GWh at future projects including Dasu, Pattan and Thakot
- Reservoir with live storage of 6.4 MAF would augment the irrigation releases from Tarbela reservoir for existing canal cultivated lands by supplying an additional 5.7 MAF during Rabi and 0.4 MAF during early Kharif cropping seasons
- Add 35 years to the life of Tarbela by reducing sediment deposition
- Huge saving in foreign exchange of equivalent electricity generated on imported oil
- Additional 16,500 jobs will be created, 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.
- Would help in Food Security
- Project would enable flood mitigation.

Diversion Tunnel 2 Inlet & Right Bank Power Intake - Diamer Basha Dam

Environment & Cultural Heritage Impact Assessment	
No. of Villages Affected	32
No. of Households / Families Affected	4102
Population Affected	30,350
Agricultural Land Submerged	2660 Acres
Length of KKH Submerged	94 Km
Prehistoric Rock Carvings	37,000 Nos.
Infrastructure	Electricity Lines, Roads etc.
Total Land to be acquired	35,924 Acres
	(Private Land = 16,491 Acres)
	(Govt. Land = 17,942 Acres)
	(Disputed Land = 1,491 Acres)

Resettlement Action Plan

- For resettlement of Diamer Bash Dam affectees three (3) composite model villages were planned, out of which one is located at Harpan Das, Chilas. The work progress at Harpan Das Model Village is 98%
- Due to Non-availability of land for other two Model Villages, Land Acquisition & Resettlement Sub-Committee of ICDBMD headed by Chief Secretary, GB as convener has worked out a compensation package for affectees to select one of the option as follows:
- 17 Marla Land in Harpan Das
- 10 Marla Land and Rs 1.7 Million
- Rs. 3.5 Million Cash Compensation
- Contingency cost for around 150 households and an additional package for 1500 households distributed uniformly over 4,102 households.
- Alternate resettlement plan has been approved in 2nd revised PC-I. The amount has been released to DC/LAC Chilas for disbursement to affectees in fair and transparent manner.
- Infrastructure development works like Right Bank Periphery Roads is under implementation. Four contracts RBPR-I, RBPR-II, RBPR-03 and RBPR-04 have been awarded and the work is in progress.
- Under CBMs (Confidence Building Measures), two schemes CBM-I and CBM-II comprising of 10 No. contracts comprising of upgradation of schools, protection bunds & irrigation channels have been completed.
- Work at Cadet College Darang Das (Academic Cum Administrative Block, Hostel Block (2 Nos.) & Mess Cum Auditorium) have been completed. External Development works at Cadet College, Chilas are in progress.
- Leveling of plots, water supply, sewerage system work is under progress.

Main Project Implementation

Project Consultancy Services

Consultancy Contract for Construction Design, Construction Supervision and Contract Administration of Diamer Basha Dam Project awarded to JV M/s Diamer Basha Consultants Group (DBCG), comprising of 12 National & International firms led by M/s NESPAK amounting to Rs. 27.182 billion (Phase-I Rs. 15.617 Billion & Phase-II Rs. 11.565 Billion) for a period of 120 months.

Consultancy Services Agreement signed on May 11, 2020 and commenced w.e.f June 10, 2020.

Procurement of Contractor for Main Works (MW-1)

Contract MW-1 Dam Part (Civil Works) and Tangir Hydropower Works were awarded to M/s PowerChina-FWO JV amounting to PKR 442,402,786,420/- (Rupees Four Hundred Forty-Two Billion, Four Hundred Two Million, Seven Hundred Eighty-Six Thousand, Four Hundred and Twenty Only).

Work commenced w.e.f. August 07, 2020. The work on aditing tunnel, dam abutment, excavation, diversion tunnel inlet, outlet portals, diversion canal, permanent access roads and 21 MW Tangir HPP is in progress. Guide wall, left bank flushing & power intakes, right bank diversion, flushing tunnels intake & outlet diversion tunnels intake area, upstream and downstream coffer dam phase 1 work started and is in progress. Overall progress of Contract Package MW-1 as on June 30, 2023 is 9.95% whereas overall progress of PC-I Dam part is 8.48%. Component wise detail is as under:

Land Acquisition

Land Acquisition process started in 2010 and is in progress. So far 33,039 acres (91.97%) of land has been acquired out of total required land of 35,924 acres.

Area (Location)	Total Land (Acres)	Acquired Land (Acres)	% of Acquired Land
GB	34,939	32,679	93.5 %
KPK	985	360	36.6%
Sub Total	**35,824**	**33,039**	**92.22 %**
Disputed	100	---	---
Grand Total	**35,924**	**33,039**	**91.97 %**

Construction of Composite Model Villages

The construction work of Composite Model Village–II (Harpan Das) is being executed through 7 contract packages. Work at site is in progress. 98% work progress achieved so far.

Construction of KKH Bypass from Shatial to Thor Nullah (STNBP) 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's deposit work, will be utilized for uninterrupted traffic flow. Contract has been awarded and work is in progress at site. The critical reach (0 to 24 Km) has been substantially completed and opened for traffic on April 10, 2022. The overall physical progress achieved on KKH Bypass is 77.71% and financial is 70.39% up to 30 June, 2023.

Environmental, Resettlement Work / Studies

Comprehensive Environmental Management Plan (EMP) and Resettlement Action Plan (RAP) were prepared by DBC Consultants which was reviewed and updated in consultation with ADB. GB Government issued NOC.

Expenditure Status

WAPDA Self-Financed for Preliminary Works amounting to Rs. 7,336 Million

(Project Colony, KKH By-Pass, Consultancy Services etc.)

Activity	Status
Site Investigation	Geotechnical exploration and monitoring along with test adit construction is in progress.
Guide Wall	Guide wall bedrock exploration plan, drilling, and supporting pile construction completed and concreting work is in progress.
Right Bank Flushing Tunnel Intake	Design criteria and report is in progress.
Left Bank Flushing Tunnel Intake and Outlet	Analysis, design, drawings and design report is in progress.
Upstream Coffer Dam Phase 1	Work is in progress on upstream coffer dam phase 1.
Downstream Coffer Dam Phase 1	Work is in progress on downstream coffer dam phase 1.
Permanent Access Bridge	Work is in progress on Permanent Access Bridge.
Permanent Access Roads	Drilling, blasting and mucking activities are in progress.
21 MW Tangir HPP	Work is in progress on Employer's Permanent Colony.

Downstream Coffer Dam - Diamer Basha Dam

Financial Status (Dam Part) (Rs. Million)	Local	Foreign	Total
PC-I Cost (November 14, 2018)	325,686.000	154,000.000	479,686.000
Expenditure up to June 30, 2023*	84,854.30	21305.43	106,159.73
PSDP Allocation 2023-24	20,000.000	---	20,000.000

The Foreign component WAPDA arranged includes 5800 million as WAPDA equity.

Government of Pakistan is funding for Acquisition of Land & Assets, Construction of Composite Model Village for resettlement of affectees and other social Safeguard activities. Detail of payments made in this regard is as follows:

Financial Status (AL&R) (Rs. Million)	Local	Foreign	Total
PC-I Cost 2nd Revised (September 10, 2021)	174,700.000	---	174,700.000
Expenditure up to June 30, 2022	128910.865	---	128910.865
PSDP Allocation 2023-24	5,000.000	---	5,000.000

Implementation Committee of Diamer Basha and Mohmand Dams (ICDBMD)

The honorable Supreme Court of Pakistan while disposing of a writ petition regarding construction of dams in the country, in its historic judgement dated July 04, 2018 directed to expedite construction of two dams namely Diamer Basha and Mohmand and take all necessary steps for the commencement of construction and early completion of these dams. An ICDBMD has been constituted for early commencement and timely completion of these projects.

The detailed progress Report on Diamer Basha and Mohmand Dams is being submitted in Supreme Court of Pakistan Regularly.

LAND ACQUISITION & RESETTLEMENT LA&R

Introduction

Land Acquisition & Resettlement formation was established in 2009 in WAPDA to resolve the issues of land acquisition and resettlement at mega projects. The detail of the activities performed by this formation is as under:

DIAMER BASHA DAM PROJECT

2nd Revised PC-I (LA&R) of DBDP amounting to Rs.174.700 billion approved by ECNEC on September 10, 2021.

Land Acquisition	(Acres) Total Land 35,924 Acquired 33,039 Remaining 2,885	Land yet to be acquired as under: ● GB Land RBPR-00 Package ● Dam Foot Print to Basri due to Boundary Disputed Area (approx. 802 Acres)
Resettlement	Resettlement Package	Total Nos. of Cases 4102 Total Paid 3826 Under Process 276
	CMV- II-07 Model Village Harpan Das	i. Consulting Firm(s) / Leading Firm ii. DBDP-CBM Consultant. A Joint Venture of BAK, ECSP and AA Associates iii. Contractor: HBCC-RA-DC JV iv. Contract Price: 3.890 Billion v. Commencement Date: July 05, 2024 vi. Completion Date: July 05, 2026 vii. Physical Progress: 14%
	RBPRs	Block A, B, C, D, F, G, H: Land Levelling Work & Roads Construction work is in progress. Infrastructure Development Works like Right Bank Periphery Roads is under implementation. Four Contracts RBPR-I, RBPR-II, RBPR-03 and RBPR-04 have been awarded and the work is in progress. Land Acquisition for RBPR-00 is under process.
Environmental Management Plan		Comprehensive Environmental Management Plan (EMP) and Resettlement Action Plan (RAP) were prepared by DBC Consultants which was reviewed and updated in consultation with ADB. GB Government issued NOC.
Confidence Building Measures		Under CBMs (Confidence Building Measures), Upgradation of Schools, Protection Bunds & Irrigation Channels have been completed. Work at Cadet College Darang Das (Academic Cum Administrative Block, Hostel Block (2 Nos.) & Mess Cum Auditorium) have been completed. External Development Works at Cadet College, Chilas are in progress. Levelling of Plots, Water Supply, and Sewerage System Work is under progress. MOU with GBRSP has been signed to provide Technical Education / Vocational Training to Youth of Diamer, funded by WAPDA and implemented by GBRSP.

HARPO HPP

Harpo Nala (Lungma), a left tributary of Indus River in Rondu Area, District Skardu, Gilgit-Baltistan about 75 km North-West of Skardu Town and 670 km North-East of Islamabad.

Land Acquisition	**Land**	**Permanent (Acres)**	**Temporary (Acres)**	**Total**
	Land Required	130.197	58.637	188.834
	Land Acquired	28	Nil	28
	December 12, 2022 - Issuance of Section-4, and Demarcation of Land in coordination with District Administration completed. Section 5 & 6 Notified during meeting of General Manager LA&R with Commissioner Skardu on August 16 & 17, 2024. Award of 28 Kanlas of Land has been notified. Assessment of 500 Kanal of Land has been completed and soon award will be notified.			

Mohmand Dam HPP

Land Acquisition	**District**	**Land Required**	**Land Acquired**
	Mohmand	7628	7529
	Bajaur	726	726
	Malakand	290	290
	Charsadda	143	143
	Total	**8787**	**8688**

DASU HPP

Land Acquisition

Main part of the Land Acquisition has been completed on December 31, 2023.

Batch	Land to be Acquired	Acquired	Remaining	Remarks
1	729 Acres	729 Acres	---	Completed
2	957 Acres	957 Acres	---	Completed
3	1554 Acres	1554 Acres	---	Completed
4	981 Acres	981 Acres	---	Completed
5	810 Acres	810 Acres	---	Completed
TOTAL	**5031 Acres**	**5031 Acres**	**---**	**Completed**

Resettlement

Estimated Eligible AHH	:	3,066 (Rs.10,731 Million @ Rs.3.5 M/AHH)
Total Processed Cases	:	2,776
Approved Cases	:	1,817
Paid Cases	:	1,596 (Rs.5,582 Million Disbursed)
Yet to be Paid	:	222
Under Scrutiny	:	362

DASU HYDROPOWER PROJECT

The Project

Dasu Hydropower Project is a run-of-river project on Indus River located 7 km upstream of Dasu Town, District Kohistan, Khyber Pakhtunkhwa. The site is 74 km downstream of proposed Diamer Bhasha Dam Site and 345 km from Islamabad. The project includes construction of 242 m high RCC dam. The gross head of 184 m is available between a reach of 70 km from downstream of Diamer Basha Dam to Dasu Dam Site. The design discharge of project is 2,670 m3/s which will produce 4,320 MW hydroelectric power through 12 Turbo-Generator Units having capacity of 360 MW each.

Detailed Engineering Design including Social & Environment Impact Assessment studies and Tender Documents of project were completed with financial assistance of World Bank. It was decided with the consultation of World Bank that project may be implemented in two Stages (Stage-I&II) due to huge cost involved in implementation of complete project. The Bank has approved IDA-1 Credit of US$ 588.4 million with the support of one IDA Partial Credit Guarantee (PCG) of US $ 460 million for financing of Stage-I, on June 10, 2014. Remaining cost of project will be financed through commercial financing sources under guarantees of Govt. of Pakistan and World Bank. Loan Agreement between the Government of Pakistan, WAPDA and the World Bank for IDA Credit of US$ 588.4 million and PCG of US$ 460 million was signed on August 25, 2014.

Dasu Hydropower Project is one of the priority projects under the Power Policy 2013 and Vision 2025 of Government of Pakistan. PC-I for Stage-I amounting Rs. 486,093.30 million with FC Rs. 218,547.50 million has been approved by ECNEC on March 28, 2014.

The Cabinet Division and ECNEC approved the enhancement in land rates in Oct-Nov 2019 which resulted in increase in overall cost of the project from Rs. 486,093.30 million to Rs. 510,980.20 million.

Need of the Project

Pakistan is blessed with hydel potential of above 60,000 MW, mostly located in Khyber Pakhtunkhwa, Gilgit-Baltistan and Azad Jammu and Kashmir.12% has only been exploited so far. The share of hydel & thermal power generation was 65% to 35% during the years 1960-70 which has almost gone reverse in the power system due to non-construction of any mega hydel project. The imbalance between hydel and thermal has increased the demand of imported fuels and severely affecting Country Foreign Exchange of the available potential resources. The high tariff rates of IPPs are consuming major share of revenue and have also caused immense increase in overall electricity tariff rates. Despite major share in power mix system, the thermal plants are unable to cope with electricity demand due to de-rated capacity as a result of shortage of spare parts and aging factor. The prevailing situation of severe load shedding even in winter season warrants construction of proposed mega hydel projects like Dasu, Diamer Basha, Bunji, Pattan and Thakot Hydropower Projects in the near future.

Dasu Hydropower Project will add 4,320 MW of power in the system and will produce annual energy of 21,485 GWh upon completion. The implementation of the project will increase the generation capacity and hydel share in the generation mix system which is presently dominated by thermal power. Induction of Dasu in the power system will contributes to achieve an affordable electricity tariff objective. This will also help to ease the energy crisis in the country and will also pay a pivotal role in industrial revolution.

Project Implementation Strategy

The project will be constructed in two Stages:

Stage-I:
It includes construction of complete RCC Dam with Appurtenant Structures, Underground Powerhouse along with installation of Six (06) Turbo-generators having total installed capacity of 2,160 MW, Double Circuit 765 kV Transmission Line (by NTDC), Relocation of KKH, Colony, Access Roads, 132 kV Transmission Line, Land Acquisition, Resettlement and Environmental & Social Management

Stage-II:
It includes construction of underground powerhouse and appurtenant structures, installation of remaining six (06) Units.

Works

Preparatory Works

Relocation of Karakorum Highway (Dasu-KKH-01) 25 km from Dasu Town to Kaigah
Contract Agreement between WAPDA and M/s China Civil Engineering Construction Corporation (CCECC) signed on March 16,

River Diversion Scheme - Dasu HPP

Salient Features

Installed Capacity (Full Project)	4,320 (MW)
	(12 Units @ 360 MW each)
Annual Energy (Full Project)	21,485 (GWh)
Installed Capacity (Stage-I)	2,160(MW) (06 Units)
Annual Energy (Stage-I)	12,222 (GWh)
Design Discharge	2,670 (M^3/Sec) (12 Units)
Max. Gross Head	184 (M)
Dam Type	RCC (Gravity)
Dam Height	242 (M)
Powerhouse	Underground (424 M x 31 M x 62 M)
Spillway Gates	08 Nos.
Low Level Outlets (LLOs)	09 Nos.
Flushing Tunnels	02 Nos. (Circular)
Headrace Tunnel	04 Nos. (Circular)
Tailrace Tunnel	04 Nos. (Circular)
Economic & Financial Parameters	
EIRR	24.79 %
FIRR	20.04 %
Project Cost as per Approved PC-I (Stage-I)	
Base Cost	Rs. 404,152.60 Million
Project Cost with IDC	Rs. 510,980.20 Million
Stage-I Completion	
1st Unit (360 MW) Commissioning	May 2026
Overall Completion (2160 MW)	May 2027

2015. The Contractor commenced services from August 24, 2015 and mobilized at Dasu Site. Changes have been made in basic design of KKH-01 and the revised design includes tunnels and bridges. The tentative completion date to implement revised design is July, 2024. Construction activities remained in progress. Physical progress till June 30, 2023 is 35.30 %.

Right Bank Access Road (Dasu-RAR-01) 12 km from Komila to Dam Site

Contract Agreement between WAPDA and M/s China Civil Engineering Construction Corporation (CCECC) signed on March 16, 2015. The Contractor commenced services from August 24, 2015 and mobilized at Dasu Site. Road is substantially completed with 99.0 % physical progress.

132 kV Transmission Line from Dubair HPP to Dasu (Dasu-TL-01) (45 km)

Contract Agreement between WAPDA and M/s Power China signed on April 24, 2015. The Contractor commenced services from November 02, 2015. Construction activities remained in progress. Physical progress till June 30, 2023 is 93.20%.

Project Colony and Infrastructure (Dasu-PCI-01R)

Contract was awarded to M/s CGICOP on August

27, 2018 and commencement of works held on May 20, 2019. Construction activities remained in progress. Physical progress till June 30, 2023 is 65.30%.

Relocation of Karakorum Highway (Dasu-KKH-02) 37 km from Kaigah to Sazin
Contract Agreement between WAPDA and M/s China Gezhouba Group Corporation Ltd. (CGGC) signed on April 25, 2017. Mobilization advance paid. Commencement was delayed due to non-availability of the land and issued on May 20, 2022. Physical progress till June 30, 2023 is 4.10%.

Right Bank Access Road (Dasu-RAR-02) 42 km from Dam Site to Uttar Gah
Contract Agreement between WAPDA and M/s China Gezhouba Group Corporation Ltd. (CGGC) signed on January 18, 2017. Commencement was delayed due to non-availability of the land and issued on May 20, 2021. Physical progress till June 30, 2023 is 2.30 %.

Main Civil Works

Following 02 No. Contracts amounting to Rs. 180 billion signed between WAPDA and M/s Gezhouba Construction Group Corporation (CGGC) on March 08, 2017. Contractor commenced their services w.e.f June 23, 2017.

i. RCC Dam & Appurtenant Structures (Dasu-MW-01)
ii. Underground Powerhouse & Appurtenant Structures (Dasu-MW-02)

Construction activities on 02 Diversion Tunnels (DT-A & DT-B), Underground Powerhouse, Transformer Cavern, Sediment Flushing Tunnel (Traffic Tunnel) on Left Bank, Inlet Structure, Switchyard, Access Tunnels and Drainage Tunnels remained in progress.

Major milestone of River Diversion achieved on February 18, 2023. Physical progress of MW-01 and MW-02 as on June 30, 2023 is 21.50% and 10.50% respectively.

E&M Works

Electro-Mechanical Works (Dasu-EM-01) Contract amounting Rs. 52.50 billion signed between WAPDA and JV of M/s GE and Power China on November 25, 2019. Mobilization advance paid. Commencement issued in May 2020 with effective date of February 2021, mutually agreed by WAPDA and contractor. Equipment design and manufacturing work remained in progress. Physical progress till June 30, 2023 is 7.80%.

Environment, Social & Resettlement Works

Construction of the project will have varieties of impacts on local communities. These include loss of agricultural and pasture lands due to a project colony facilities and other infrastructures on areas downstream of the dam and reservoir submerged area upstream. It further includes loss of residential, commercial, business and community structures, requiring relocation and resettlement of households from 34 villages in the valley.

Land Acquisition

Total Land requirement revised from 9,875 Acres to 5034 Acre in light of latest revenue survey received from District Administration.

Key Points & Current Status

- Section-4 and Gazette Notification issued by District Collector, Kohistan for total land acquired for project in 2013 and 2014.
- Land Acquisition & Land Assessment Unit (LA&AU) established under DC, Kohistan. WAPDA approved 147 No. posts for establishment of LA&AU under DC, Kohistan and expense on account of pay & allowances are being borne by WAPDA.
- Executive Committee of National Economic Council (ECNEC), approved Land rates for Dasu Hydropower Project), in a meeting held on November 14, 2015. The rates were already approved by the project Steering Committee for project. Ministry of PD&R has also issued Authorization Letter for approved land rates on December 04, 2015.
- The Cabinet Division and the ECNEC approved the increase in land rates as demanded by the local affectees in November 2019. Land acquisition process resumed accordingly.
- 4,908 / 5,034 (97%) Acre of land required for preparatory & main works was acquired as of June 30, 2023.

Resettlement Sites Development

For resettlement of 34 Nos. affected villages, total 40 Nos. resettlement sites have been identified at higher elevations. Master Planning of these 40 Nos. sites have been completed for development. Current status of contracts regarding development of resettlement sites is as under.

Resettlement of Village Chuchang and Construction of Shatial Museum (Dasu-RV-C&S)

- Contract was awarded to M/s Khyber Grace on April 23, 2019 and commencement of works held on June 18, 2019. Construction activities remained in progress. Physical progress till June 30, 2023 is 66.40%.

Tail Race Tunnel Dasu HPP

Resettlement of Villages on Left Bank (Dasu-LBRV-11&12 and RBRV-11)

- The Contracts LBRV-11 & LBRV-12 were awarded to M/s Zhongmei Engineering Group Limited on February 27, 2017. Work commenced at LBRV-11 and LBRV-12 on December 26, 2018. Construction activities are in progress. Physical progress of LBRV-11 and LBRV-12 as of June 30, 2023 is 97.0% and 98.0% respectively.

Enhanced Self-Managed Relocation (ESMR) Package

To expedite the resettlement process, an Enhanced Self-Managed Relocation (ESMR) Package has been introduced in project area with the approval of WAPDA and World Bank. The detail of Package is as follows:

- Rs 3.5 million per household (HH) will be paid to affectees who opted for relocating on their own
- Rs. 0.5 million per HH will be paid to affectees who opted to get resettled in resettlement sites.

Out of total 2767 HHs, 1355 HHs have been paid an amount of Rs. 4.7 billion till June 30, 2023.

Financing of Project

World Bank

Agreement between the Government of Pakistan, WAPDA and the World Bank for an IDA Credit of US$ 588.4 million along with an IDA PCG of US$ 460 million signed on August 25, 2014. US$ 329.58 million utilized till June 30, 2022.

Local Commercial Banks

Agreement with Local Commercial Banks led by M/s HBL for financing upto Rs. 144 billion signed on March 29, 2017. Rs. 60.93 billion utilized till June 30, 2023.

Foreign Commercial Bank

Agreement with M/s Credit Suisse Bank for US$ 350 Million Credit signed on June 29, 2017. US$ 189.12 million utilized till June 30, 2023.

MOHMAND DAM HYDROPOWER PROJECT

Background

WAPDA initiated preliminary geological investigations and reconnaissance survey at Mohmand Dam (Then Munda) site in 1963. In its 1969 Report, a 210 m high rockfill dam, with a gated spillway of 15,100 m^3/s capacity and 400 MW installed capacity power plant was proposed. Project was confirmed by MONENCO in "Inventory and Ranking Study of Hydropower Potential" in 1984.

Project Studies Carried Out

i) Pre-Feasibility Study

Pre-feasibility Report was prepared by NESPAK in 1992. 180 m high rockfill dam was proposed at about 4.8 km upstream of existing Munda Headworks. It was planned to generate 600 MW of hydropower, irrigate land of some 12,000 ha and provide flood control during the rainy season creating a reservoir with gross storage of 623 Mm^3.

ii) Feasibility Study

According to the JICA Feasibility Study (2000), the Munda (Mohmand) Dam Project was proposed to be located about 5 km upstream of the existing Munda Headworks and generate 740 MW Hydropower, irrigate 6,110 ha land, and provide flood control by creation of a reservoir with a gross storage volume of 1,594 Mm^3 by construction of a 213 m high Concrete Face Rockfill Dam (CFRD). The project was planned as a multipurpose project with hydropower, irrigation and flood control components.

iii) Public Private Partnership Mode

In the AMZO Feasibility Study (2006), the dam height was reduced to 200 m as compared to the JICA proposal of 213 m, as a result the storage capacity was reduced from 1,594 Mm^3 to 1,240 Mm^3. The project was planned as a pure hydropower project ignoring flood control and irrigation components. Reduced height would also reduce flood mitigation potential of the project as well as water for irrigation and power generation.

iv) Detailed Engineering Design

Under the Detailed Design Studies (2012-2017) conducted by Mohmand Dam Consultants (MDC), project was proposed to be located 5 km upstream of existing Munda Headworks. The project would comprise of a 213 m high Concrete Face Rockfill Dam (CFRD) that will create an active reservoir storage volume of about 1,594 Mm^3. The project would generate an estimated annual energy of about 2,862 GWh at a plant factor of 40.84%, and has an installed capacity of 800 MW. The project will irrigate a new command area (CCA) of 6,773 ha on left and right banks of Swat River. Besides, it will also supplement irrigation supplies to Lower Swat and Doab Canals off-taking from Munda Headworks.

v) Climate Change & Impact Assessment Study

In parallel to the MDC study, a Climate Change Adaptation and Impact Assessment Study was initiated by the Delegation of European Union to Pakistan, and carried out by the European Union Consultants (EUC) during 2013, comprising of:

Component-1:
Improvement of Resilience of Mohmand Dam towards Climate Change.

Component-2:
Impact Assessment Study of Mohmand Dam on Environmental, Social and Economic Matters.

These reports were prepared by European Union Consultants (EUC), the outcome of which were considered in different volumes of Detailed Engineering: Design Report.

Project Location

Mohmand Dam is located on Swat River approx. 190 km from Islamabad, 48 km from Peshawar and 5 km upstream of existing Munda Headworks in Mohmand Tribal District, Khyber Pakhtunkhwa. Reservoir extends 56 km upstream from Dam Axis to Mohmand, Bajaur and Malakand Tribal Districts.

Objectives

The project is a multipurpose water storage initiative with the following main objectives:

- Hydropower Generation of 800 MW (2,862 GWh Annual Energy);
- Annual Flood Control Benefits of approx. Rs. 1500 Million in Low Lying Areas;
- New Irrigated Development of 6,773 ha increasing Crop Intensities from 23% to 136%.
- Supplementing Irrigated Supply to existing 160,000 Acres (Lower Swat and Doaba Canals) with Yield increase of 19% (Rs. 1400 Million Annual Benefits).
- Drinking Water Supply of 300 Million Gallons/ per day to Peshawar.

i) River Diversion Scheme

To divert Swat River flows, two Diversion Tunnels

Diversion Tunnels - Mohamad Dam

Salient Features

Type of Dam	Concrete Faced Rockfill
Height of Dam	213 M
Gross Storage	1.293 MAF
Live Storage	0.676 MAF
Power Generation	800 MW
Annual Energy	2,862 GWh
Cultivable Command Area	18,233 Acres
	(Left Side 12,713 Acres, Right Side 5,520 Acres)
Consultants	M/s Mohmand Dam Consultants Group (MDCG)
Contractor	CGGC-DESCON JV
Commencement Date	September 20, 2019
Completion Date	December 21, 2025 (Planned)

DT-1 (1681 M) and DT-2 (1783.7 M) on the right bank are being constructed, for construction of Main Dam and related structures. This will be followed by construction of upstream and downstream coffer dams. Diversion Tunnels are concrete lined with excavated dia. of 17 m and internal dia. of 15 m. It is imperative to mention that Mohmand Dam site encountered flash flood on August 26, 2022 due to which Diversion Tunnel inlet 1 and slopes collapsed. Resultantly, Diversion Tunnel-03 of 368 m was introduced as per Consultant's proposal.

ii) Concrete Face Rockfill Dam (CFRD)

A Concrete Faced Rockfill Dam (CFRD) with a height of 213 m and crest length of 718 m will be constructed across Swat River. The dam Crest Level is at 563.00 m.a.s.l and the top of parapet wall is at 564.50 m.a.s.l. The upstream and downstream slopes are 1V:1.4 H and 1V:1.6 H respectively. Impounded Reservoir will have a gross storage volume of 1,594 Mm^3 while the live storage is 834 Mm^3. On completion, it will be the 7^{th} tallest CFRD Dam in the World.

iii) Spillway

The gated Chute Spillway with seven No. 15 m x 21 m radial gates is located on Left abutment of dam. A 100 m wide concrete chute, with a double stilling basin arrangement for energy dissipation, will be constructed for a PMF discharge of 27,427m^3/sec.

iv) Low Level Outlet (LLO) and Flushing Outlet (FO)

Diversion Tunnel (DT-2) will be converted into LLO to facilitate the controlled first filling of reservoir, whilst maintaining downstream environmental and irrigation demand releases. The LLO will also serve for any future requirements for emergency drawdown of reservoir.

v) Power Intake, Waterway and Powerhouse

Power Intake will be excavated upstream of dam axis on right bank. Water will be conveyed to Powerhouse via a Headrace Tunnel & Penstock. The 800 MW surface Powerhouse

with 4 Units (200 MW each) will be located 60 m downstream from CFRD toe.

vi) Re-regulation Pond

A Re-regulation Pond will be developed by widening the current Swat River Valley downstream of Powerhouse and up to Munda Headworks. This will regulate river flows by enhancing the capacity of Munda Headworks Pond to a minimum of 8 Mm^3.

vii) 220 kV Switchyard

The 220 kV Switchyard will be located approx. 400 m from Powerhouse on the right bank. Span between Powerhouse & Switchyard will be interconnected with double circuit towers.

viii) Left and Right Bank Irrigation Tunnels

Irrigation facilities include intake structures, tunnels and irrigation canals. Small powerhouses are proposed to be constructed at suitable locations to generate energy. Length, diameter and discharge of Left & Right Bank Irrigation Tunnels will be 4.77 km/3m/4.66 cumecs and 3.5 km/3m/2.1cumecs respectively. Length and discharge of Left & Right Bank Irrigation Canals will be 12.4 km/3.5 cumecs and 11.75 km/3.32 cumecs respectively. Command Area for Left and Right Banks will be 18,233 Acres (Left Side 12,713 Acres, Right Side 5,520 Acres).

ix) Project Colony

Project Colony is a permanent feature which will initially accommodate WAPDA and Project Consultants Staff during construction and thereafter will be occupied by Operation and Maintenance (O&M) Staff of WAPDA in commissioning & subsequent operation.

x) Access Roads

There are two types of Roads i.e. Temporary & Permanent Access Roads. Temporary access roads were constructed immediately to provide access to various work fronts i.e. River Diversion Scheme, Project Colony, Spillway, Power House, Power Waterway etc. whereas construction remained in progress at Permanent Access Roads. Permanent Access Roads further comprises of Left Bank Access Road (LBAR 6.66 km) and Right Bank Access Road (RBAR 7.566 km).

Project Financing

As per PC-I approved by ECNEC on April 26, 2018, financing strategy and project cost is apportioned into two parts. Part A (Dam Part) is Rs. 114 billion of total project cost of Rs. 309 billion is to be financed through PSDP Grant. Indicative funding strategy is as:

Component	Source	% age	Rs. In Billion
Dam Part	PSDP Grant	100	114

Power Generation Facility involves Equity, Debt and IDC which is as below:

Indicative Funding Strategy for Power Generation Facility (Cost Recoverable through Tariff)

Equity		
WAPDA's Own Resources	20 %	Rs. 29 Billion
Debt	**80.0**	
Foreign Commercial Financing (Equiv. US$)	45.0	Rs. 71.5 Billion
Local Commercial Financing	35.0	Rs. 44.5 Billion
Sub-Total	**100**	**Rs. 145 Billion**
Interest During Construction (By WAPDA)		Rs. 50 Billion
Total		**Rs. 195 Billion**

Federal PSDP Grant

- Govt of Pakistan approved PSDP of Rs. 10.500 billion (including FEC Rs. 500) for fiscal year 2023-24 against Rs. 26.719 billion requirement submitted by WAPDA.
- In current FY, Rs. 3000 million & Rs. 500 million FEC releases have been made by PSDP till date.
- Due to non-availability of PSDP Funds, Liability of Rs. 8.052 billion remains pending on project office as of December 31, 2023.

Foreign Commercial Financing

- The foreign currency requirement of the project is US$ 716 million.
- To arrange the financing, EAD and WAPDA had multiple constructive meetings with the Arab Co-ordination Group (ACG) namely Islamic Development Bank (IsDB), Saudi Fund for Development (SFD), Kuwait Fund for Arab Economic Development (KFAED) and OPEC Fund for International Development (OFID). All the respected member from ACG reaffirmed their commitment to assist for the FX component of MDHP. The details are as follows:

  a) Board of Director of SFD has approved SAR 901.2 million (equivalent to US $ 240 Million) financing for Mohmand Dam Hydropower Project. The loan agreement has been signed on April 07, 2023 with SFD. Assignment Account has been opened and operational. Withdrawal application No.1 amounting to USD 58.663 million has been submitted to SFD in December 2023.

b) KFAED has agreed to provide financing of US$ 100 million. The loan agreement was finalized in October 2022 and KFAED is seeking Board Approval after which loan will be available for draw down.
c) IDB has agreed to provide US$ 180 million to partially finance the Lot 4 of the project under three tranches of US$ 130 million in 2021, US$ 25 million in 2022 and US$ 25 million in 2023, through Instalment Sale Agreement. The appraisal mission carried out the due diligence exercise in October 2021, followed by finalization of the terms and conditions of the draft loan agreement in November 2021. The loan has been approved in IsDB annual board meeting in December 2021. Loan Agreement signed on March 21, 2022 by IsDB & EAD.
d) OFID has participated in the appraisal mission conducted by IsDB for partially financing Lot-4 and have agreed to provide a loan of US$ 72 million. OFID board has accorded approval of the US$ 72 million loan and loan agreement was signed in June 2022. Assignment Account has already been opened and operative. 1st & 2nd withdrawal application amounting to USD 27.805 m ~ Rs. 7,842 m has been released to MDHP.

Confidence Building Measures/Public Welfare Schemes for Locals

- After detailed deliberations, meeting and discussions with district administrations and locals, a number of schemes have been identified amounting to Rs. 4500 million for implementation as confidence building measures.
- The schemes have been divided into two phases. Phase 1 amounting to Rs. 1900 million implemented regarding projects in energy and power sector, road/communication sector, drinking water supply and education sector.
- The schemes in Phase-2 amounting to Rs. 2600 million will be implemented regarding projects in road/communication sector, drinking water supply, education sector, health sector and sports, culture and youth affairs.
- Identification of land for 132 kV grid station at Danish Kool Pindayli has been carried out. The Section-IV of issuance is in process by the DC Mohmand Tribal District.
- Admin Approval for Estimate of Abazai to Yousaf Baba Road (1st Reach of 9.5 km) has been accorded by the GM/PD MDHP and the same has been conveyed to Chief C&W (South) Government of KPK to proceed further.
- The PC-I's/detailed cost estimate of the 1 No. school at GPS Johar Tehsil Barang, Bajaur Tribal Distt is in process for Admin approval while PC-1/detailed cost estimate of upgradation of 3 Nos. GP School at Shaheed Banda & Daryab Korona Tehsail Pindayli are to be submitted by the C&W (Building) Mohmand.

Besides Social uplift of the locality, the project office initiated /completed the following quick impact-projects under the confidence building measures:

- Under Tree Plantation, a total of 150500 Fruits/Native/Ornamental Plantation completed by Forest Dept. KP on area of 345 Acres.
- 18 Free Medical Camps has been arranged in various Tehsils of Distt; Mohmand and nearly 19000 patients have been examined/treated.
- 05 Free Eye Camps held in District Mohmand and so far, 2545 patients treated.
- Free Veterinary Camps held in Sappary Mulagori and Prang Ghar.
- Free Community Transport was being provided for 10 different routes for students, elderly and women of District Mohmand, contract for one year was completed.
- Work on construction of cattle ponds at Koz Sappary and Kum Sappary (Project Affected Areas) at District Mohmand has been completed.

Land Acquisition and Confidence Building Measures

Phase	Description	Distt.	Area (Acres)	Acquired Land (Acres)
1	Main Project Area (Dam Head, Spillway, Access/Diversion Tunnels, Power House, Access Roads, Project Colony/Facilities, Chinese/ Pakistani Camp and Fence Area.	Mohmand Charsadda	2602 143	2602 143
2	Irrigation Network-Left & Right Bank irrigation Canals	Mohmand	228	129
3	Reservoir Area	Mohmand Bajaur Malakand	5814	5814
	Total		**8787**	**8688**

- Overall Progress of Land Acquisition up to June 30, 2023 is 98.88 %.

Project Implementation

Contract Packaging
Works have been divided in four Lots, implemented under single contract as follows:

Lot 1 Preparatory Works (Access Roads and Project Colony)
Lot 2 Main Dam and Appurtenant Structures
Lot 3 Irrigation Facilities and Ancillary Works, and,
Lot 4 Design, Supply and Installation of Electrical and Mechanical Works and Hydraulic Steel Structures.

Consultancy Services
Mohmand Dam Consultants Group (MDCG), a joint venture of NESPAK, SMEC, Australia, MWH International, USA, DOLSAR Engineering: Turkey, ACE Limited, MMP in association with BAK Consulting Engineers - Pakistan, SIDRI - China, Engineering: General Consultants - Pakistan, AGES - Pakistan, DMC - Pakistan, MWH Pakistan, Technical Resource Services, - Pakistan signed Contract Agreement with WAPDA on May 20, 2019.

Overall objective of the services is to review the detailed design of Mohmand Dam Project, carry out construction design activities, construction supervision & contract management as "The Engineer" and successful delivery of project on schedule time and forecasted budget. Specific Scope of Services includes the following major activities:

- Design Review
- Engineering Studies include:
  - Dam Break Analysis
  - Design of Low-Level Outlet and Flushing Outlet including Model Studies
  - Reservoir Rim Slopes Stability Analysis
  - Re-regulation Pond Operation Studies and Development of Operation Manuals
  - Flood Mitigation Studies and related Reservoir Operation Manual
  - Detailed Engineering. Design of Identified Hydropower Potential of Irrigation Facilities
  - Design of Intake Structure for Water Supply Scheme to Peshawar
  - Technical Presentations and Perspective Model (3D) required from time to time
  - Hydraulic Model Studies of Structures using Physical/Numerical Modeling Techniques
  - Design of Public Welfare Projects and assist in Implementation of Projects
  - Scanning and Digitization of Office Record
  - Supervision of Field Testing / Investigation and Maintenance of Record
  - Any other Additional Study needed during Project Execution phase will be considered as additional services
- Construction Design
- Construction Supervision
- Contract Management
- Environment and Resettlement Aspects i/c Assistance in Implementation of Resettlement Action Plan
- IFC drawings of Project Colony, Right & Left Bank Access Roads, Diversion & Access Tunnels, CFRD, Spillway and Right & Left Bank Irrigation Tunnels issued.

Contract Agreement
Contract Agreement for Contract ICB No. MDHP-01 was signed between WAPDA and M/s CGGC-DESCON JV on March 26, 2019 and contractor started mobilization of Machinery and Equipment at Site w.e.f. April 04, 2019.

Ground Breaking Ceremony of the project performed by Hon. Prime Minister of Pakistan on May 02, 2019. Construction activities on site was started on September 20, 2019.

Physical Progress
Project Progress in FY 2022-23 can be summarized as under:

- Access Roads:
- At RBAR from Munda Headwork to Point A, cutting and filling up to subgrade and subbase is completed while stone pitching drain /slope is in progress at various RD's.
- At RBAR from Point A to Colony, road excavation & mucking is completed while work on slope protection and stone pitching drain/slope remain in progress at various RD's.
- At RBAR Road to Switchyard cutting and filling is completed while work on subbase is in progress at various RD's.
- At RBAR Road to Dam crest cutting and filling up to subgrade and subbase is completed while stone pitching drain /slope is in progress at various RD's.
- At LBAR, retaining wall construction, cutting/excavation, embankment filling, slope stabilization, WBM, stone pitching drain/slope remains in progress.
- WBM, Subbase and TST at various RD, s at L-BAR and R-BAR and Colony remained in progress.
- Total progress achieved on Permanent Access Roads (Left & Right) 71.61%.

Spillway - Mohamad Dam

Project Colony
- Construction of roads is in progress.
- CAT I, II, III, IV block masonry is in progress.
- Overall progress of Project Colony (Priority-I) & (Priority-II) is 78.75% & 63.90% respectively.

Re-regulation Pond
- Excavation & haulage work and Second stage excavation of material at various RDs on both Right and Left Bank of Re-regulation Pond remain in progress.
- Total progress achieved on Re-regulation Pond is 56.80%.

Diversion & Access Tunnels
- 03 Invert and 02 Arch shutters are operational in DT-01. 03 Invert and 02 Arch shutters are operational in DT-02, whereas assembly of 3rd Arch shutter is in progress in both tunnels.
- Concrete Lining of Invert & Arch Portion of DT1 & DT2 completed up to 1066 m, 492 m & 787 m, 432 m respectively. Convergence remedial works in DT-2 remained in progress.
- Excavation of DT-03 main tunnel (368 m) is in progress and 183 m excavation (Heading Portion only) has been achieved.
- Jet Grouting Work for construction of dyke has been completed.
- Total progress achieved on DTs is 59.10%

Spillway
- Excavation of spillways from Top Slope RD 0+542 – 0+620 is remained in progress.
- Bulk excavation of material at Spillway Lower Chute and Lower Stilling Basin Area from RD 0+545 – 0+560 at elevation 425-430 m is in progress.
- Total Excavation achieved on spillway is 77.60%.
- Total Progress achieved on Spillway is 26.50%.

Power Intake and Main Dam
- Excavation, mucking and slope stabilization work remains in progress at various elevation on Right side and Left side of Main Dam. Dental concreting carried out at various elevation of Left and Right side of Dam Plinth.
- Excavation and mucking are in progress at elevation 390 and 375 m
- Installation of tension ground anchors at Upper Stilling Basin Left side is in progress
- Total Progress achieved on Main Dam is 0.47%.
- Total Progress achieved on Main Dam plinth is 37.06%

Irrigation Tunnels and Canals
- Full face excavation from outlet of Left Bank Irrigation Tunnel (LBIT) completed up to 369.8 m.
- Full face excavation from outlet of Right Bank Irrigation Tunnel (RBIT) completed up to 345 m.

- Excavation of Left Bank Irrigation Tunnel Intake Shaft started and completed up to 9 m.
- Excavation & mucking at RBIT Inlet Portal at elevation 585 m remain in progress.
- Excavation/cutting, embankment filling and compaction remain in progress at various RDs of Left Bank Irrigation Canal from RD 0+000 to 10+800 is in progress. However, construction work on various RDs has been stopped by locals.
- Work on RBIC stopped since January 31, 2023 by locals.
- Similarly, work on various structures including Head Regulator Complex, Culverts, Super Passage and aqueduct of Left Bank Irrigation Canals also remained in progress.
- Total Progress Achieved on Irrigation facilities and Ancillary works is 12.82%.

Drilling Works

- The contractor has completed the drilling of 02 No. boreholes at Todobo quarry area for geotechnical investigations of rockfill material.
- 6th No. trial blast in Todobo quarry area was performed on June 29, 2023 at elevation of (650-640).
- Shifting of material from blast location to stock pile area is in progress.
- Drilling of 06 No. boreholes out of 07 for geological/geotechnical investigations have been completed at Sappare Quarry todate.
- Drilling and jet grouting of 104 No. boreholes for seepage control at DT-3 inlet protection dyke have been completed.
- 99 Acres' land at Sappare Quarry area has successfully leased by contractor for aggregate and rock fill materials.

Overall progress as of June 30, 2023 is 26.68%.

Flood 2022

An unprecedented very high flood of 260,000 cusecs and 300,000 cusecs have been witnessed at Mohmand Dam corresponding to 1:250 years, 1:425 years return period.

Flood Damages

- Diversion Tunnels Inlet Protection Bund Breached, overtopped & finally collapsed.
- Diversion Tunnel -1 Inlet Portal Slope and 66m Tunnel in length collapsed
- Diversion Tunnels completely submerged.
- Huge Debris Inflow in Diversion Tunnels.
- Diversion Tunnels Outlet Protection Bund overtopped and eroded.
- Concrete Lining Arch Shuttering & Working Steel Platform flushed out from Diversion Tunnel Outlet into the Outlet Portal construction pit.
- Middle three spans of Munda Headworks & Bridge (5 km d/s of Munda Dam Site under the control of KP Govt) collapsed & washed away

Post Flood Recovery Works

- Inlet and Outlet Construction pit areas dewatered and cleared from deposited silt.
- DT-1 & DT-2 dewatered and silt removal completed.
- Construction of Inlet Protection Bund completed.
- Construction of Inlet Protection Bund in front of DT-03 remained in progress 60% completed.
- Water and Power supply restoration completed.
- Concrete lining works in both tunnels resumed on December 04, 2022.
- New access tunnel cleaning & dewatering completed.

Financial Progress

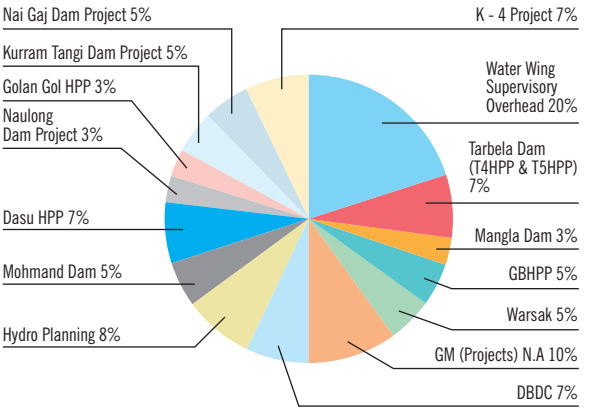
Financial Status (Rs. Million)	Local	Foregin	Total
PC-I Cost (26 April, 2018)	238,009.151	71,548.864	309,558.015
Expenditure up to 30 June, 2022	53,090.213	13,192.027	66,282.240
PSDP Allocation 2022-23	13,860.310	---	13,860.310
Current FY Expenditure	18,406.51	5,371.624	23,778.13
Upto Date Expenditure	71,497.1	18,563.71	90,060.82
Overall Financial Progress			**27.57 %**

TECHNICAL SERVICES DIVISION

The office of General Manager (Technical Services) was established in 2002 to render advisory/expert services on various projects of WAPDA Vision 2025. Since then, the office of GM (TS) has been providing technical advisory services on different water resources and hydropower projects.

The charters of duties of this office are summarized as under:

- Review of PC-I, PC-II & PC-IV of Water Wing/ Power Wing Projects
- Review Project Planning Reports
- Review EIA Reports
- Review Feasibility Reports



General Manager (Technical Services) administers/ supervises the following formations:

- WAPDA Environment Cell (WEC)
- Water Resources Directorate
- Computer Application Directorate
- Central Material Testing Laboratory (CMTL)
- Defunct Telemetry Project for Indus Basin Irrigation System (TPIBIS)

The tasks carried out by the office of General Manager (Technical Services) during the FY 2022-23 are as under:

Standing Review Committee (SRC)

Owing to reconstitution of SRC WAPDA in 2016, the administrative control of SRC was shifted from the office of GM (P&D) to the office of GM (TS). The function of SRC is to review and issue clearance of PC-I, PC-II & PC-IV of different Projects carried out by the various Organizations of WAPDA for onward transmission to Ministry of Water Resources through Chairman WAPDA.

During the financial year 2022-23, Standing Review Committee (SRC) has reviewed and processed PC-I, PC-II & PC-IV, detail is attached in Technical Directorate progress section.

Comments on Monthly Progress Reports

Comments on Monthly Progress Reports of following projects were offered by Water Resources Directorate:

- Dasu Hydropower Project
- Mohmand Dam Hydropower Project
- Diamer Basha Dam Project

WAPDA ENVIRONMENT CELL

WEC Role for WAPDA

WAPDA Environment Cell (WEC) was created in 1987 to take care of environmental aspects of WAPDA's Water Sector Development Projects. Its objective was to basically work for establishment of appropriate Environmental Quality Standards for WAPDA Projects to meet the National Environmental Quality Standards and then enforce and monitor these standards to ensure their compliance.

WEC served its mandate to actively carry-out various Environmental Impact Assessments (EIA) and Initial Environmental Examinations (IEE) of Hydropower Projects up to 2011. Later on, it took the leading role of top supervision and advisory services in implementing of Environmental Management Plans (EMPs). WEC also helps WAPDA Authorities to facilitate in environmental auditing and suggests improvement in the environmental reports prepared by consultants and other Agencies.

WEC Progress during year 2022-23

Top Supervision of Environmental Management Plans

i) **Kurram Tangi Dam Project**

There is an important role of WEC in Environmental Monitoring of Kurram Tangi Dam Project (Various Stages). WEC initiated its role in 2020-21 for Kurram Tangi Dam Project-Stage I as supervisory agency to ensure environmental compliance as per USAID Standards which remained continued during 2022-23. WEC is continuously guiding the project team to ensure the environmental compliance during project implementation. In this regard, WEC commented on Quarterly Environment Monitoring Report for the fiscal year 2022-23 pertaining to KTDP Stage-I Project. WEC also suggested improvement in Flood Hydrology and Climate Risk and Vulnerability Assessment Reports of Integrated Water Resources Development Project of Kurram Tangi Dam Project.

ii) Neelum Jhelum Hydro Electric Project

WEC performed its assigned top supervision role for environmental concerns of NJHEP during the construction phase. WEC is active partner in implementation of environmental considerations (as and when required) during O & M Phase of Neelum Jhelum Hydro Electric Project (NJHEP). This role remained active during the Fiscal Year 2022-23.

iii) Tarbela 5th Extension Hydropower Project

During the construction phase of Tarbela 4th Extension HPP, WEC was assigned the role to provide supervisory services in the implementation of Environmental Management and Mitigation Plan (EMMP). WEC remained actively involved in the implementation of EMMP during the construction phase and now it is also taking care of environmental issues of T4 Ext. HPP in the O&M Phase.

WEC is providing technical assistance to ESMU of Tarbela 5th Extension HPP and Floating Solar Photovoltaic project. WEC also participated in Public Hearing regarding ESIA of Tarbela Floating PV Project and seminar on the topic "Impact Evaluation of Climate Changes on Water Resources and Environment of Pakistan". Later, WEC provided technical support regarding the 2nd seminar on "Impact Evaluation of Climate Change on Water Resources in Context with Social and Environmental Aspects". During 2022-23, WEC reviewed environmental related reports of the Floating Photovoltaic Solar Project prepared by the consultants as listed below:

- Initial Environmental Examination (IEE) Report 16-25 MW for Solar Pilot Project (Ghazi Head Pond)
- Initial Environment Examination (IEE) Report 16-25 MW for Solar Pilot Project at Tarbela Reservoir

iv) Dasu Hydropower Project

WEC have an assigned role to perform environmental auditing and monitoring of ESMP of Dasu HPP during construction phase. In this regard Project Authorities have been requested to initiate WEC role to do the job (on Deposit Work Basis) as defined in Project Appraisal Documents (World Bank), PC-I and ESIA of Dasu HPP. During 2022-23, WEC role was limited to evaluation and review of various environmental related reports including quarterly and monthly reports titled "Dasu HPP, consultancy services, project management support, monitoring and evaluation and supervision of Environmental and Management Plans".

v) Shatung Hydropower Project

WEC has undertaken the role of supervisory services for:

i) Critical Habitat Assessment
ii) Exclusive Ecological Impact Assessment Studies of the Project

WEC also reviewed and commented on Draft Inception Report and other environmental reports including Monthly Progress Reports during the fiscal year 2022-23.

Environmental Reports Evaluated and Reviewed during 2022-23

WEC evaluated and reviewed the environmental reports of various projects detail of which is given below:

i) Harpo Hydropower Project

- Draft Environmental & Social and Management Plan (ESMP) and updated Initial Environmental Examination (IEE) Report
- Draft Environmental & Social Management Plan (ESMP) and Initial Environmental Examination (IEE) Report for the Transmission Line of 34.5 MW Harpo Hydropower Project, Skardu

ii) Chitral Capacity Enhancement Project

- Draft Initial Environmental Examination (IEE Report) of Chitral Capacity Enhancement Project from 1 MW to 5 MW
- Updated Initial Environmental Examination (IEE Report) of Chitral Capacity Enhancement Project from 1 MW to 5 MW
- WEC Teams visited Chitral Capacity Enhancement Project located on Lutkho River to access and earmark the environmental and social ground realities of the project for the improvement of IEE.

iii) Other Environmental Reports

- Fish Survey Reports, River Habitat Mapping and E-Flow Assessment of the Keyal Khwar Hydropower Project
- Feasibility Review/Validation Report Attabad Lake Hydropower Project along with Monthly Progress Report
- Environmental Impact Assessment (EIA) of Naulong Multipurpose Dam Project, Jhal Magsi, Balochistan.
- Outcome of Supplementary Updating Study the final Report of GBHP (Flood Plains between Ghazi Barrage and Khairabad Bridge)
- IWASRI Report of Domestic and Industrial Effluent on contamination of Rivers and

Groundwater especially near Lahore City and in Downstream Areas
- Project Planning Report Volume-I (Part B: Chapter 8 Environmental and Resettlement Plan of Murunj Dam Project

Project Documents Reviewed during 2022-23

WEC is an active member of Standing Review Committee of WAPDA to review and scrutinize all PC-I, PC-II documents of the WAPDA development projects. WEC reviewed and commented on following PC-I, PC-II & PC-IV proformas of WAPDA projects specifically for evaluation of environmental related sections and generally the whole of project documents:

PC-I Documents
- PC-I Proforma – National Master Plan for Flood Telemetry Network (Phase-I), July 2022
- Revised PC-I Proforma of 1530 MW Tarbela 5th Extension Hydropower Project, July 2022
- Commented on PC-I Proforma (Revised) for Establishment of Pakistan Glacier Monitoring Network, August 2022
- PC-I Proforma for Kachhi Canal Project-Restoration of Flood Damages-2022(RD 0 to RD 1005), October 2022
- PC-I Proforma of National Master Plan for Flood Telemetry Network (Phase-1), November 2022
- PC-I (Final Version) for Kachhi Canal Project (Phase-II) RD 1322+000 to RD 1512+000 Amounting to PKR 70,811 Million
- 1st Revised PC-I for Remedial Measures to Control Water Logging due to Muzaffargarh and Taunsa Panjnad Link Canal Project, November 2022
- PC-I Proforma for Restoration of Flood-2022 Damages of RBOD-1& RBOD-III, December 2022
- PC-I Proforma for 300 MW Floating Solar Photovoltaic (FPV) on Water Bodies in Tarbela Barotha Hydropower Generation Complex, December 2022
- 3rd Revised PC-I for Lower Indus Right Bank Irrigation and Drainage Project (LIRBP) Stage-I Priority Works RBOD-I, January 2023
- 2nd Revised PC-I for Balochistan Effluent Disposal into RBOD (RBOD-III), January 2023
- 1st Revised PC-I Proforma for Remaining Works of Kachhi Canal Project (Phase-I) RD 1193+30 to RD 1322+30 amounting to PKR 38,024/ Million, February 2023
- PC-I Proforma for Strengthening and O&M of Glacier Monitoring Research Centre (GMRC) under Part of Flood Protection Sector Project-III (FPSP-III), March 2023
- PC-I Proforma (Draft) for Strengthening and O&M of SWHP Network under Part of Flood Protection Sector Project-III (FPSP-III), March 2023
- PC-I for "Updating of High Frequency Radio Network and Flood Centre" WAPDA Scheme under Flood Protection Sector Project (FPSP-III), April 2023

PC-II Documents
- PC-II Proforma for Pre-Feasibility Study of Yulbo Hydropower Project (2800 MW), September 2022
- PC-II Proforma for Pre-Feasibility Study of Tungas Hydropower Project (2800 MW), September 2022
- PC-II Proforma for Detailed Engineering Design, Preparation of Tender Documents & PC-I of Thakot-I Hydropower Project, October 2022
- PC-II Proforma for Updating of Feasibility Study, Detailed Engineering Design, Preparation of Tender Documents and PC-I of Patan Hydropower Project (2400 MW), February 2023
- PC-II Proforma for Hydraulic Calibration and Formulation of Feasibility Study and PC-I for Installation of Telemetry System on Remaining 17 Sites (IBIS), March 2023
- PC-II Proforma for Development Projects-Research Studies on Quantification of unaccounted Surface Water and Soil Salinity Survey of Indus Basin Irrigation System (July 2023 to June 2027), December 2022.

PC-IV Documents
- PC-IV (Project Completion Report) of Jinnah Hydropower Project, January 2023

Miscellaneous Assignments completed during the 2022-23
- WEC previously contributed its vital role in securing the green financing through the successful completion of Green Bonds proceeds in 2020-21. WEC is now contributing to explore and capture the green finance and carbon credit venues i.e., Green Climate Fund (GCF), Global Carbon Council (GCC) etc.
- WEC commented on the Ministry of Water Resources query about "Prospects of Low - Carbon Development across the Energy Sector Value Chains of Pakistan".
- WEC also commented Ministry of Water Resources query on 6th Round of Pakistan-Spain Bilateral Political Consultations in Backdrop of Climate Change.
- WEC participated in the Webinar on the "Development of Adaptation Related Measurement, Reporting and Evaluation Guidelines for Water Sector".

- WEC commented on Development and Transfer of Environmentally Sound Technologies (ESTS) for Pakistan's Third National Communication (TNC) on Climate Change under United Nations Framework Convention on Climate Change (UNFCCC).
- Commented on Agri-Climate Water Portal (ACWA) Stakeholder meeting for Federal Level Consortium organized by United Nations Food and Agricultural Organization (FAO).

WATER RESOURCES DIRECTORATE

The Water Resources Directorate is working under administrative control of the office of General Manager (Technical Services) WAPDA and scope of work and work progress are as below:

The Technical Directorate is performing key function as " Secretariat of Standing Review Committee (SRC)" of WAPDA to holistically review/comment, coordinate with all Stakeholders and issue clearance of PC-I's & PC-II's Proforma of both "Water Sector and Hydropower Projects of WAPDA", before submission to Ministry of Water Resources through Chairman, WAPDA.

Further, PC-I's/PC-II's Proforma regarding "Flood Protection Schemes" of Provinces, AJK and FATA etc., received through Federal Flood Commission, Islamabad are reviewed on behalf of Member (Water), WAPDA being the member of "Scrutinizing Committee' made at the level of Ministry of Water Resources.

This Directorate also focuses on "Agriculture Aspect" for agriculture development & food security.

This Directorate also reviews on "Financial & Economic Aspects" of PC-I &PC-II Proforma of both "Water Sector and Hydropower Projects of WAPDA to examine their Financial & Economic viability in terms of their indicators like Benefit Cost Ratio (B/C Ratio), Net Present Value (NPV), Financial Internal Rate of Return (FIRR) & Economic Internal Rate of Return (EIRR) and Unit Costs are worked out for every proposed project of the WAPDA and Flood Protection Schemes of Provinces, AJK and FATA etc.

Progress during the year 2022-23

During the financial year 2022-23, this Directorate being Secretary of Standing Review Committee (SRC) has reviewed/processed and cleared PC-I, PC-II & PC-IV whose details is attached as below (Annex – A & B).

Technical Directorate as Secretariat of Standing Review Committee cleared the following Projects during the year 2022-23.

PC-I Proformae

1. 1st Revised PC-I Proform for Establishment of Pakistan Glacier Monitoring Network (August,2022).
2. 2nd Revised PC-I Proforma for Kurram Tangi Multipurpose Dam Project Stage-I, Kaitu Weir, Irrigation & Power Project (June, 2022).
3. Original PC-I Proforma Regarding "Kachhi Canal Project-Restoration of Flood Darnages-2022 (RD 0+000 to RD I005 + 000)" (October, 2022).
4. Original PC-I Proforma for National Master Plan for Flood Telemetry Network (Phase-I)-(November, 2022).
5. 1st Revised PC-I Proforma for Remedial Measures to Control Water Logging due to Muzaffargarh & Taunsa Panjnad Link Canals Project - (December,2022).
6. Final Version PC-I for Kachhi Canal Project (Phase-II) RD 1322 + 000 to RD 1512 + 000 (November, 2022).-
7. Original PC-I Proforma for 300 MW Floating Solar Photo Voltaic (FPV) on Water Bodies in Tarbela Barotha Hydropower Generation Complex, (December, 2022).
8. Original PC-I Proforma for Restoration of Flood-2022 Damages of RBOD-1 & RBOD-III Projects (December, 2022).
9. 1st Revised PC-I Proforma for remaining works of Kachhi Canal Project (Phase-I) RD1192+000 to RD 1322+000 (February, 2023).
10. 1st Revised PC-I Proforma of 1530 MW Tarbela 5th Extension Hydropower Project (T5HPP) including Solar Pilot Project (16-25 MW) - (October, 2022).
11. Original PC-I Proforma for strengthening and O&M of GMRC through FFC (FPSP-III) under Foreign Financing of donor ADB (March, 2023).

PC-II Proformae

1. Original - PC-II Proforma for Feasibility Study of Pilot Project for Development to Inland Water Ways Navigation System in a Reach from Nowshera to Daudlkhel (November,2022).
2. Original - PC-II Proforma for Preparation of Feasibility Study, Detailed Engineering Design, Tender Documents and PC-I of K-V Project (November, 2022).
3. Original - PC-II Proforma of IWASRI for Research Studies on " Quantification of Unaccounted Surface Water and Soil Salinity Survey of IBIS"- (December,2022).
4. Original - PC-II Proforma-Detailed Engineering Design, Preparation of Tender Documents & P-I of Thakot-I Hydropower Project-2400 MW (October,2022).
5. Original - PC-II Proforma for updating of Feasibility Study, Detailed Engineering Design,

Preparation of Tender Documents & PC-I of Patan Hydropower Project 2400 MW (March-2023)

Technical Directorate as Secretariat of Standing Review Committee Reviewed / Processed

The following Projects during the Year 2022-23.

PC-II Proformae

1. Original - PC-II Proforma for Pre-Feasibility Study of Yulbo Hydropower Project-2800 MW (September, 2022).
2. Original - PC-II Proforma for Pre-Feasibility Study of Tungas Hydropower Project 2800 MW (September, 2022).
3. Original - PC-II Proforma for Hydraulic Calibration and Formulation of Feasibility Study and PC-I for Installation of Telemetry System on Remaining 17 Sites (March, 2023)

PC-I of Proformae

1. 3rd Revised- PC-I Proforma of RBOD-I Project (January,2023).
2. 2nd Revised- PC-I Proforma of RBOD-III Project (January,2023)
3. Original PC-I Proforma for Strengthening and O&M of SWHP through FFC (FPSP-III) under PSDP Financing (March, 2023).
4. Original PC-I Proforma for upgradation of HF Radio Network & Flood Centre, through FFC (FPSP-III) under PSDP Financing (April, 2023).
5. Original PC-I Proforma for Hub Dam Hydropower Project (1.4 MW) Detailed Engineering Design, Preparation of Tender Documents and Implementation of the Project including 11 kV Transmission Line at Hub Dam Project -(October, 2022).
6. 2nd Revised PC-I Proforma of Allai Khwar Hydropower Project 121 MW, Khan Khwar Hydropower Project 72 MW & Duber Khwar Hydropower Project 130 MW.

PC-IV Proformae

I. Jinnah Hydropower Project and O&M of Staff Colony
2. Darawat Dam Project
3. Neelum Jhelum Hydropower Project
4. Balochistan Effluent Disposal into RBODI-RBOD-III Project
5. Lower Indus Right Bank Irrigation and Drainage Project (LIRBP) Stage-I, Priority Works-RBOD-I Project

COMPUTER APPLICATION DIRECTORATE

The Computer Application Directorate (CAD) manages application of computer programs/ packages and models for analyzing field survey data used for designing, planning and evaluation of water sector projects through application of computer technology and models.

This Directorate is maintaining water resources data base containing different data sets and updated on regular basis for use in water sector planning. Barrages & headworks and water quality data have been collected and compiled.

This Directorate is also providing IT Assistance to the GM (TS) formation as well as o/o GM (HRM) in repair/maintenance of computer hardware/ software as and when required.

Progress during year 2022-23

Document Scanning & Digitization

This Directorate has initiated document scanning & digitization process of PC-I's & PC- 1I's proforma of Water and Hydropower Projects of WAPDA dealt at Standing Review Committee (SRC) including SRC members' comments, minutes of meetings and related drawings and images in order to examine/ view the updated status online by concerned WAPDA formations. The 30 Nos. of PC-1's & PC-II's have been scanned and digitized.

Designing & Development of Website for GM (TS) Office

This Directorate has designed and developed a website for GM (TS) office and its allied formations including offices of DG (WEC), PD (CMTL) and Director (Technical) WR

Automation of CMTL Testing Processes

The Computer Applications Directorate (CAD) has successfully accomplished by developing "Web Application on Portal" to automate testing processes of CMTL WAPDA and the milestones achieved in creating CMTL portal are mentioned as:

(i) Feasibility Study
(ii) Documentation / Software Requirements Specification Document
(iii) Designing and Development of CMTL Portal
(iv) Testing and Integration
(v) Acceptance Testing
(vi) Implementation / Installation of Software in CMTL Billing Section
(vii) Organizing Training Sessions for CMTL Staff
(viii) User Manual for CMTL Staff
(ix) Providing Compatible Hardware (Systems/Printers/Accessories) to CMTL Offices

CENTRAL MATERIAL TESTING LABORATORY (CMTL)

Introduction

Central Material Testing Laboratory (CMTL) is working under WAPDA. CMTL is housed in its own building complex. It is constructed over an area of 72 Kanals in WAPDA Employees Co-operating Housing Society, Phase II. The covered area is 44000 ft^2, out of which 20280 ft^2 is in use of GM (TS), Director General IWASRI, Project Director H&R, PD GMRC, Pension Disbursement Unit (PDU) WAPDA & SE Telemetry on rental basis.

CMTL is the only laboratory in Pakistan which provides state of the art testing facilities at public sector level. The effective functioning of CMTL is quite vital as WAPDA is continuously pursuing the water and power resources development in Pakistan. WAPDA is building number of new dams and hydroelectric power plants across Pakistan. Presently investigations and testing of various flagship projects are underway at CMTL.

Total Income in FY 2022-23

i. Total Income of CMTL during FY 2022-23
Rs. 52.425 Million
(Through Laboratory Testing, Deposit Works, Building Rent, Bank Profit, Tender Fee etc.)

Section Name	No. of Tests
Soil Mechanics/Dynamics	6040
Rock Mechanics	1590
Cement, Steel and Concrete	5012
Total No. of Tests (FY 2022-23)	**12642**

Details and List of Works of Prominent Projects

List of prominent projects on which CMTL has carried out field investigations & testing works are as under:

Project	Tests Performed
Suki Kinari Hydropower Project (CPEC)	In-House Testing
300 MW Balakot Hyropower Project (CPEC)	In-House Testing
Diamer Basha Dam Project	In-House & Field Testing
Dasu Hydropower Project	In-House Testing
Thakot Hydropower Project	In-House Testing
Murunj Dam Project	In-House Testing
Tarbela 5thExtension Work	In-House Testing
Mohmand Dam Hydropower Project	In-House Testing
Sanam Dam Project (Govt. of KPK)	In-House Testing
Siritoi Dam Project (Govt. of Balochistan)	In-House Testing
Kolachi Dam (Govt. of Balochistan)	In-House Testing
Khilero Dam (Govt. of Balochistan)	In-House Testing
Sub-Soil Investigation Kachhi Canal Project Site from RD 1286+000 to RD 1322+000	In House & Field Testing
Calibration of Compressive Strength Machine at different projects of NTDC, DISCO's, Punjab Govt etc.	Field Testing
Central Business Development Project LDA Lahore	In House Testing
Musa Tang Dam (Govt. of KPK)	In House Testing
Shah Habib Dam (Govt. of Punjab)	In-House Testing
Panjgor Storage Dam (Govt. of Balochistan)	In-House Testing
Zakar Dam (Govt. of KPK)	In-House Testing
Defense Housing Authority (DHA) Road and Building	In-House Testing
Jalalpur Irrigation Canal Project (Govt. of Punjab)	In House Testing
Pakistan Telecommunication Authority Towers Testing	In-House Testing
Madyan Dam (Govt. of KPK)	In-House Testing
Sub Soil Investigation (SSI) Work of Right Bank Rest House at Tarbela Dam Project	In House & Field Testing
Geotechnical Investigation for Hill Torrent Management for Kachhi Plains Project (Govt. of Balochistan)	In House & Field Testing
SSI Work of 132 kV Grid Station Dajal (MEPCO)	In House & Field Testing
SSI Work of 132 kV Grid Station Vehari Industrial Estate (VIE) Vehari (MEPCO)	In House & Field Testing
Machine Calibration of 220/500 kV T/L Faisalabad (NTDC)	Field Testing
Plate Load Test at Sukkur Barrage (Sindh Irrigation Department)	Field Testing
Electrical Resistivity Tomography (ERT) Survey at Copper Detection Site Bannu KPK (FWO)	Field Testing
Schimidt Hammer Testing and Cores Extraction Work University of Sambrial, Punjab	In House & Field Testing
Punjab Safe City Authority Works	In House Testing

Prominent Tests

Flat Jack Test at Diamer Basha Dam Project (DBDP)
Flat Jack Tests (FJT) have been performed in Adit No. 5 of Diamer Basha Dam Project (DBDP). A total of 7 Nos. tests have been performed to assess the in-situ stresses. FJT is an important test for determination of in-situ stresses in the rock mass for the design of Cavern Power House.

Plate Load Test at Sukkur Barrage (Irrigation Department Sindh Govt.)
Total 12 Nos. Plate Load Tests have been performed on different piers of Sukkur Barrage. This is an important test to assess the deform ability in the structure against applied load. These tests are carried out in the scenario of rehabilitation of Sukkur Barrage.

Electrical Resistivity Tomography (ERT) Survey at Copper Detection Site Bannu KPK (FWO)
A total of 150 sq meters of area has been surveyed to assess the presence of copper reserves underground.

Sub-Soil Investigation Kachhi Canal Project Site from RD 1286+000 to RD 1322+000
The CMTL Team has drilled 11 Nos. boreholes of different depths to explore the sub-soil strata. After field tests, disturbed and undisturbed soil samples have been collected from site and tested in laboratory. A complete report has been issued based on field and lab test results.

Geotechnical Investigation for Hill Torrent Management for Kachhi Plains Project
A total of 5 Nos. boreholes of 50 feet depth each have been drilled for exploring the Geotechnical Investigation. Disturbed and undisturbed soil samples have been collected from site after field testing. Subsequently, soil samples have been tested in the laboratory. A complete report has been issued based on field and lab test results.

HYDRO RESOURCES MANAGEMENT

General Manager (HRM) is responsible for the management of water resources throughout the country. He is responsible for various tasks like monitoring, collection, evaluation and publishing of hydro-meteorological data for planning, development and operation of water resources projects; coordination with federal/provincial flood management and reservoir operation authorities; annual, periodic and special inspections of water sector projects; evaluation of all the EOI's & proposals submitted by consultants and additional assignments assigned from time to time etc.

General Manager (HRM) performs these tasks with the help of following formations; each headed by Chief Engineer:

1. Dams Organization
2. Hydrology and Water Management (H&WM) Organization
3. Dams Safety Organization (DSO)
4. Indus Telemetry Organization

DAMS ORGANIZATION

As a member of Standing Review Committee (SRC), this office is responsible for reviweing PC- I, PC-II, PC-IV proforma of Water & Power Projects.

During 2022-23, this office has reviewed PC-II proforma for various assignments of Thakot Hydropower Project, Inland Waterways Navigation System in a reach from Nowshera to Daudkhel and Research Study on quantification unaccounted Surface Water and Soil Survey of Indus Basin Irrigation System.

This office has reviewed PC-I proforma for different assignments of Kurram Tangi Multipurpose Dam Project Stage-I (2nd Revision), Establishment of Pakistan Glacier Monitoring Network, Up-gradation of High Frequency Radio Network & Flood Centre, Strengthening and O&M of Glacier Monitoring Research Centre, Remaining Works of Kachhi Canal Project (Phase-I & Phase II), Balochistan Effluent Disposal into RBOD (RBOD-III), Floating Solar Photovoltaic (FPV) three sites in Tarbela - Ghazi Barotha Complex, 1,530 MW Tarbela 5th Extension Hydropower Project (T5 HP), Remedial Measures for restoration of Flood-2022 damages of RBOD-I & RBOD-III Projects, Remedial Measures to control water logging due to Muzaffargarh & Taunsa Panjnad Link Canal Project, K-IV Project, National Master Plan for Flood Telemetry Network (Phase-I), Installation of Telemetry System on remaining 17 Sites (IBIS) and Patan Hydropower Project (2,400 MW).

This office has reviewed PC-IV proforma of Jinnah Hydropower Project (96 MW).

As WAPDA hires consultancy services for different studies and tasks for different projects time to time, this office is also a member of Standing Committee for Evaluation of EOI's, Technical and Financial Proposals submitted by the consultants. Proposals submitted by the consultants for various assignments of Naulong Integrated Water Resources Project, Kurram Tangi Integrated Water Resources, 300 MW Floating Solar Panels in Tarbela-Ghazi Barotha Complex, Institutional Assessment and Reforms Consultancy (IARC) and Consultancy Services for Confidence Building Measures for Diamer Basha Dam Project were evaluated during 2022-23.

The land related court cases of Indus Basin Projects and also pertaining to other issues involving WAPDA are also under jurisdiction of this office. This office also carries out different assignments for WAPDA Authority from time to time e.g answering different Assembly/Senate questions. Preparation of presentations, briefs, working papers etc. and providing input in different water sector programs in the country.

Moreover, this office is also involved dealing with various technical dams related issues, Indus Basin Projects (IBP) land related issues, reviewing monthly, quarterly and annual progress reports related to water sector and hydropower development projects.

HYDROLOGY AND WATER MANAGEMENT (H&WM)

This organization is headed by Chief Engineer (H&WM) and comprises of following offices:

WATER RESOURCES MANAGEMENT DIRECTORATE (WRMD)

Water Resources Management Directorate (WRMD) of H&WM Organization established during 1973 with the aim to assist in co-ordination for efficient functioning of Indus Basin Irrigation System through timely provision of authenticated data communicated through Wireless Communication System for optimal use of water for irrigation and power purposes.

Basic functions of WRMD are:

- Operation and maintenance of 21 No. High Frequency (HF) Radio Telecommunication Stations, installed in the catchment of Tarbela, Mangla and Chashma Reservoirs, for timely provision of hydromet data required for their operational needs.

Powerhouse, Tailrace Culvert and PH Coffer Dam

- Co-ordination between WAPDA, Indus River System Authority (IRSA), Federal and Provincial governments for release of water, for irrigation and power needs from the existing IBP reservoirs.
- Daily Hydrological Data Report and Press Release on water situation of the country is prepared and disseminated to quarter concerned.
- Data from all sources relating to Indus Basin Irrigation System is collected and issued in the form of regular publications.
- Directorate also helps IRSA in preparation of seasonal operational criteria for the existing reservoirs of Tarbela, Mangla & Chashma.
- Additionally, a Flood Information Centre also established in WAPDA House during flood season, which works round the clock.

HF Radio Telecommunication System

For timely provision of authenticated data, a telecommunication network consisting Tarbela & Mangla Flood Warning Stations and Admn. network linking Tarbela, Mangla, Chashma, FFD and Sunny View Lahore has been established. WAPDA has constructed its own huts for accommodating staff and sensitive/precious 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 transmit the river inflow and reservoir data on hourly basis especially during flood season.

Hydromet data is transmitted from the catchment stations to their control station at Tarbela & Mangla then gauge data is converted in discharge and transmitted to main control station at Sunny View, Lahore. From Sunny View, Lahore. Data is disseminated to all concerned agencies i.e. WAPDA, FFC, FFD, PIDs and Met Department throughout the year. Data is communicated on pre-fixed time on the pre-allotted frequencies by the Ministry of Communication with the clearance of Defense/Civil-Aviation etc. Both voice as well as Morse Code Communication Systems is utilized depending upon the weather conditions.

Hydrological Data Report & WAPDA Press Release

Daily hydrological data report and WAPDA press release are published early in the morning before 10:00 Hour. This report demonstrates the water situation at the reservoirs and barrages of the country in comparison with last year, last 5-years & last 10-years averages. This report is based on the data collected through HF Radio Network from the catchments, reservoirs and barrages all over the country. The daily reports are published throughout the year without any holiday. These reports are also published on WAPDA Website. Public Relations Division WAPDA shares this data on social media as well.

Annual Publications

This Directorate also deals with Systematic collection, compilation and publication of the historic

rivers and canal discharge data of the Indus Basin in the form of annual publications. These publications are utilized for Water Sector Planning and Research purposes.These publications are based on the data received through HF Radio Network and monthly returns from Provincial Irrigation Departments.

Following Annual Reports of Operational Data of Indus Basin Irrigation System used for different Research & Planning purposes are being published every year:

1. Indus Basin Irrigation System Rivers and Canals Discharge Data
2. Historic and Probable Western River Rim-Station Inflows on 10-Daily Basis

Significant assignments accomplished during the year 2022-23 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, PIDs and Flood related agencies.
- Performance of HF Radio Communication System during the Flood Season 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 and WAPDA formations.
- Annual Reports of Operational Data of Indus Basin Irrigation System to be used for different Research & Planning purposes were published.
- PC-I for Improvement of HF Radio Network under FPSP-III has been prepared and submitted to Federal Flood Commission (FFC), Ministry of Water Resources for scrutiny & further processing.

SURFACE WATER HYDROLOGY PROJECT (SWHP)

Objective

The Planning & Monitoring of water resources is vital for its efficient use. It becomes more important when reviewed in the context of scarce water resources. For quantification of such resources, Systematic collection and valuation of surface water data is to be ensured. This data, sets direction for the planners to ensure its optimum utilization. Surface Water Hydrology Project (SWHP) was created in 1960 with the aim to collect and monitor data relating to surface flows for planning and development of water resources projects of Pakistan.

Scope of Work

In order to evaluate the potential of different rivers/nullahs, SWHP is responsible for the collection, analysis, processing and publication of the hydrometeorological (River Stage, Discharge, Sediment, Chemical, Max. & Min. Temperature, Relative Humidity, Dew Point, Wind Movement, Rainfall/Precipitation, Evaporation etc.) data of major rivers, nullahs and river catchments of Pakistan. SWHP is maintaining hydromet network of 121 No. of stations spread across Pakistan. During 2022-23, 98 Nos. hydromet stations monitored on regular basis. In addition, 23 No. hydromet sites entrusted to the SWHP by various WAPDA formations working on different Water Resources & Hydropower Projects for specific time period were operated and maintained.

The hydrological data observed from a network of hydromet stations (121 Nos.) is the basic information required for future planning and design of Water Resources and Hydropower Development Projects. In addition, the observed data by SWHP has been playing basic role in reservoir operation and sediment management of Mangla, Tarbela, GBHP, Chashma, NJHEP, Gomal Zam, 3-HHPs etc. as well as flood mitigation activities.

This project provided the precious hydromet data during 2022-23 to WAPDA, IRSA, NDMA, PIDAs, PCIW, Army, PMD, P&D, NHA and GoP for flood forecasting, designing of new hydraulic structures (Water Resources & Hydropower Projects), infrastructure development etc.

Tasks Completed During FY 2022-23

The following assignments/tasks have been completed during FY 2022-23:

- Publishing of Annual Report of “River and Climatological Data of Pakistan on River Discharge, Sediment and Quality of Water Data (VOL-I) for the year 2021 on HYDSTRA Software.
- Publishing of Annual Report of “River and Climatological Data of Pakistan on Daily and Hourly Precipitation Data (VOL-II) for the year 2021.
- Publishing of Annual Report of “River and Climatological Data of Pakistan on Evaporation, Temperature and Wind Movement Data (VOL-III) for the year 2021.
- Provision of daily flow data of Neelum River to MoWR, PCIW, Neelum Jehlum Project authorities and WAPDA head office on daily basis through e-mail.
- Provision of monthly flow data of Indus River Basin to PCIW during the year 2022-23 in accordance with manual of Responsibility

(1971) viz-a-viz Indus Water Treaty-1960, the responsibilities assigned to WAPDA for sharing of Indus River Basin Flows.
- Submission of monthly progress reports to O/o Chief Engineer (H&WM).
- Provision of rating tables to Tarbela and Mangla Dam Projects authorities for flood mitigation and operation of reservoirs.
- Provision of flows data to WRMD and other WAPDA formations for flood mitigation.

Future Plans
- O&M of 121 No. hydrometeorological stations for FY 2023-24.
- Reactivation and strengthening of remaining hydrological network in Khyber-Pakhtunkhwa & Baluchistan Scheme.
- SWHP, WAPDA is switching to modern equipment for efficient and more Accurate Data Observation (e.g.), Digital Current Meters (AQUACALC), ADCP, SVR, Digital Climate Observatory etc.
- To enhance expertise on bed-load measurement especially for highly turbulent rivers/streams.
- Proposal for Upgradation of SWHP Hydromet Network under Umbrella PC-I of Flood Protection Sector Project-III (FPSP-III).

HYDROLOGY & RESEARCH DIRECTORATE WAPDA

Introduction
The Hydrology & Research Directorate established since 1976 is responsible for operation & maintenance of a network of 44 Telemetry Stations installed in the upper catchment areas of Punjab, AJK and KPK and also including rim stations of eastern rivers, for hydro-meteorological data acquisition through Telemetric Hydromet Network for dissemination of the same to specifically to Flood Forecasting Division of Pakistan Meteorological Department (PMD) for issuance of early flood warnings. Furthermore, also shares generally to Federal Flood Commission (FFC), Provincial Irrigation Departments (PIDs) and some relevant research institutes.

The Directorate is also involved in flood discharge measurements which are gauged at key river locations & barrages of the Indus River System for timely transmitting information regarding flood peaks to PMD for timely flood management.

Additionally, Hydrology & Research Directorate is also operating and maintaining a network of 12 No. Automated Climatological Stations located in Central Punjab. The data comprising temperatures, relative humidity, rainfall and evaporation is collected throughout the network which then collected, compiled and is being published on an annual basis.

Major Activities (2022-23)
H&R Directorate is carrying out following new schemes in order to have effective use of the hydrological data and information for the efficient operations and management of reservoirs and ensure the optimum use of the impounded water for power generation, flood control and the mitigation of flood damages, particularly loss of human lives, and also considering the growing need of meteorological observations requirement due to climate change, the existing Flood Forecasting Telemetric (FFT) Stations are being up-graded as automated hydro-meteorological stream gauging stations by integrating with meteorological and flow measuring sensors on the existing FFT Stations to monitor real time flows.

In addition, various activities for expansion/ strengthening of existing Telemetric Network including installation of automatic new hydro-meteorological stations, upgradation of the existing stream gauging manual stations under WAPDA are also under taken by H&R Directorate.

The details of the ongoing activities during 2022-23 are summarized hereunder:

Up-gradation of Existing H&R Directorate Telemetric Stations Network under WCAP
Up-gradation of Existing Network by Integration of Meteorological Sensors and Automation of Manual Climate Station for Hydrology and Research Directorate has been carried out through approved-PC-II under Phase-II Additional Financing of Component, B1-WCAP Project funded by World Bank. The installation got delayed due to Covid-19 restrictions. However, the project was rescheduled for the installation of equipment on Automatic Weather Station (AWS)/Flood Forecasting Telemetric (FFT) Stations and was completed on June 30, 2021, which is currently in its Defect Liabilty Period (DLP).

Up-grade existing 34 No. Flood Forecasting Telemetric (FFT) Stations with latest meteorological sensors and installed 12 No. New AWS for forecasting of climate/hydrological cycle under WCAP. Water level, water velocity, flow discharge, rain gauge, temperature, relative humidity, dew point, evaporation, wind speed & direction, solar radiation etc. are the parameters which are measured through sensors at these stations. The real time data of mentioned sites is being reviewed and analyzed in H&R Directorate.

04 No. Automatic Stream Gauging Stations for Neelum Jhelum Hydropower Project
Installed 4 Nos. flows measuring stations at the

upstream of NJHP on river Neelum at Islampura, Taubat, Kel and Sharda. The scope of work includes installation of automatic stream gauging sensor for measuring automatic real time velocity/flows of River Neelum and catchment precipitation, max. and min. temperatures. These are primarily intended for acquisition of real time flow verifications to ensure the continuity environmental flows from the transboundary/neighbour country. The real time data of aforesaid sites is being reviewed and analyzed in H&R Directorate.

Flood Telemetric Network under Warsak Hydroelectric 2nd Rehabilitation Project

Expansion of Flood Telemetric Station is being done through foreign funding under Warsak Hydroelectric Power Station 2nd Rehabilitation Project under Flood Management Component of Approved PC-I financed by French Development Agency (AFD).

The scope of work includes installation of 8 No. Flood Forecasting Telemetric Station on River Kabul, Chitral and Swat and 1 No. complete Weather Station having multi-weather parameters. The hydrological and meteorological data will help Warsak Dam authorities for smooth reservoir management. The data received from these sites during the flood season 2022 was much helpful for prediction of early flood warnings. The project is currently under Defect Liability Period (DLP). This project is also helpful to resolve transboundary issues with Afghanistan by taking real time better assessment of flows coming from neighbouring country.

Pakistan National Master Plan for Flood Telemetry Network (Phase-I) under FPSP-III

WAPDA was directed to prepare and submit PC-I for flood telemetry prioritizing the installation in calamity hit areas during a meeting held on September 21, 2022 in Ministry of Water Resources (MoWR) under FPSP-III. In the light of above decision, PC-I was prepared by H&R Directorate with total number of sites all over the Pakistan in the phase-I (Top Most Priority Sites) are 457 No. amounting to the total cost of Rs. 15,496 million.

Location

The project area is spread across all major rivers, canals and nullahs all over the Pakistan, prioritizing the areas affected by the 2022 Flood. Furthermore, 8 No. Regional Data Centers (RDC) will be established under the subject project for regional data acquisition & storage and to carry out O&M of their respective sites. Details are tabulated below:

Current Status

The umbrella PC-I prepared by FFC in consultation with all the stakeholders & ADB was approved by ECNEC in June 2023. However, the individual approval of PC-I H&R Directorate WAPDA is under process.

Installation of 45 No. Flood Telemetric Hydro-Met Stations/Early Warning Stations & establishment of Main Data Centre/Servers through JICA Funding

Chairman Federal Flood Commission (FFC) requested the JICA for Financing of new Telemetric Stations on different sites of Upper Indus Basin to strengthen the existing Flood Telemetric Network to improve country's existing early flood warning System.

A comprehensive meeting of all stake holders (FFC, WAPDA, NDRMF, ADB) with JICA held at Ministry of Water Resources on March 17, 2022 wherein the JICA delegation was briefed about the progress regarding National Master Plan for flood telemetry.

Later, after mutual understanding, out of 110 Stations 45 Sites are finalized and JICA agreed to provide Financing for these aforesaid sites for strengthening and to improve the existing early flood warning in Pakistan. The pre-feasibility tour of the highlighted sites was conducted along with Japanese consultants in the month of June, July and September, 2022 to all the highlighted sites and 45 No. Stations were finalized.

Scope of Work

The scope of work includes installation of 45 No. Flood Telemetric Hydro-Met Stations as to have real-

Name of Area	No. of Stations	No. of Offices	Name of Divisions
Punjab	114	(2 Offices)	1. Lahore 2. Islamabad
Sindh	30	(1 Office)	Hyderabad
KPK	90	(1 Office)	Peshawar
Baluchistan	149	(2 Offices)	1. Quetta 2. Turbat
Gilgit - Baltistan	48	(1 Office)	Gilgit
AJ & Kashmir	26	(1 Office)	Muzaffarabad
Total	**457**	1 DHDC + 7 RDC Offices	

time data of hydro-meteorological parameters (Rainfall, River Level, River Flow, Temperature, Humidity etc.) & digital monitoring and management system, water data management, water analytics with decision support system. The system would comprise a unified architecture to deliver an intelligent user interface, a reporting engine & a decision support system and their key deliverables giving WAPDA a single unified water management system for this domain.

Location

17 No.	Telemetric Stations have been proposed in KPK
23 No.	Telemetric Stations have been proposed in Punjab
05 No.	Telemetric Stations have been proposed in AJK

Other Activities

- Annual Reports of 12 No. Climate Stations (Daily Data) on rainfall, humidity, temperature, evaporation etc. for the year 2023 is under preparation.
- The Directorate is also involved in flood discharge measurements which are made at key river locations & barrages of the Indus River System for timely transmitting information regarding flood peaks to PMD for timely flood management.

Achievements after Implementation of above-mentioned Projects

After implementation of the above mentioned contracts/ schemes/projects, the existing telemetric network under the H&R Directorate will further be strengthened/upgraded and will be converted to a smart organization as real time data with numeric models (Hydrological, Hydraulics and Atmosphere) to measure below listed parameters will also be available for the reservoir management authorities i-e Tarbela, Chashma, Warsak, Dasu, Diamer Basha Dam, H&R Directorate, Flood Section at WAPDA House Lahore and in FFD Division of PMD Lahore for better assessment of the flows and reservoir operation.

1. Catchment Rainfall
2. River Level/Gauge
3. River Flow/Velocity
4. Maximum/Minimum Temperature
5. Relative Humidity/Dew Point
6. Solar Radiation
7. Wind Speed and Direction
8. Evaporation
9. Turbidity

Benefits to WAPDA after Upgradation / Expansion of H&R Directorate

- Automatic Stream Gauging Network will provide up to date data on reservoir and stream flow conditions.
- More precise water resources management can be done on d/s of Tarbela, Kabul, Dasu, Diamer Basha Dam and Warsak by using Hydro-metrological data in various numerical computer models.
- Hydro-meteorological parameters will help to design various hydropower projects and their relevant structures/components in appropriate manner.
- Improve flood disaster management by real-time monitoring of flows for taking up immediate appropriate decision.
- Real time flows monitoring can be used by different national organizations for their planning purposes.

GLACIER MONITORING & RESEARCH CENTRE (GMRC)

Introduction

The Indus River and its tributaries draw major share of its flow from the cryosphere of Upper Indus Basin (UIB). Climate change presents a new challenge to the management of water resources of Pakistan for irrigation and energy production. Due to climate change and its impact on our glaciers, Glacier Monitoring and Research Centre (GMRC) established in 2012 by upgrading the already existing Pakistan Snow and Ice Hydrology Project (PSIHP) funded jointly by WAPDA and Canada's International Development Research Centre for Monitoring and Research on the Upper Indus Basin's glaciers. This center is responsible for carrying out mass-balance studies, glacier terminus movement studies, discharge measurements of field stations in the upper catchment of the Indus. A field office of GMRC has also been set-up at Skardu since June, 2015. GMRC functions under the General Manager (HRM).

GMRC is maintaining an high altitude (2,100-4,700 M.A.S.L) Automatic Weather Stations (AWS) Network comprising 20 stations in Upper Indus Basin established under Canadian grant for collection and transmission of hourly data of temperature, precipitation, relative humidity, wind, solar radiation and snow water equivalent. Furthermore, a hydrologic model "University of British Columbia Watershed Model (UBCWM)" was developed for flow forecasting system for three major western rivers, Indus, Jhelum & Kabul. This advance information with applause able accuracy on water entering into the reservoirs provide great facilitation in optimized reservoir operations with regard to hydel production at Tarbela, Mangla and Chashma.

International Collaborations
GMRC has made collaboration with different international organizations and institutions like ICIMOD, CSIRO-Australia & ITP-CAS China with the aim to identify the existing needs, gaps of knowledge, expertise and skills with modern technology in the field of glaciology. These sharing of expertise and knowledge gaps are being explored to understand feasibility of implementation of Integrated Water Resources Management (IWRM) for sustainable management of water resources across the basins.

Establishment of Pakistan Glacier Monitoring Network
World Bank provided financial assistance amounting to US$ 4.0 million for monitoring of glaciers and glacial lake studies located in the Upper Indus Basin. The project area covers all the Upper Indus Basin including area falling within Khyber-Pakhtunkhwa, Gilgit-Baltistan (GB) and Azad Jammu & Kashmir (AJK).

Major activities to be undertaken are:
- Procurement and installation of 14 No. new High-altitude Automatic Weather Stations (AWS), upgradation of 16 No. existing AWS & 8 No. new Automatic River Levels (ARL) Stations
- Procurement of Equipment
- Ablation studies of preferably but not limited to the following five glaciers in Upper Indus Basin
  - Biafo (Shigar Basin)
  - Hispar (Hunza Basin)
  - Yashkuk/KozYaz (Hunza Basin)
  - Passu (Hunza Basin)
  - Rakhiot (Astore Basin)

- Snout Survey of 42 No. Glaciers
- Construction of office buildings for Glacier Monitoring Research Centre at Lahore and Skardu
- Depth profiling of the above-mentioned glaciers for mass balance studies
- Mapping and monitoring of glacial lakes in UIB using remote sensing and field surveys
- Upgradation of Data Communication System
- Training and participation of GMRC Staff (National & International) on Remote Sensing/GIS, Safety, Handling of Equipment and etc.

Major Activities of GMRC during 2022 – 2023

Data Processing and Flow Forecasting
Data from high-altitude network was processed in the UBC Watershed Model and seasonal &10-daily flows for river Indus at Tarbela, river Jhelum at Mangla & river Kabul at Nowshera were generated by using UBCWM.

Field Activities
GMRC continued its field activities during the year 2022-23. Various field activities were done in UIB to study the glaciers and to determine the flows of glaciers outlets and stream.

Deposit Works
Field investigation and RS/GIS studies have been carried out for analyzing and characterizing landslides in Uchar Nullah catchments of Dasu Hydropower Project and identification of the probable source of debris flow and the debris pool in the catchment which can trigger future debris flows.

GMRC Team visited Uchar Nullah site to collect the baseline data and carried out the following tasks:
- GMRC conduct Ground Penetrating Radar (GPR) survey in order to determine the depths and lithology of the debris pool sites
- Conducted geological survey of the site to consider disaster threats in any kind of spatial planning processes
- Installation of Portable Automatic Weather Station (AWS) in the catchment to obtain the meteorological parameters which will further utilized for hydrological modeling
- Discharge measurements were carried out and permanent gauge was also installed at the Nullah to read the water level
- Snow depth measurements at higher elevations which will be utilized for hydrological analysis
- Social Survey at the site to gather data to monitor and explain trends and changes

GMRC Skardu Team visit to Dook Pal Glacier & Lake Site
In-situ observations and field activities have been carried out during 2023 at Dookpal Glacier & Glacial Lake of Golen Gol Hydropower Project.
- The glacial lake from which GLOFs of 2019 & 2020 were occurred, does not exit at this time but empty basin was found during the field visit
- GMRC Team also identifies some other small supra glacial ponds/lakes which are not considered dangerous at this stage but may be a threat in future as the rapid melting ice and snow during Summer Season
- GMRC Team installed three stakes on the glacier which helps to understand how much ice melted and snow accumulated within one season to observe the melt behavior of the glacier
- The snout of Dookpal glacier is hanging and whole snout is not accessible but GMRC Team collected some GPS points nearby the snout, subsequently these points were plotted and extrapolated to draw a snout map by using Arc GIS.

Based upon the in-situ observations and field activities a comprehensive report has been prepared and submitted to project authorities.

Reports Prepared
Following reports were prepared by GMRC during 2022-23:

- GMRC submitted the annual meteorological data report for the year 2022 after collection, archiving, analysing and quality assessment
- Report on Field Investigations Study at Uchar Nullah Dasu Hydropower Project
- Report on RS/GIS based analysis/landslide inventory & susceptibility mapping of Uchar Nullah
- Report on Field & RS/GIS based Investigation of Dookpal Glacial Lake

Other activities

MOU with LUMS
Memorandum of Understanding (MOU) was signed with Lahore University of Management Sciences (LUMS) for mutual cooperation actions in the following areas:

- Knowledge-sharing joint research in the domain of cryosphere studies, climate change studies, hydrological modelling
- Conduct joint studies using GIS/RS and other tools in the domain of cryosphere/glaciers/snow cover, GLOFs in the Upper Indus Basin, or other mutually agreed areas of interest
- Collaborate to develop proposals for local and international grants, future projects and initiatives
- LUMS will facilitate WAPDA in its technical resources, training and capacity building
- Initiate a pilot project to deploy and test LUMS's indigenously-developed equipment at mutually agreed feasible sites (Above and Below 5,000 ft. Altitude)

Proposal for future study
GMRC submitted detailed technical and financial proposals to following formations of WAPDA in order to carry out detailed monitoring/study of different glaciers in the Upper Indus Basin (UIB):

- Harpo Hydropower Project
- Attabad Lake Hydropower Project

DAMS SAFETY ORGANIZATION (DSO)

WAPDA Authority has established a comprehensive mechanism to ensure the safety of its dams including Mangla, Tarbela, Warsak, Khanpur & Hub in addition to Chashma Barrage, Gomal Zam HPP, Golen Gol HPP and Ghazi Barotha HPP. Surveillance staff at each project is responsible for observing, collecting, and monitoring of performance data while, DSO is responsible for reviewing, analyzing and interpretation of the data to detect any abnormality. DSO also performs comprehensive annual inspection of the projects and prepares reports containing comments and recommendations related to the project. Similar services are being extended to Simly Dam (Islamabad), a project of Capital Development Authority (CDA) and Darawat Dam (Hyderabad) on deposit work basis. In addition, the periodic inspections of the projects are normally conducted every five years by hiring consultants (3rd Party) according to ICOLD guidelines.

Moreover, Baseline Inspections are carried out soon after completion of the projects by project consultants and contractors. DSO also facilitates consultants and associates during the inspection and reviews their inspection reports. On special requests by federal and provincial governments, DSO provides expertise for the technical problems of federal projects and small dams of the provincial governments.

Baseline inspections of Ghazi Barotha Hydropower Project, Mirani Dam, Mangla Dam Raising Project, Darawat Dam and Sabakzai Dam were also performed by DSO on request of project authorities.

The following inspections were carried out by DSO during the year 2022-23:

TARBELA DAM PROJECT
Twenty-eighth (28th) annual inspection of the Tarbela Dam Project was conducted in September-2022. Upon recommendations of DSO, the process for conducting seventh (7th) Periodic Inspection of the project has been initiated by the concerned project authorities. During the inspection, the project staff was requested to prepare and update a Dam Safety Register so that milestones and major events of the project history can be recorded in a comprehensive way.

Maximum Reservoir Level i.e., 1,550-ft. was observed for forty two (42) days from August 12, 2022 to September 30, 2022.

Hydrographic survey was conducted at high reservoir level in Sep-Oct 2022 and submitted to DSO on April 04, 2023. According to the hydrographic survey, gross storage capacity of the reservoir has been reduced by 44.12% i.e. from 11.62 MAF (1974) to 6.493 MAF (2022), whereas, live storage capacity has been reduced by 39.98% i.e. from 9.679 MAF to 5.809 MAF. The current location of sediment delta pivot point was reported at 3.78 miles upstream from Main Embankment Dam which was initially at 14.30 miles in 1979. The advancement rate of delta pivot is 0.23 miles per

year. The pivot elevation was reported at 1,400 ft. according to the survey which has necessitated to revise Minimum Operating Level (MOL) of reservoir from 1,398 ft. to 1,402 ft.

During the period (July-2022 to June-2023) total inflows & outflows were recorded as 58 MAF & 54.53 MAF respectively. During the above period, maximum & minimum inflows were observed as 353,800 cusecs on August 24, 2023 and 14,300 cusecs on March 02, 2023 respectively.

Data including hydrology, seepage and instruments were analyzed, interpret and recorded by this office. The instrumentation, movement and sedimentation data were analyzed in detail. Based on the data received, project performance remained satisfactory. However, issues are being faced in some piezometers which are likely due to construction activities of T5 HPP. It has been instructed by DSO to keep monitoring the readings of critical piezometers likely to be disturbed due to construction activities.

KHANPUR DAM PROJECT

Twenty-Ninth (29th) DSO annual inspection of Khanpur Dam was conducted during February-2023. Wearing course of all the embankments was found in deteriorated condition. Provision of a fresh layer of wearing course was recommended by DSO. Movement survey of all embankments and concrete structures were also recommended.

Fourth (4th) Periodic Inspections have been conducted since the completion of the project. Case to conduct fifth (5th) Periodic Inspection has been initiated by the project authority under recommendations of DSO.ToRs were vetted by DSO and forwarded to the project authorities for further action.

During reported period, maximum reservoir level was observed as 1,981.97 ft. on September 03, 2022, while minimum reservoir level of 1,927.14 ft. was observed on July 06, 2022. Data including hydrology, seepage, movement, sedimentation and instruments was analyzed by this office which revealed that project performance remained satisfactory.

As per hydrographic survey-2019, the gross, live and dead storages of Khanpur Dam reservoir have been reduced from 107,080 AF to 85,586.36 AF (Reduction 20.07%), 91,280 AF to 84,458.36 AF (Reduction 7.47%) and 15,800 AF to 1,128 AF (Reduction 92.88%) respectively. From July 2022 to June 2023, total inflows & outflows were recorded as 0.17 MAF & 0.12 MAF respectively. Maximum and Minimum Inflows during this period were recorded as 2,282.41 cusecs on August 22, 2022 and 12.86 cusecs on January 18, 2023 respectively. From the safety point of view, all the structures remained safe. Routine safety monitoring of the project remained continued. Generally, performance of the project remained satisfactory.

MANGLA DAM PROJECT

In year 2022-23, Mangla Dam reservoir level reached a maximum EI. 1,193.05 ft. on September 16, 2022 which was 10.15 ft. less than the previous year. Due to the non-filling of reservoir up to maximum level, national economic benefits could not be attained in 2022-23.

According to 2017- Hydrographic Survey conducted by ISRIP, Gross, Live, and Dead Storage capacities of Mangla reservoir were 7.387 MAF, 7.356 MAF and 0.031 MAF respectively. These capacities have reduced by 15.86%, 9.53% and 95.22% respectively.

SIMLY DAM PROJECT

Simly Dam Project is playing vital role in supplying water to Islamabad and Rawalpindi cities. 31st Annual Inspection of Simly Dam was carried out by DSO from March 14, 2023 to March 17, 2023. During the reported period maximum reservoir level was noted as 2,315.40 ft. on September 17, 2022. The overall performance of main embankment Dam and other allied structures indicted satisfactory behavior at high reservoir level conditions.

The original Gross, Live and Dead Storage capacities of Simly reservoir were 37,848 AF, 29,098 AF and 8,750 AF respectively. According to latest (2020) hydrographic survey, these capacities have been reduced by 32%, 17.60% and 79.76% respectively. Sediment deposition rate is 271 Acre–ft per year in the Simly reservoir which is about 0.72% loss in Gross Storage. It has been recommended to conduct a fresh hydrographic survey of the project.

The last (4th) Periodic Inspection of Simly Dam was carried out in June 2012 and 5th Periodic Inspection is overdue since a period of almost ten years. It is recommended that the necessary formalities regarding conducting of 5th Period Inspection of Simly Dam be initiated on priority.

Two Strong Motion Accelerograph (SMA) installed at Simly Dam Project are out of order since 2017. Due to which, the project is missing the earthquake ground motion data. In addition to existing two SMA, two more SMA's were also recommended by DSO during previous three inspections but no action has been taken so far. It is recommended again to expedite the process of procurement.

It is emphasized that the tendering process regarding PMF study and flood routing through main spillway and auxiliary spillway to ascertain Simly Dam outflow capacities should be expedited. The study is recommended to be completed before the forthcoming Periodic Inspection of Simly Dam.

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. During the year 2022-23, maximum level of Hub Dam reservoir was observed at El. 342.10 ft. on July 26, 2022 and minimum reservoir level was observed at El. 322.30 ft. on July 04, 2022. In addition to the special inspection conducted during high flood in July-2022, the 29th Annual Inspection of the project was conducted during May-2023.

During year-2022, unprecedented rainfall occurred over the catchment of Hub Dam, which caused the ungated spillway to overflow on July 17, 2022 at 12:00 Hrs. The duration of spillway overflow lasted for 72 Days. Last spillway overflow was observed on September 29, 2022 at 02:00 Hrs. Total volume of spillover has been calculated as 1,018,892 cusecs or 2.02 MAF during year-2022. Peak inflow of 204,814 cusecs entered into the reservoir on July 27, 2022 which caused the reservoir level to rise up to El. 343.05 ft. while maximum discharge through spillway was calculated as 169,619 cusecs on the same date and time.

DSO had recommended earlier that Surface Water Hydrology Project (SWHP) of WAPDA should be contacted to rehabilitate and make operational both upstream and downstream stream gauging stations of Karpasaniwat (1979 to 1985 & 1992 to 2000, afterwards only Gauge Reading is being observed by SWHP) and Bund Murad Khan (1960 to 1978, then abandoned) respectively, but no action has been taken so far, therefore, it is recommended again for taking necessary action so that the project office would be able to get reliable information about the flood inflows & outflows.

Hydrographic Survey of complete reservoir was conducted during year 2009-10. According to 2009-10 Hydrographic Survey Gross, Live and Dead Storage capacities were 0.687 MAF, 0.646 MAF and 0.041 MAF respectively and these capacities have reduced by 19.9%, 15% and 57.7% respectively. DSO has recommended, to conduct a fresh hydrographic survey in its annual inspection report.

CHASHMA BARRAGE

The 35th annual inspection of Chashma Barrage was conducted in January 2023. Complete drawdown of the barrage was undertaken in year 1996/97 for inspection and repair purposes. It is imperative and need of the time to explore possibility of complete drawdown for inspection of upstream conditions of the structures and to carryout repair works on downstream as well. But due to addition of stakeholders such as WAPDA hydel power station and continuous supply to CHASNUPP through CJ Link complete drawdown of reservoir does not seem feasible.

Total inflows calculated during the calendar year 2022 were observed as 74.47 MAF. i.e. 20.53 MAF lesser than the designed average annual inflows of about 95 MAF at Chashma Barrage. Gravity Survey for subsurface shallow imaging of downstream side of the Barrage should be done to ascertain cavities and movement of any fines below the concrete survey. Services may be requested to Bureau of Geophysical Prospecting, China (BGP) or Geological Survey of Pakistan (GSP). Geophysical imaging surveys are often performed in combinations to affirm the subsurface target. High Resolution Electromagnetic Survey may be conducted in combination with Gravity Survey that may be most affected in this particular downstream shallow imaging case of Barrage.

During routing of flood-2022, concentration of river flows hit left branch spur nose on August 01, 2022 at 04:00 Hrs. Formation of two (02) vortices were reported by the site staff at nose portion. Turbulent river flow continued till August 20, 2022. After that, Hydrographic Survey of the eroded portion was conducted by the project office.

DSO also conducted sounding to check the extent of erosion. Physical observation and plots of Hydrographic Survey revealed that a large dense bela exists in front of its nose which is causing river flows to hit the nose of left branch spur. CJ link & CRBC Canals conditions are badly suffering due to non-availability of O&M Staff and budget provision for proper maintenance which must be resolved on priority basis for better upkeep of canal prisms that has deteriorated overtime.

GHAZI BAROTHA HYDROPOWER PROJECT

Seventh (7th) annual inspection of Ghazi Barotha hydropower project was conducted in October 2022. Physical inspection of the project revealed that, overall general condition of the Barrage, Power Channel, Powerhouse and allied structures was found satisfactory. However, some minor and major deficiencies observed by the Dams Safety inspectors.

Principal findings of Seventh annual inspection state that whole project needs general upkeep like, cutting of wild growth & shrubs, clearing of side drains, clearing of catch pits, inlet pipes, repainting of RD markers on cross drainage structures, clearing of cattle grids, repair of damaged pump sump block-outs on service road and maintenance of cut & fill slopes. It is recommended that adequate manpower and machinery man & financial resources be provided to the project authority for project unhindered O&M.

GOMAL ZAM PROJECT

Gomal Zam Dam Project is a multipurpose dam project situated in Tank and D. I. Khan Districts of KPK. It was implemented as a part of WAPDA Vision 2025 Programme to irrigate 66,000 Hectares of land and generate 17.4 MW electricity in addition to 1.14 MAF storage capacity. The dam was constructed on Gomal River at Khanjuri Kach area in South Waziristan Agency. It is a133 m high curved Roller Compacted Concrete (RCC) Gravity Dam.

A team of DSO conducted 3rd annual inspection of the project in May 2023. During the inspection, it was noted that shortage of O&M Staff was hampering the health of the project. It was strongly recommended to depute appropriate number of staff to ensure smooth O&M of the project in accordance with O&M manuals.

No flood warning and gauging station has been installed upstream of reservoir which makes it difficult to assess the quantum of water likely to enter during flood. Such facility should be provided to collect timely information of flood.

It was also noted that one (out of two) Unit of 8.70 MW was out of order since 2016 which the benefits of the project considered before execution of the project remained at odds. The unit be rehabilitated on emergent basis to regain the project benefits. The overall drainage system was found choked in all inspection galleries (03 Nos.) causing swelling of concrete and development of cracks. Cracks on the deck slab were previously repaired 08 years ago. These cracks were seen deteriorating which need surficial repair.

Access road from Bailey Bridge to Power House is vulnerable to land sliding and mud flows. The accessibility to Power House becomes compromised during rainy season. To facilitate movement of O&M Staff from Power House to Dam Site, an alternate access road should be provided.

Two (02) Strong Motion Accelerograph (SMA) have been installed on Main Dam at different elevations, the SMA were checked and found functional/ operational, and the SMA couldn't connect to laptop / computer system due to software security password. It is recommended that GZDP authorities should approach Chinese contractors / suppliers / manufacturers of these SMA's for the removal of security password or approach to any software experts for this purpose.

SPECIAL INSPECTIONS

HUB DAM PROJECT

A special inspection of Hub Dam Project was conducted in July 2022 during high flood. A DSO Team of two members was deputed at the project for flood routing. The flood was successfully routed.

After successful flood routing, it was noticed that majority of the piezometers showed less pressures in comparison to the years as well as seepage values were also found in decreasing trend, which concludes satisfactory performance.

WARSAK HYDROPOWER PROJECT

An excessive leakage was observed in northern staircase from already existing cracks and a team of DSO visited the site on request of Chief Engineer / PD (Warsak HP) in July 2022. Leakage was observed on downstream wall of left gallery shaft staircase of Main Dam at El. 1,225 ft. level from the cracks which were developed due to Alkali Aggregate Reaction (AAR). Source of the leakage was hidden; however, it was apprehended that source may be due to damaged water stopper in expansion joints or u shape transverse cracks over left non overflow section. The team after inspection furnished its findings and recommendations.

DUBER KHWAR HYDROPOWER PROJECT

Duber Khwar HP faced a devastating flood in August 2022 which necessitated to conduct a special inspection to ascertain post flood scenario. On the request of Chief Engineer (P) 3 HHP, a team of DSO conducted a special inspection of the project in December 2022 to assess the damages caused by flood. An inspection report was issued thereafter.

A flood peak of 1,700 m^3/s entered the project reservoir on August 25, 2022 against design flood of 2,000 m^3/s (Q100) which damaged both wing walls of stilling basin, stone apron d/s of stilling basin, PCC access road to sand trap tunnel, flushing tunnel of sand trap and other installations like electric poles, security camp, watch tower etc. During the inspection, it was noted that there existed 04 Nos. auto reservoir level gauge sensors to read the reservoir level at weir. However, no physical gauge was installed at the weir for observing reservoir level manually.

Earlier, instant provision of communication data accusation and remote handling of gates at weir site was provided using Optic Fiber System connected to SCADA System which has been damaged since long. After the said damages, no communication system was observed, established currently to transmit information to Power House and the site staff used their mobile phones to convey such information. DSO team has recommended to reinstate the SCADA System so that effective network to convey correct information timely from weir site to Power House can be restored.

Stone apron d/s of stilling basin was observed, washed out completely and a cavity of 12 m deep below design bed level was developed. It was recommended by the DSO team to refill the cavity to ensure smooth river flow. Further, guide line to operate Bottom Outlet Gates was also provided to the site staff. River bed up to 12 km stretch was also found eroded due to the flood which was also instructed to restore. Surveillance of civil structure using installed instruments has not been practiced during O&M phase of the project which is not an appropriate practice for the safety of the structures. The project staff was neither found well acquainted with the provided monitoring instruments not having had the data logger device to obtain reading of various instruments.

MANGLA DAM PROJECT

Approximately 1,000 ft. away from main gate of Mirpur City, cracks of 500 ft. to 800 ft. length were observed, developed due to settlement on both sides of dual carriage way Mirpur-Kotli Road during routine inspection of the Dam in September 2022. The cracks were approximately 6 inches to 3 ft. deep and 0.5 inches to 3 inches wide.

A team of DSO physically inspected the site during September 2022 and furnished their report. It was conveyed that there was a blockage of storm water drain constructed by Mirpur Development Authority (MDA) to facilitate their allottees adjacent to dual carriageway. Apparently, water was seeping towards the collapsed portion of the road due to blockage of drain which may be the probable cause of settlement.

RAWAL DAM

Rawal Dam is a partly arched stone masonry dam across the Kurang River located near village Rawal in Islamabad, about 14 km from Rawalpindi city. The project was commenced in July, 1959 and was completed in February 1962. It is a 113.5 ft. high and 700 ft. long Dam. The purpose of the dam is to supply water for Irrigation and Domestic purposes to Rawalpindi city. On the direction of Chairman WAPDA, a team of DSO conducted a special inspection of the project in November 2022.

Before the said inspection, only two (02) inspections had been conducted by WAPDA during years 1979 and 1995. Current inspection was third (03) one conducted by DSO team. During the inspection all the major components of the dam had been inspected and due recommendation provided in this post inspection report.

Different parts of the project components were found covered with excessive wild growth, trees, weeds & shrubs mainly saddle embankment, the walls of right and left canals and weed growth was rampant on u/s and d/s on the dam. Wild growth and shrubs attract the burrow animals, snakes etc. which can jeopardize dam safety. Regular upkeep of the whole project is required to avoid attraction to the burrowing animals, for making ease in inspection of dam and allied structures and to impart an aesthetic view of the area.

A chunk of concrete has been chipped off at top upstream nose of Pier No. 1, under girder of hoisting bridge shows a sign of serious concern to the structure. It should be repaired to avoid further damage to the structure. The underwater inspection of upstream face of the dam is recommended by means of divers or scanning through video / drones.

Cracks and bulging were also observed on the stone masonry wall of the right-side canal, which had a height of 12 feet approximately moving towards the downstream side below the bed level of the canal. It was recommended to fill these cracks with suitable material. In addition to a forestation, the possibility of construction of more check dams upstream of the Dam may be explored to minimize the deposit of sediments in the reservoir. An appreciation in watershed management measures in the catchment will help to decrease the sediment inflow.

Flip bucket has never been inspected in dry condition since its completion. Being an important part of energy dissipation system, it needs to be inspected at the earliest opportunity to check its physical condition.

Hydrographic Survey was never carried out at maximum conservation level of 1,752 ft. Ground Survey is essential so that sediment deposits at all elevations is estimated. This will also help in verifying the results of Hydrographic Survey.

DARAWAT DAM

Darawat Dam Project is located in Sindh Province, South East of Pakistan. Dam site is about 70 km

West of Hyderabad and 135 km North East of Karachi. Dam and reservoir area fall in Jamshoro District and Command Area of the project lies in Thatta District.

Special Inspection of Darawat Dam Project was conducted in January 2023 by a team of Dam Safety Organization (DSO) WAPDA on request of Chief Engineer Small Dams Region Sindh, Hyderabad.

Previously, the inspection of Darawat Dam has also been conducted by DSO in 2017, 2019 & 2020 to report any structural distress in Dam or appurtenant structures. Current inspection was the 4th inspection in this context with special emphasis of cracks.

There is no sedimentation information and hydrological station within Baran Nai Basin, thus no real correlation of water level and discharge is available. Mainly rainfall occurs during Monsoon Season and the area remains dry during rest of the year. There is a need to conduct a Hydrological Survey to ascertain the sedimentation of the reservoir after the recent filling.

Surface cracks were observed on bay No. 02, 03 and 04 of the spillways. These cracks appeared after the reservoir surpassed its normal storage level during flood 2022. The cracks were observed in detail and the initiation point of crack was seen to be the joints where rubber sealant was not available/worn out. It was recommended to replace the sealants along with application of epoxy bitumen or any other suitable material on priority basis.

A leakage was noticed under the flip bucket (Soffit Area) which was recommended to repair with epoxy and the area should also be kept under observation. In case the area is still observed to be leaked, the source of this leakage may be ascertained. A joint/gap in M17 Crown was observed which should be monitored by installing the monitoring pins/tell-tales to ascertain that the gap is not further widening with the passage of time. The floor of left abutment toe weight was seen settled downstream approximately 2 inches. Full Vertical and Horizontal Survey of Dam may be carried out to check the total settlement. Instrumentation network has performed well and satisfactory in monitoring the safety parameters.

T-5 HYDROPOWER PROJECT

Two special inspections of T-5 HP were conducted during the reported period in March and April 2023 respectively. Service and Bulkhead gates of Tunnel-5 have been facing sticking problem since long due to which the gates have not been fully closed. Special Inspection in March 2023 was conducted jointly with Project Staff and T-5 HP consultants to witness / analyze the sticking issues of the gates. A post inspection report was issued thereafter. DSO team recommended not to follow the instructions made by the consultants to change the gates along with associated concrete works (Partially or Fully). A joint inspection with the Consultants and Project staff was again conducted in July 2023, a separate report of which was also issued by DSO.

SPECIAL INSPECTION OF INSTRUMENTATION NETWORK OF TARBELA DAM PROJECT

On the direction of Chairman WAPDA, a team of DSO was deputed to conduct detailed inspection of instrumentation network and instrument houses of Tarbela Dam Project, inspect functional / working instruments and check rehabilitation of non-functional / abundant instruments, identify the shortcomings and suggest remedial measures for improvement of the existing system. The inspection was conducted in June 2023.

All available data including Project Completion Report, Instruments O&M Manuals, Inspection Reports (Performance, Annual & Periodic), Instrument's status, Drawings and other relevant reports were scrutinized during the inspection. After that, a joint inspection of all instruments & instrument houses was conducted by the officers, officials, technicians from Tarbela Dam Monitoring Organization (TDMO) & Dam Safety Organizations (DSO).

After conducting a thorough inspection of TDP instrumentation network installed, category wise summary of working instruments, is tabulated below;

Status of Instruments Installed at Tarbela Dam Project (May-2023)

Category	Description	No. of Offices	O & M Manual (1984)	Working (2023)	Working w.r.t Installed	Working w.r.t O&M Manual
A.	Pore Pressure Measuring Devices	1,001	761	65	46%	61%
B.	Deformation Measuring Devices	2,138	1,238	806	38%	65%
C.	Flow Measuring Devices	39	39	39	100%	100%
D.	Micro-Seismic Network Instruments	51	51	48	94%	94%
Total		**3,229**	**2,089**	**1,358**	**42%**	**65%**

From the above, it is revealed that 65% of the handed over instruments are still functional. According to expert view of the 6th Periodic Inspection, the instrumentation system at Tarbela has served well to monitor performance of the project features over more than 43 years since initial impoundment.

However, the system has gradually shown its age (40 to 48 Years from Installation) and many of the original instruments are no longer functional. Still, a sufficient number of key instruments are working and continue to deliver useful data. The Inspection team reviewed information on original and supplemental instrument installation; current status of instruments; instrument data collection and processing since impoundment of the reservoir, and recommends repair / replacement of key monitoring equipment for continued satisfactory monitoring of the dam behavior. However, the Inspection team does not recommend drilling through the embankment dams for this purpose. DSO agrees with the aforementioned recommendations.

Further, 3rd Party Expert Review on TDP instrumentation network, its reliability, adequacy of functional instruments, recommendation for installation of new instruments and need of automation of existing network has been included in ToR's of upcoming 7th Periodic Inspection of Tarbela Dam.

INDUS TELEMETRY ORGANIZATION

Ministry of Water Resources (MoWR) planned to install new real time water monitoring Telemetry System at 07-key sites {Barrages out of 24 which stand calibrated under Water Sector Capacity Building & Advisory Services Project (WCAP Project)} as a Pilot Project under Phase-I to resolve the sensitive water distribution issues and develop a transparent water accounting mechanism as per Water Apportionment Accord 1991. This critical task was assigned to WAPDA by MoWR. The PC-I prepared by WAPDA in consultation with all the stakeholders was approved by CDWP on June 04, 2022 at the Financial Cost Rs. 2,399.572 million (USD 7.9 M eq. Rs.1,577 M as Foreign Exchange Component & Rs. 822.4 M as Local Component), however, formal approval or minutes were issued on July 04, 2022.

Consultants for the project have been hired on June 20, 2023 and consultants presented Telemetry Design Concepts on November 15, 2023, gaining agreement from stakeholders for extension to 25 sites by IRSA. Accordingly, WAPDA has framed revised PC-I for 25 sites for approval from competent forum ECNEC. Furthermore, during CDWP's meeting on February 01, 2024, 27 sites have been finalized by the addition of 02 more sites. Furthermore, it was agreed that calibration for the remaining 18 sites will proceed in parallel for swift implementation. This will ensure comprehensive water accounting and audit across all sites. ECNEC, in its meeting dated February 07, 2024, has approved the revised PC-I having following features:

Location	27-Key Monitoring Sites
Sponsoring Agency	Ministry of Water Resources
Executing Agency	WAPDA
Ownership of Project	IRSA
Stakeholders	PIDs
Submission to MoWR	December 29, 2023

Inspections carried out by Dams Safety Organization up to June 2023 are as follows (Except Special Inspection)

Name of Project	Annual Inspections	Periodic / Baseline Inspections
Regular Projects		
Tarbela Dam	28	6
Khanpur Dam	29	4
Mangla Dam	33	7/1
Simly Dam	31	4
Hub Dam	29	4
Chashma Barrage	35	6
Warsak Dam	30	4
Ghazi Barotha	7	1/1
Golen Gol HP	5	---
Mirani Dam (Provincial Dam)	4	0/1
Sabakzai Dam (Provincial Dam)	1	0/1
Gomal Zam Dam	3	0
Satpara Dam	5	---
Total Inspections	**240**	**36/4**

Submission to Planning Commission by Ministry of Water Resources January 05, 2024

Approval by ECNEC	February 07, 2024 (Admin Approval awaited)
Completion Date as per Revised PC-I	June 30, 2028
Likely Completion Date	December 31, 2027
Total PC-I Cost	Rs. 23,834.71 Million
FEC	USD 32.38 M (Rs. 9,059.08 M)
L.C.	Rs. 14,775.63 M

Objectives of the Project

The prime objective of the TPIBIS is to establish accurate, transparent water accounting, auditing and distribution flow monitoring system for efficient management of the Indus Basin Irrigation System (IBIS). The project will improve the water governance and build confidence among the provinces in the water accounting and distribution.

The overall objective of the project is to set up a system, which will help in planning, irrigation, water management on scientific grounds. Since the water flow/ availability and gate positions will be monitored at all locations on real time basis, the element of mistrust will be eliminated and thus create harmony among the provinces.

More specifically, the project aims at achieving the following objectives:

- The availability of online and accurate information of water availability & flow information at Barrages/Dams & allied off-taking Canals and at crossing points of inter-provincial Canals which is transmitted to all concerned authorities in parallel.
- The information being received and processed has the confidence of all stakeholders.
- To maintain databases at each location, this could subsequently be used for analyses, planning and in addition, to produce suitable data for auditing purpose.
- To use database of real-time flows to analyze losses/gains pattern in different river reaches and to conduct research activities on erratic behavior of Hydrology and Climatology.

Scope of the Project

The scope of project is summarized as under:

- At any hydraulic structure, the system will disseminate in real time only directly sensed Basic Parameters (Upstream/Downstream Water Level and Gate Openings acquired through Radar Level Sensor and Optical Absolute Encoders respectively)
- Discharge will be calculated subsequently at Main Headquarter using discharge equations with calibrated hydraulic coefficients corresponding to the geometry of the structure as a function of hydraulic flow conditions, and duly using the water level and gate opening sensed and transmitted by the Telemetry System.
- Hydraulic coefficients will be calibrated based on direct flow measurement by qualified and independent experts and undertaken in the presence of nominated representatives of Provincial Irrigation Departments; these representatives will sign off on the calibration process witnessed.
- Data Collection, Processing & Transmission
- Establishment of Data Centre as well as client workstations for the key stake-holders.

Updated Progress

- Commencement of the Project August 01, 2022
- Consultancy Agreement signed on June 20, 2023
- International Panel of Experts (IPOE) hired on August 18 & 20, 2023
- Detailed Technical Session with stakeholders held on November 01, 2023
- Submission of Final Inception Report on December 05, 2023
- Submission of Final Options Report on December 05, 2023
- Flow Measurement Mission – 1 concluded on December 05, 2023
- Flow Measurement Mission – 2 concluded on February 03, 2024
- Bidding Process (27 Sites) started on February 23, 2024
- Bid Submission and Opening held on April 15, 2024

Location of 27 Monitoring Sites (Including 7 Key Pilot Locations of IBIS Project)

Sr. No.	Name of Water Distribution Nodes	Latitude	Longitude
	7 Key Monitoring Sites (as per Original PC-I)		
1.	Marala Barrage	32° 40' 11.21"	74° 27' 59.91"
2.	Chashma Barrage	32° 26' 8.63"	71° 23' 2.82"
3.	Chashma Right Bank Canal (Ramak)	31°19' 26.00"	70°36' 2.00"
4.	Taunsa Barrage	30° 30' 49.25"	70° 51' 17.53"
5.	Guddu Barrage	28° 24' 53.54"	69° 43' 0.96"
6.	Garang (Kirther Canal)	28° 12' 10.93"	68° 13' 15.19"
7.	Pat Feeder Canal (RD 109)	28° 25' 40.85"	69° 16' 12.93"
	20 Key Discharge Monitoring Sites (Included in the Revised PC-I)		
1.	Tarbela Dam/ Ghazi Barrage	34° 4' 58.15"	72° 42' 40.38"
2.	Kabul @ Nowshera	34° 0' 23.48"	71° 58' 39.54"
3.	Jinnah Barrage	32° 54' 59.68"	71° 31' 33.02"
4.	Sukkur Barrage	27° 40' 30.75"	68° 50' 48.99"
5.	Kotri Barrage	25° 26' 30.04"	68° 19' 8.70"
6.	Mangla Dam	33° 7' 46.66"	73° 38' 43.17"
7.	Rasul Barrage	32° 40' 46.65"	73° 31' 16.86"
8.	Khanki Headworks	32° 24' 11.74"	73° 58' 3.02"
9.	Qadirabad Barrage	32° 19' 4.72"	73° 41' 13.14"
10.	Trimmu Headworks	31° 8' 44.18"	72° 8' 32.58"
11.	Punjnad Headworks	29° 20' 37.93"	71° 1' 24.32"
12.	Balloki Headworks	31°13' 20.72"	73° 51' 32.53"
13.	Sidhnai Barrage	30° 34' 19.58"	72° 9' 27.45"
14.	Suleimanki Headworks	30° 22' 35.77"	73° 52' 7.19"
15.	Islam Headworks	29° 49' 29.51"	72° 32' 57.21"
16.	Uch Canal	28° 25' 28.51"	68° 52' 22.13"
17.	Manuthy Canal	28° 25' 33.73"	68° 44' 51.02"
18.	Kachhi Canal at RD 1005	28° 31' 20.25"	69° 20' 6.6"
19.	Indus River at Chachran Bridge (b/w Taunsa & Guddu)	28° 53' 49.64"	70° 26' 41.19"
20.	Greater Thal Canal Head-Regulator	32° 05' 51.7"	71° 48' 07"

CENTRAL DESIGN OFFICE (WATER)

Background

The Water and Power Development Authority (WAPDA) was established by the Government of Pakistan in 1958 to undertake the coordinated development of water and power resources of Pakistan. Being a new and developing organization, the WAPDA did not possess, then, its own expertise to carry out various responsibilities entrusted to it. The WAPDA initially engaged foreign consultants for planning and detailed designs of development projects, but later on realized the need to develop its own engineering services in order to minimize its dependence on foreign consultants and for development of indigenous technical skills. In this process of self-reliance, Central Design Office (Water) was established in August, 1961.

CDO(W) started its long journey with a small organizational setup and grew up into a full-fledged Civil Engineering Design Office with passage of time. The office with multilayered expertise in different disciplines of Civil Engineering and Architecture is currently headed by a General Manager. The targeted objectives of the CDO (W) are as under:

Objectives

- To provide one window design services for projects such as dams, power houses, irrigation and drainage networks, flood protection, roads and buildings.
- To provide technical support to the field formations of WAPDA, GENCO, NTDC, DISCOs etc. during the implementation/construction of the new projects and remedial measures/ trouble shooting for already completed projects.
- To review detail designs, tender/construction drawings, technical specifications implied/ used by consultants appointed for WAPDA projects as per clause 14.3(B)(V) of WAPDA Procurement and Contracts Manual, 2022.
- To review PC-I, PC-II and PC-IV of WAPDA water resources and hydropower projects in accordance with Planning Commission guidelines as Chief Engineer CDO(W) being member of WAPDA Standing Review Committee (SRC).
- To impart training to water wing drafting staff required for the departmental promotion.
- To assist WAPDA Authority through different technical committees such as Evaluation committee, Inquiry Committee, etc.
- To review Terms of Reference & Man Months for hiring of consultants, and Technical Proposals of Bidders & consultants as per guidelines of WAPDA Procurement and Contracts Manual 2022.
- To establish drafting standards.

Technical Expertise

CDO(W) offers a full range of services in various fields of Civil Engineering, which are as under:

a) Dam Engineering
b) Geo-technical Engineering
c) Irrigation Systems
d) Barrages
e) Bridges
f) Multi-Storied Buildings
g) Power Houses Civil Infrastructure
h) Architectural Design and Planning
i) Water Supply and Sewerage
j) Sub-soil Investigation and Foundation Design

Organization Set Up

CDO(W) headed by the General Manager and is supported by a Chief Engineer, 2 Nos. Directors, 02 Nos. Executive Engineers, 01 No. Advisor (Arch.), 04 Nos. Assistant Executive Engineers and 47 Nos. Technical and Non-technical supporting staff as per working strength 2022-23.

Assignments Accomplished During 2022-23

Brief description of major jobs undertaken and completed is as under:

A) Major Design Assignments

A total of 630 drawings were issued against the works described below of different WAPDA & PEPCO Formations during the year 2022-23:

Allai Khwar Hydro Power Project

Structural Drawings for Mosque

Chashma Barrage / CRBC Project

i. Drawings for short term remedial measures of super passages is issued regarding early rectification of flood damages inflicted to CRBC Main Canal
ii. Drawings of Flood Protection Bund, Guide Bank and Spur prepared by Project Office regarding Training Works

CMTL, Lahore

Drawing for extension of Boundary Wall at CMTL Premises

Duber Khwar Hydropower Project

i. Drawings of D/S Riprap Structure and Protection of Flushing Tunnel regarding Flood Damages at Site due to Floods of August 2022
ii. Layout Plan for Conducting the Plate Load Test has been provided to project office to finalize the design of Wing Wall and retaining Wall

Ghazi Barotha HPP
Structural drawings of Store Building for Power Complex

Gomal Zam Dam Project
i. Proposed Design of Vehicle Porches at CRBC WAPDA Colony, D.I. Khan
ii. Proposed Design Plans of works related to existing WAPDA Hostel & Boundary Wall of existing Bungalows at Dam Site
iii. Structural Drawings of existing Bungalows Boundary cum Fence Wall

GEPCO, Gujranwala
i. Provision of Drawings (Layout Plan, Office Building, Stores Building, Toilets, Security Guard Room, Watch Tower & Compound Wall) for new Transformer Workshop at DC Colony, Gujranwala
ii. Architectural and Structural Drawings regarding Remedial Measure of 18 No.s Category-VI Flats Situated at WAPDA Colony, Old Power House, Gujranwala

HESCO, Hyderabad
Architectural Drawing of main gate of Grid Station at Mirpur Khas. Further, drawings for addition of Oven Room and Stair Case in existing Transformers Reclamation Shed at Phulleli

Jinnah HPS, District Mianwali
i. Foundation and Structural Drawings of Workshop, Service Station and Parking Shed for Light Vehicles and Motor Cycle
ii. Foundation, Structural and Public Health Drawings for Construction of Staff Hostel (60 Persons)
iii. Structural Drawings of Ladies and Gents' Toilets of Park at O&M Colony Jinnah HPS, Kalabagh

Kurram Garhi Power Station
i. Site Plan and Structural Drawings of Cat-IV & V Residences
ii. Standard Drawings for Steel Windows & Doors, Aluminum Windows & Doors and Compound Wall & General Architectural Notes for Buildings

Kurram Tangi Dam Project, Bannu
Structural, Foundation and Public Health for Recreation Center /Club

Mangla Dam Organization
Drawing for Construction of Foundation Pad for Stop Logs at Right Side of Main Spillway

Nandipur Hydel Power Station
Structural Drawings of Cat-III & V Residences

Rasul Hydel Power Station
i. Foundation Drawings of Parking Shed
ii. Foundation, Structural and Public Health Drawings of 4-bed Rest House

SEPCO, Sukkur
Architectural and Structural Drawings of Boundary Wall at various Grid Stations under SEPCO (08 No. Grids)

Tarbela Dam Project
i. Architectural and Structural Drawings for addition of 02 Class Rooms in existing Academic Block at WAPDA Cadet College Tarbela.
ii. Architectural and Structural Drawings for Construction of Washrooms/Ablution Area at Jamia Mosque Sobra City, Tarbela

Warsak Dam Project
Architectural Drawings for 20 Bed Bachelor Hostel

WAPDA Sports Complex, New Kot Lakhpat, Lahore
Architectural and Structural Drawings for Construction of 3rd storey on WAPDA Officer's Hostel

WAPDA Hospital Peshawar
Architectural Drawings for Construction of Additional Block of WAPDA Hospital Peshawar in replacement of old Building.

WEA Faisalabad
Structural Drawings of WEA Faisalabad regarding Structural Stability

B) Review of Technical Documents:
The following tasks including Terms of References (ToRs) for Request for Proposal (RFP), Feasibility Studies, Tender Documents, Evaluation of Technical Proposals and Technical Cases were reviewed and Technical Comments/CDO(W) View Point conveyed to Concerned Quarter:

Attabad Lake Hydropower Project
Management Consulting Services for Review of Feasibility Study, Procurement of EPC Contractor and Contract Management & Administration of Attabad Lake Hydropower Project (54 MW)

Bhasha Dam Project
i. Tender Drawings of additional Works for Roads, Water Supply and Sewerage System
ii. Construction of roads Water Supply and Sewerage Works at Harpan Das Model Village Bhasha

Chashma Barrage / CJ-Link Canal

i. Construction of Two Lane Seismically Qualified Bridge over C.J Link Canal of Chashma
ii. Issuance of NOC for Bridge/Road over CJ-Link Canal "Reconstruction/Construction of Road from Mianwali D.I Khan Road at Chashma Lake to Allu Wali Piplan Kallur Kot Road I/C 04 No. Bridges, District Mianwali"
iii. NOC For Erection of Floating Trash Deflection and Collection Barrier System in CJ Link Canal at Upstream of NPPS Intake Structures (C-1/C-2 & C-3/C-4)

Chitral Hydropower Station

Review of Draft Design Report and Drawings of Chitral Capacity enhancement Project from 1 MW to 5 MW

Dargai Rehabilitation Power Project

Bidding Documents, Drawings & Technical Specifications regarding Design, Supply and Installation of Mechanical & Electrical Works along with Rehabilitation/Construction of Civil Works of Dargai HPP

Dasu Hydropower Project

Bidding Document, Drawings & Technical Specifications regarding Construction of Project Colony, Infrastructure, Water Supply and Sewerage Network Drawings (ICB NO: DASU-PCI-02)

Diamer Basha Dam Project

i. Re-Construction / Rehabilitation of Irrigation Channel / Water Supply Scheme At 3.0 MW HPP Thak
ii. Land Levelling for Plots and Additional Works for Roads, Water Supply and Sewerage System In Harpan Das Model Village (Contract CMV-II-07)
iii. Request For Proposal (RFP) Regarding Consultancy Services for Implementation of Confidence Building Measures and other Allied Works

Garuk Storage Dam

Review the Design aspects of Garuk Storage Dam

Ghazi Barotha Hydropower Project

Draft Final Report regarding updation of Supplementary Environmental and Social (SES) Study of Indus River reach between Ghazi Barrage and Khairabad Bridge

Golen Gol Hydropower Project

i. Rehabilitation / Protective Measures for affected Transmission Towers in Mirkhani to Chukiatan Section
ii. Vetting of Estimate, Bidding Documents, Drawings and Technical Specifications of Package-'C' "Rehabilitation of Bridges and Access Roads from Powerhouse to Intake of Golen Gol Hydropower Project, Chitral"
iii. A Fact-Finding Inquiry Committee proposed Audit Para on the account of Performance Audit of Golen Gol Hydropower Project
iv. Inquiry Committee Report regarding Review of Revised PC-I proforma of Golen Gol HPP, Chitral

Harpo Hydropower Project

i. Draft Tender Documents of Civil Works & Hydraulic Steel Structures (HHPP-02), E&M Equipment Works (HHPP-03) and 132kV Transmission Line and associated Grid Station Works (HHPP-04), of Harpo Hydropower Project, Skardu
ii. Draft Engineering Manual/Design Report of Harpo HPP, Skardu

Hingol Dam Project

i. Inception Report of Hingol Dam Project
ii. Technical Memorandum on Selection of Suitable Channel Tunnel Alignment of Hingol Dam Project

Indus Basin Irrigation System (IBIS)

i. Expression of Interest (EOI) Document for Indus Basin Irrigation System (IBIS) - Automation of 07 key Sites for Discharge Monitoring Project
ii. Request for Proposal (RFP) for Hiring Consultancy Services
iii. Evaluation of Technical Proposals for Preparation of Project Design & Bidding Documents, Bid Evaluation, Design Review, Installation Supervision and Contract Administsration for Indus Basin Irrigation System (IBIS) – Automation of 07 Key Sites for Discharge Monitoring Project

Kachhi Canal Project

i. Vetting of Draft Bidding Document for Restoration of Flood Damages – 2022 from RD 0+000 to RD 1005+000 - (Contract No. KCP-RFD-01 to 04)
ii. Design Report for Consultancy Services of Kachhi Canal Project Phase-II RD 1322+000 to RD 1512+000
iii. Vetting of Draft Bidding Documents for Phase-II RD 1322+00 to 1346+00 – (Contract KC-7A)

Keyal Khwar HPP

Consultancy Services Contract – Version of Proposed Terms of Reference (TOR) for Advisory Services as Member of the POE

Kurram Tangi Water Resources Development Project

i. Report on Impacts of Increasing NWL of Kurram Tangi Water Resources Development Project
ii. Report on Water Availability of Kurram Tangi Water Resources Development Project
iii. Report on Project Formulation of Kurram Tangi Water Resources Development Project
iv. Report on Diversion System Optimization of Kurram Tangi Water Resources Development Project
v. Evaluation of Technical Proposals regarding Detailed Engineering Design, Preparation of updated PC-I, Land Acquisition and Resettlement Plan PC-I & Tender Documents for Kurram Tangi Water Resources Development Project

Murunj Dam Project

Vetting of Feasibility Study of Murunj Dam Project Naulong Integrated Water Resources Development Project

i. Expression of Interest (EOI) for Procurement of Consultancy Services from Individual Experts as Member of Dam Safety Panel of Experts (POE) for Naulong Integrated Water Resources Development Project
ii. Request for Proposal (RFP) for Review and updated of Detailed Design, Preparation of Procurement Documents, Safeguard Documents update for Naulong Integrated Water Resources Development Project
iii. Bidding Documents for Detailed Engineering Design of Command Area Development Works and Water Supply Components
iv. Review and update of Detailed Engineering Design, Preparation of Procurement Documents and update of Safeguard Documents
v. Evaluation of Technical Proposals regarding Stakeholder Engagement and Social Mobilization for inclusive, Community and Gender-based Project Design for Naulong Integrated Water Resources Development Project
vi. Fact Finding Inquiry to examine Draft Paras regarding Irregular Engagement of Consultant for ADB Studies on Naulong Dam Project in Violation of PPRA Rules

Nai Gaj Dam Project

Joint Technical Committee regarding Review of Detailed Engineering Design Reports

O&M Review of WAPDA

Evaluation of Technical Proposals for O&M Review of WAPDA

Satpara Dam Project

Design Team of CDO(W) visited Site for Clarification of Safe Disposal of Water for making PH-4 Operational

Simly Dam Project

Design of Construction Works recommended by DSO-WAPDA in Annual Inspection Report-2020

Shatung Nullah Diversion Project

Review of Inception Report of Shatung Nullah Diversion Project

Tarbela 5th Extension Hydropower Project

i. Monitoring, Evaluation and Management Support Consultancy (ME&MS) Services of Tarbela 5th Extension Hydropower Project
ii. Terms of Reference (ToRs) for Individual Consultants to support WAPDA during Procurement Process of 300 MW Floating Solar PV Project Pakistan in Ghazi Barrage Pond and Barotha Head Pond

Tarbela Dam Project

Terms of Reference (ToRs) and man-months regarding Engagement of Sedimentation Management Expert: Mr. Gerrit Basson, PhD

C) Review of PC-I, II & IV

Chief Engineer CDO (W) being Member of Standing Review Committee (SRC) which is constituted for scrutiny and review of the PC-I's, PC-II's & PC-IV's and comments/ observations of following issued to concerned quarter:

- 12 PC-Is
- 04 PC-IIs

Flood Telemetry Network

PC-I proforma – National Master Plan for Flood Telemetry Network (Phase-I) – July 2022

GMRC

PC-I Proforma for Strengthening and O&M of Glacier Monitoring and Research Centre (GMRC) under part of Flood Protection Sector Project-III (FPSP-III) – March 2023

IBIS

i. PC-II Proforma for Hydraulic Calibration and Formulation of Feasibility Study
ii. PC-I for Installation of Telemetry System on remaining 17 Sites (IBIS) – March 2023

Kachhi Canal Project

i. PC-I (Final Version) for Kachhi Canal Project (Phase-II) RD 132+000 to RD 1512+000 amounting to PKR 70,811 million.
ii. 1st Revised PC-I Proforma for remaining Works of Kachhi Canal Project (Phase-II) RD

1193+000 to 1322+000 amounting to 38.024 million – February 2023

K-IV Project
Preparation of Feasibility Study, Detailed Engineering Design, Tender Documents and PC-I of K-IV Project (November-2022)

National Master Plan for Flood Telemetry Network-PC-I
National Master Plan for Flood Telemetry Network (Phase-I) (Total Cost: PKR 1.470 Billion)

Patan Hydropower Project
PC-II Proforma for updation of Feasibility Study, Detailed Engineering Design, Preparation of Tender Documents & PC-I (February 2023)

RBOD-I
3rd Revised PC-I Proforma – Lower Indus Right Bank Irrigation and Drainage Project (LIRBP) Stage-I priority Works – RBOD-I (January 2023)

RBOD-III
2nd Revised PC-I Proforma – Balochistan Effluent Disposal into RBOD-III - January 2023

Remedial Measures to Control Water Logging due to Muzaffargarh and Taunsa Panjnad Link Canals Project
1st Revised PC-I for Remedial Measures to Control Water Logging due to Muzaffargarh and Taunsa Panjnad Link Canals Project

Surface Water Hydrology
PC-I Proforma for Strengthening and O&M of SHWP Network under part of Flood Protection Sector Project-III (FPSP-III) March-2023

Thakot-I Hydropower Project
PC-II Proforma, Detailed Engineering Design, Preparation of Tender Documents and PC-I of Thakot Hydropower Project - October 2022

Tungas Hydropower Project
PC-II Proforma for Pre-feasibility Study of Tungas Hydropower Project (2800 MW)- September 2022

WAPDA Scheme Under Flood Protection Sector Project
PC-I Proforma for upgradation of High Frequency Radio Network and Flood Center

Yulbo Hydropower Project
PC-II Proforma for Pre-feasibility Study of Yulbo Hydropower Project

D) Internships and Trainings
In addition to all above, the following activities were also accomplished:

a) Mandatory Training of the Tracers and Draftsmen required for promotion
b) Internship Training of Students of Different Engineering Universities

Kurram Tangi Dam Project Stage - I (Weir)

HYDRO PLANNING ORGANIZATION

General

Hydro Electric Power Organization (HEPO) was created from Planning & Investigation (P&I) Organization in September, 1982.

P&I and HEPO were responsible for planning and design of water resources and hydropower projects in Pakistan, respectively. P&I and HEPO were re-merged in 2015 into Hydro Planning Organization (HPO). It includes preparation of reconnaissance, appraisal, feasibility studies and detailed engineering design for development of hydropower and water resources schemes in Pakistan. The survey works are carried out by Survey Division whereas Geo-technical & Geological Investigation works are carried out by Drilling Division, stationed at Lahore.

Charter of Duties

- Identification of Planning and Investigation of Hydropower & Water Sector schemes
- River Basin Planning
- Preparation of PC-I/PC-II for Hydropower & Water Sector Projects for approval of Government of Pakistan
- Feasibility & Detailed Engineering Design Studies of Hydropower & Water Sector Projects
- Preparation of Concept Reports, Pre-Feasibility & Feasibility Studies of Hydropower & Water Sector Projects with in-house expertise
- Other assignments from the Authority
- Review of Projects Planned by other Agencies

Since its inception, Hydro Planning Organization (HPO) has played significant role in planning and design of a number of WAPDA Projects.

Area of Expertise

HPO is working with existing limited manpower and resources and have succeeded in exploitation of hydel and water storage potential. At present, HPO has the following specialize fields involved for monitoring of Feasibility Study, Detailed Engineering Design through consultants and conduction of Feasibility Studies through in house expertise.

- Topographic Survey
- Hydrology and Sediments
- Geological Investigations
- Geotechnical Studies
- Economic & Financial Analysis of Hydropower & Water Sector Projects
- Design of Hydraulic Structures
- Environmental Impact Assessment
- Socio-Economic Section
- Electrical & Mechanical Studies

Studies Completed by Hydro Planning

Identification Studies

- Small High Head Schemes (GB, AJK, KPK) – 190 Nos.
- Small Low Head Schemes (Punjab, KPK and Sindh) – 600 Nos.
- Medium High Head Projects (GB, AJK and KPK) – 30 Nos.
- Large High Head Projects (Indus, Jhelum and Swat Rivers) – 20 Nos.
- Small to Large size Storage Dam (All over Pakistan)

Planning Studies

Ghazi Barotha	1,450 MW
Chashma	184 MW
Neelum Jhelum	969 MW
Jinnah	96 MW
Golen Gol	108 MW
Diamer Basha	7.6 MAF, 4,500MW
Kalabagh	7.9 MAF, 3,600MW
Dasu	4,320 MW
Mohmand	800 MW
Bunji	7,100 MW
Patan	2,400 MW
Thakot	4,800 MW
Kohala	1,100 MW
Keyal	128 MW
Mirani Dam	0.302 MAF
Satpara	17.4 MW
Kachhi Canal	
Kurram Tangi	
Nai Gaj	
Sabakzai	
Akhori	7.6 MAF, 600 MW
Harpo	34 MW
Attabad	54 MW
Dargai	22 MW
Tangir	21 MW
Chitral	5 MW
Phandar	80 MW
Basho	28 MW

The following projects have been dealt by HPO during the year 2022-23:

1. PC-II Ready for Submission For Feasibility Study

i. Yulbo HPP (2,800 MW)
ii. Tangus HPP (2,200 MW)

For Detailed Engineering Design

i. Patan HPP (2,400 MW)
ii. Thakot HPP (I, II, III) (4,714 MW)

2) Detailed Engineering Design, Preparation of Tender Documents and PC-I

i. Chiniot Dam Project
ii. Chashma Right Bank Canal (Lift cum Gravity Project)

3) Feasibility Study / Detailed Engineering Design

i. Murunj Dam Project
ii. Hingol Dam Project (New Site)

4) In-House Feasibility Studies

i. Nauseri HPS
ii. Rehabilitation of Existing 03 Nos. Hydel Power Stations:
   - Chichoki Hydel Power Station
   - Shadiwal Hydel Power Station
   - Nandipur Hydel Power Station
iii. Sindh Barrage Project (being finalized by Foreign Consultants)

1) PC-II READY FOR SUBMISSION FOR FEASIBILITY STUDY

YULBO HPP

Location

The dam site has been identified on Indus River, 95 km downstream of Skardu City and 645 km from Islamabad.

Salient Features (Desk Study)

Installed Capacity	2,800 MW
Gross Head	240 M
Net Head	220 M
Dam Height	140 M
Design Discharge	1,500 M^3/Sec
Length of Power Tunnel	11 Km
Plant Factor	46.5 %
Mean Annual Energy	11,400 GWh

Project Status

- The project was identified by MONENCO under Canadian International Development Agency (CIDA) grant during 1984 for a capacity of 710 MW.
- The capacity was upgraded up to 2,800 MW by HPO.
- PC-II amounting to Rs. 734.287 million for Feasibility Study was submitted to Ministry of Water & Power in July, 2014 which was returned in April 2016 for cost updating, confirmation of financing source, and priority of project.
- PC-II has been updated and will be submitted to Ministry of Water & Power after firming up the financing.

TANGUS HPP

Location
The dam site has been identified on Indus River, 95 km downstream of Skardu City and 645 km from Islamabad.

Salient Features (Desk Study)

Installed Capacity	2,200 MW
Gross Head	190 M
Net Head	170 M
Dam Height	120 M
Design Discharge	1,500 M^3/Sec
Mean Annual Energy	8700 GWh
Plant Factor	45.14 %
Length of Power Tunnel	11.3 Km

Project Status
- The project was identified by MONENCO under Canadian International Development Agency (CIDA) grant during 1984 for a capacity of 710 MW.
- The capacity was upgraded up to 2,200 MW by HPO, WAPDA.
- PC-II amounting to Rs. 708.640 million for Feasibility Study was submitted to Ministry of Water and Power in July, 2014, which was returned in April 2016 for cost updating, confirmation of financing source, and priority of project.
- PC-II has been updated and will be submitted to Ministry of Water & Power after firming up the financing.

FOR DETAILED ENGINEERING DESIGN

PATAN HPP

Location
The project is proposed on the left bank of Indus River with Powerhouse 3 km downstream of Patan and 275 km from Islamabad.

Salient Features

Installed Capacity	2,400 MW
Dam Height & Type	105 M, Concrete Gravity
Gross Head	98 M
Design Discharge	2,800 M^3/sec
Mean Annual Energy	12,500 GWh
Headrace Tunnels	206 M long
Tailrace Tunnel	4.55 Km
Construction period	6 Years
Land Acquisition	
Land Acquisition	786 Ha
No. of Houses Effected	75
Economic Parameters	
EIRR	41%
FIRR	12.9%
Unit Generation Cost	5.17 US Cents

Project Status
- The project was identified by MONENCO in "Inventory and Ranking Study" in November 1984 for a capacity of 1,172 MW.
- Feasibility Study completed by Consultants JV of M/s Lahmeyer International, Germany (Lead Firm), M/s NDC, M/s BAK and M/s PES in December, 2015.
- Asian Development Bank (ADB) shown willingness for the study of a potential hydropower project through Project Readiness Financing (PRF) of US$ 10 million for carrying out detailed Engineering Design & preparation of Tender Documents.
- ADB's Team comprising of Technical Assistant Consultant Mr. Cesar Alvarado & Associate Project Analyst along with HPO's Team visited Dasu, Patan, Thakot-I, II & III Hydropower Projects in October, 2022 for technical validity check of the project for processing PRF.
- After discussion with ADB, Cost Estimate & Concept Clearance Paper were prepared to update Feasibility Study, Detailed Engineering Design, preparation of Tender Documents & PC-I and the same were submitted to Ministry of Water Resources in January, 2023 for soliciting approval from the Competent Forum.
- Updated PC-II amounting to Rs.3,666.897 million for Updating of Feasibility Study, Detailed Engineering Design, Preparation of Tender Documents & PC-I was submitted to Ministry of Water Resources for approval from competent forum in March, 2023.
- Ministry of Water Resources approved submission of Concept Paper to Ministry of Planning, Development & Special Initiatives for consideration of Concept Clearance Committee in June, 2023.

THAKOT HPP (I, II, III)

Location
Thakot Cascading Hydropower Dam Projects (Thakot-I, II & III) are located at Indus River near Besham Town, Khyber Pakhtunkhwa.

Project Status
- The project was Identified by MONENCO in "Inventory and Ranking Study" in November, 1984 for 1,043 MW with long tunnels of 20 km located on the right bank of Indus River in District Shangla, 240 km from Islamabad.
- HPO reviewed the project layout to reduce environmental issues at Besham and upgraded its capacity to 2,800 MW with long tunnels of about 26 km.
- Govt. of Pakistan approved PC-II for Feasibility Study in June, 2012, at a cost of Rs. 719.62

Salient Features

Parameter	Cascading Projects		
	Thakot - I	Thakot - II	Thakot - III
Dam Type	Concrete Gravity Dam		
Power	2,220 MW	963 MW	1,490 MW
Energy	10,500 GWh	4,765 GWh	6,925 GWh
Dam Height (M)	100	75	87
Gross Head (M)	73.7	32.7	55.8
Discharge (M^3/S)	3,400	3,400	3,400
Plant Factor (%)	53.9	54.3	54
Land Requirement (Acres)	2219	932	1510
No. of Houses Affected	251	158	279
EIRR (%)	40.8	20.1	45.4
FIRR (%)	17.4	15.3	35.2

million including Foreign Component of Rs. 303.139 million.

- The Consultancy Services Contract was awarded to JV of M/s Lahmeyer Intl. (Lead Firm) and M/s NDC, Lahore in November, 2015 to complete the Feasibility Study in 24 Months.
- The consultants reviewed previous project layout with long tunnel and it was replaced with three Cascade Projects; Thakot-I, Thakot-II, Thakot-III.
- Consultant's submitted Draft Feasibility Study of Thakot-I in December, 2018 and Draft Feasibility Studies of Thakot-II & III HPP's in January, 2020. Consultants submitted the Final Feasibility of Thakot-I HPP in May, 2022.
- Asian Development Bank (ADB) shown willingness for the study of a potential hydropower project through Project Readiness Financing (PRF) of US$ 10 million for carrying out Detailed Engineering Design & preparation of Tender Documents.
- ADB's Team comprising of Technical Assistant Consultant Mr. Cesar Alvarado & Associate Project Analyst along with HPO's Team visited Dasu, Patan, Thakot-I, II & III HPPs in October, 2022 for technical validity check of the project for processing PRF.
- PC-II amounting to Rs. 2,060.260 million for Detailed Engineering Design, Preparation of Tender Documents & PC-I of Thakot-I HPP has been submitted to Ministry of Water Resources for approval from competent forum in March, 2023.
- The Final Feasibility Reports of Thakot-II & III HPPs were submitted by consultants in June, 2023.

2) DETAILED ENGINEERING DESIGN, PREPARATION OF TENDER DOCUMENTS AND PC-I

CHINIOT DAM PROJECT

Location

The barrage / dam site is located on Chenab River about 5 km from Chiniot City and approx. 100 m up-stream of existing Railway Bridge.

Objectives

(i) Water Storage
(ii) To regulate existing Downstream Canal Network
(iii) Flood Mitigation
(iv) Power Generation
(v) Ground Water Improvement

Salient Features

Main Dam	Earth Rock-fill
Type of Dyke	Earth-fill
Dam/ Barrage Height	17 M
Embankment Crest Level	192 M
Reservoir Area	185 Km^2
Reservoir Length	35 Km
Live Storage	0.85 MAF
Power Generation	80 MW
Mean Annual Energy	275 GWh
River Bed Level	175 M
Normal Conservation Level	190 M
Barrage Capacity	34,000 M^3/s
Construction Period	04 Years
Land Acquisition	
Area required for Land Acquisition	21,700 Acres
No. of Houses / Population Effected	1,056 / 8300

Present Status

- Feasibility Study started in February, 2016 and completed in June, 2019.
- DDWP approved PC-II amounting to Rs. 533.303 million for Detailed Engineering Design, Tender Documents & PC-I in August, 2020.
- Consultancy Services Contract was awarded in June, 2022 to JV of M/s NESPAK (Lead Firm), M/s PES, M/s BARQAAB and M/s DOLSAR for the period of 18 Months.
- Govt. of Pakistan has allocated Rs.100.00 million and released Rs.20.00 million in 1^{st} Quarter and 80 million in 4^{th} Quarter of PSDP for FY 2022-23.
- Consultant submitted the inception report in October, 2022.
- Topographic Survey of Dam/ Structure Area has been completed. X-sectional Survey of dam and reservoir is under progress.

CHASHMA RIGHT BANK CANAL (LIFT CUM GRAVITY) PROJECT

Location

The proposed project is located on the right bank of Indus River in D.I. Khan District of Khyber Paktunkhwa Province. The canal off-takes from Headrace Channel of Chashma Hydropower Plant.

Background

- DDWP approved the PC-II amounting to Rs. 477.853 million for "Review of Feasibility Study, Updating of Detailed Engineering Design, Bidding Documents & PC-I" in August, 2020.

Present Status

- WAPDA awarded Consultancy Services Contract to JV comprising of M/s NESPAK (Lead Firm), M/s ACE, M/s SILT and M/s ECPAK in June, 2021 at the cost of Rs.148.416 million.
- Govt. of Pakistan allocated Rs. 213.926 million for the subject study in PSDP for FY 2022-23 & Rs. 213.926 million has been released in 4th quarter of FY 2022-23.
- Consultants submitted Inception Report, Design Report, Project Planning Report, Environmental & Social Impact Assessment Report, Draft Bidding Documents for Package 3, 4, 5 & 6 and are currently preparing Bidding Documents for remaining 04 Nos. contract packages.
- Request for Proposal (RFP) for hiring of Supervision Consultants was submitted to GM (Projects) North for initiating process of hiring.

Salient Features

Intake Structure:
- To draw 3,050 Cusecs

Feeder Canal:
- 30.17 Km Long Parallel to existing CRBC Gravity (RD 0 to 104+000)

Main Canal:
- 138.8 Km Long

Pumping Station:
- 8 Nos. having 2,557 Cusecs Capacity with Design Lift of 66.6 ft.

Irrigation System:
- Distributaries (28 Nos.) & Minors (16 Nos.)

Flood Carrier Network:
- 58 Nos. Carrier Channels

Mechanical Works:
- Gates & Pumping Units (8 Nos.)

Objectives:
- Additional Area Irrigation of 295,902 Acres of Land (Tehsils: Paharpur, D.I. Khan & Paroa)
- Socio-economic Uplift of Remote Areas
- Self-sufficiency in Agriculture
- To fulfill Irrigation Requirements
- Safety against Floods through appropriate Drainage Measures
- Environmental Conservation

- As per direction of Prime Minister's Office the prequalification of contract is to be ensured. The consultants are preparing the prequalification documents for prequalification of Contractor for 06-Nos. Contract Packages & have submitted final Pre-qualification Documents for contract package-3 & 4.

Approval Status of PC-I

- ECNEC approved PC-I for implementation of CRBC (Lift cum Gravity) Project in October, 2022 at an updated cost of Rs.189,606.482 million including foreign component amounting to Rs.18,030.58 million.

3) FEASIBILITY STUDY / DETAILED ENGINEERING DESIGN

MURUNJ DAM PROJECT

The Murunj Dam Project is proposed across Kaha Nullah about 116 km west of Rajanpur, Punjab. The nearest village is Lundi Saidan, which is about 13 km from Dam Site.

Background

- CDWP approved PC-II amounting to Rs. 349.956 million and Ministry of Water Resources issued administrative approval in March, 2018.
- Consultancy Contract was signed between WAPDA & M/s NESPAK-JV in May, 2020.

Present Status

- Feasibility Study Report was submitted by the consultants in October, 2022.
- The consultants submitted the Draft Prequalification Document for construction of main dam and its structural components in April, 2023.

Salient Features

Type of Dam	Earth Core Rock Fill
Height of Dam	310 ft.
Average Annual Inflow	0.183 MAF
Gross Storage	0.445 MAF
Live Storage	0.40 MAF
Reservoir Length	6.8 Km
Culturable Command Area (CCA)	88.856 Acres
Power Generation	6 MW
Diversion Tunnel	2 Nos. (20'x20')
Design Flood	27,500 Cusecs
Spillway Design Discharge	365,400 Cusecs
Weir Height at Darah Site	28 ft.
Right Bank Irrigation Canal	- 209 Cusecs - CCA = 48,000 Acres - Length = 51 km
Left Bank Irrigation Canal	- 179 Cusecs - CCA = 41,000 Acres - Length = 30 Km

- Project Planning Report and PC-I has been submitted by consultants which is under review.

Progress

Physical Progress 97%

HINGOL DAM PROJECT

Location

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

Objectives

(i) Irrigation of Culturable Command Area of 26,305 Ha
(ii) Hydropower Generation 1.37 MW
(iii) Flood Mitigation
(iv) Drinking Water Supply to nearby Community
(v) Ground Water Recharge
(vi) Recreation/ Tourism
(vii) Socio-Economic Uplift of the Area

Background

- Pre-feasibility Study was prepared by WAPDA in August 1987. Feasibility Study was completed by M/s NESPAK in 1992-93.
- Detailed Engineering Design and Tender Documents at Aghor Site, 1 km upstream of Makran Coastal Highway Bridge completed by M/s NDC in 2009.
- Hindu Community raised objections due to submergence of their Holy Places. Hence, on the directions of Ministry of Water & Power, WAPDA shifted the dam site 16 km upstream of Aghor Site.
- PC-II for Detailed Engineering Design and Tender Documents of new dam site submitted to Ministry of Water & Power in December, 2012.

Salient Features

Type of Dam	Embankment / Zoned Dam
Maximum Dam Height	176 ft.
Length of Dam	2181 ft.
Spillway Type	Un-gated Overflow Ogee Crest
Design Capacity of Spillway	560,000 Cusecs
Total Catchment Area	26,941 Sq. km
Average Annual Inflow	537,227 AF
Probable Maximum Flood	769,958 Cusecs
Reservoir Area	88.3 Sq.km
Gross/ Live Storage	1.206 / 0.816 MAF
Culturable Command Area	65,000 Acres
Power Generation	1.37 MW (5.6 GWh)

Present Status

- PC-II for Detailed Engineering Design, Preparation of Tender Documents & PC-I amounting to Rs. 421.372 approved by DDWP in August, 2020. Ministry of Water Resources issued Administrative Approval in March, 2021.
- Contract Agreement was signed with top ranked firm M/s BAK (JV) in April, 2022. Consultants mobilized in May, 2022.
- Inception Report received from Hingol Dam consultants in June 2022.
- The progress of survey, geological & geotechnical investigations has been severely impeded by the floods in 2022.
- Site visit of WAPDA Team was carried out in November, 2022 for layout optimization.

Progress

Overall Physical Progress: 18%
Financial Progress: 30%

4) IN-HOUSE FEASIBILITY STUDIES

NAUSERI HYDEL POWER STATION (52 MW)

Location

Nauseri Hydel Power Station (NHPS) is proposed on the diversion tunnel of Neelum Jhelum Dam located at right bank of Neelum River near Nauseri some 41 km from District Muzaffarabad, Azad Jammu and Kashmir.

Project Status

- On the request of Govt. of AJ&K, WAPDA issued NOC for the development of NHPS in July, 2013. M/s Hydroelectric International Pvt. Ltd. (Canada), registered with Private Power Cell, AJ&K was issued Pre-qualification Document, but it was not materialized.
- Consequently, the rights of the company to develop the project were forfeited in November, 2016. Govt. of AJ&K issued NOC to WAPDA for conducting Feasibility Study of the project in October, 2017.
- Draft Feasibility Study Report completed by HPO was sent to Chief Executive Neelum

Salient Features

Installed Capacity	52 MW
Gross Head	44 M
Net Head	42 M
Design Discharge	150 M^3/Sec
Mean Annual Energy	152.7 GWh
No & Type of Turbine	3 No. Francis
Length of Tunnel	490 M (Existing)
Plant Factor	33.52 %
Construction Period	3 years

Nandipur Hydel Power Station

Jhelum Hydroelectric Company (NJHPC) & GM (Hydel) Development in December, 2019.

- HPO has requested arrangement of Rs. 9.60 million for topographical survey, geological and geotechnical investigations from NJHPC & GM (Finance) Power to finalize the Feasibility Study of NSHPS.

REHABILITATION OF EXISTING 03 NOS. HYDEL POWER STATIONS

CHICHOKI HYDEL POWER STATION

The project is located near village Joyanawala District Sheikhupura about 20 km both from Sheikhupura & Muridke, 35 km North-West of Lahore.

The salient features of the project as per Feasibility Study are:

Installed Capacity	13.2 MW
Rated Head	25 ft.
Design Discharge	8,100 ft.^{3}/sec
Generation Voltage	3.3 kV

SHADIWAL HYDEL POWER STATION

Shadiwal Hydel Power Station is located at the tail of Upper Jhelum Canal (UJC) that takes off from Mangla Headworks on Jhelum River at a distance of 15 km West of Gujrat City in Punjab.

The salient features of the project as per Feasibility Study are:

Installed Capacity	13.5 MW
Rated Head	24 ft.
Design Discharge	7,800 ft.^{3}/sec
Generation Voltage	11 kV

NANDIPUR HYDEL POWER STATION

Nandipur Hydel Power Station is situated on Upper Chenab Canal (UCC) near Nandipur Village at a distance of about 10 km from Gujranwala on Gujranwala- Sialkot Road.

The salient features of the project as per Feasibility Study are:

Installed Capacity	13.8 MW
Rated Head	22 ft.
Design Discharge	9,120 ft.^{3}/sec
Generation Voltage	3.3 kV

Status of Feasibility Studies

- GM (Hydel) Development requested Hydro Planning Organization (HPO) in August, 2022 to prepare Feasibility Studies for Rehabilitation of existing 03 No. Hydel Power Stations including Chichoki, Shadiwal and Nandipur Hydel Power Station.
- Technical Team of HPO visited these Hydel Power Stations for the preparation Feasibility Studies in September, 2022. A detailed visit of different components of the Power Stations including Machine Hall, Turbine Hall, Headrace, Tailrace,

Switchyard, Spillway Site, Intake & Outlet Sections and Main Control Room was carried out.

- Following survey were performed in connection with the Feasibility Studies:

  (i) Topographic Survey of Specified Area
  (ii) Canal Cross-sections, 10 Nos. Upstream and 10 Nos. Downstream of Power Station at an Interval of 100 m each covering Canal Bank and Bank Levels for Power Channel
  (iii) Upstream and Downstream Elevations of Power Station Building. Power House Floor Plan with building details, Machine Hall Level, Service Bay Level, Turbine Levels etc. for the Power Station
  (iv) Water Way Profile from Intake to Draft Tube for both Units of Power Station
  (v) Intake and Outlet Sections for both Units of Power Station. Control Room and Switchyard Plan of Power Station

- Hydrological Analysis, Hydraulic Design, Digitization of Survey Results and further continuation of studies is in progress

SINDH BARRAGE PROJECT

Location
The barrage is proposed about 180 downstream of Kotri Barrage, 45 km upstream Indus River outfall into Arabian Sea & 120 km East of Karachi, Sindh.

Objectives
(i) Ensure availability of Fresh Water South Kotri/ Delta
(ii) To prevent Seawater Intrusion through Structural Measure
(iii) To improve Ecology of Indus River Downstream Kotri
(iv) Drinking Water Supply in Project Vicinity

Salient Features

Twin Barrages & Reservoir Dykes	
Barrage-I: Capacity	350,000 Cusecs
Barrage-II: Capacity	700,000 Cusecs
Reservoir Level / Embankment Level	11 M / 15 M
Length of Reservoir Dykes	Right Bank = 79 Km, Left bank = 76 Km
Gross / Live Storage	2.2 MAF / 2.0 MAF
Off-Taking Canals	
Right Bank Canal to Gharo	60 Km Concrete Lined, 3,000 Cusecs
Left Bank Canal to Jati	54 Km Concrete Lined, 2,000 Cusecs
Downstream Indus River Dykes	46 Km along both River Banks
Coastal Dykes	
Length of Left Bank Coastal Dyke	127 Km
Length of Right Bank Coastal Dyke	66 Km

(v) Augmenting Irrigation Supplies (If required)
(vi) Flood Mitigation
(vii) Groundwater Recharge
(viii) Socio-economic Uplift of the Area

Approval Status

- Prime Minister of Pakistan during a meeting regarding "Pakistan's Water Issues and Way Forward" in May, 2019 instructed Ministry of Water Resources & WAPDA to carry out: ***"Feasibility Study of a Weir d/s Kotri & formulation of a Lake up to Kotri to address the issue of ecological needs to prevent sea intrusion"***

- Prime Minister of Pakistan gave in-principle approval of the proposed Sindh Barrage Project in August, 2019.
- Chief Minister Sindh chaired a meeting in August, 2019 wherein it was agreed that WAPDA will undertake Feasibility Study of the project.
- DDWP approved PC-II in November, 2019.

Stakeholder Consultations
Chief Minister Sindh in August, 2019 decided that WAPDA will conduct the Feasibility Study. The TORs were discussed with Technical Committee of Irrigation Department, Government of Sindh in January, 2020. The Inception Report prepared by WAPDA was shared with Irrigation Department, Government of Sindh & other stakeholders in July, 2020. WAPDA along with Individual Consultants hold meetings with Irrigation Department, Government of Sindh & other stakeholders in January, 2021. WAPDA and Individual Consultants discussed the Inception Report with Irrigation Department, Government of Sindh in February, 2021. The consultative meeting with Irrigation Department, Government of Sindh was held to finalize the MoM dated February 23, 2021. In August, 2021, it was agreed that WAPDA would share the draft Feasibility Study and Final Report would be issued for Stakeholder's consultation. The Virtual consultative meeting between WAPDA & Irrigation Department, Government of Sindh was held in February, 2022 wherein ToRs of International Consultants & CVs of Key Experts were shared with Irrigation Department, Government of Sindh.

WAPDA, M/s Deltares (Netherland) & M/s PES (Local JV Partner) during May & June, 2022 carried out the site visits, stakeholder consultation and attended meeting with Technical Committee Members on Sindh Barrage including Irrigation Department, Government of Sindh.

Studies/ Work Progress

- Project Studies commenced in March, 2020.
- Project Inception Report issued in July, 2020.
- Feasibility Study completed by WAPDA in December, 2021. However, keeping in view the emphasis of Irrigation Department, Govt. of Sindh for engaging consultants of international repute, the services of M/s Deltares (Netherlands) and M/s PES (JV) were hired in March, 2022.
- Consultants mobilized in March, 2022 and Inception Report from M/s Deltares (Netherland) received in April, 2022.
- Due to on-going forex crunch in the country, payments to foreign consultants are not possible through banking channel. Therefore, foreign consultants suspended the project activities since September 2022.
- Ministry of Water Resources has been requested in February, 2023 to approach Ministry of Finance/ State Bank of Pakistan to allow transfer of foreign currency amounting to Euro 300,000 to M/s Deltares (Netherlands).
- Finalization of Feasibility Study by M/s Deltares-PES (JV) in progress.

Progress (June 2023)

Overall Physical Progress	:	96%
Financial Progress	:	72%

NEELUM JHELUM HYDROELECTRIC PROJECT

General

Neelum Jhelum Hydroelectric Project is a major run-of the river project of immense national and strategical importance, located in the vicinity of District Muzaffarabad, Azad Jammu & Kashmir (AJ&K). Neelum River originates from Occupied Kashmir, enters in to Azad Jammu & Kashmir near Taobat and has confluence with Jhelum River at Domel, Muzaffarabad City. The Diversion Dam of Neelum Jhelum Hydropower Project has been constructed on Neelum River at Village Nauseri.

Location

The Composite Dam and Intake of the project is located at Nauseri 41 km upstream of Muzaffarabad City and an underground Power House, located at Chattar Kalas, 22 km downstream of Muzaffarabad City.

The Project

Through the Diversion Dam, 280 cumecs of water is diverted in to a Headrace Tunnel through which water goes in to Power House, 28 km away from Dam located at Chattar Klass, Muzaffarabad, where through four Francis Turbines, 969 MW is generated. From Power House water passes through a 3.5 km Tailrace Tunnel having outfall in Jhelum River.

The project has an installed capacity of 969 MW (4 Units, each of 242.25 MW) with energy generation of about 4.66 billion units annually. The project is a success story, substantially completed in 2018 and since then generating power being injected in to National Grid.

Diversion Dam

A Composite Dam (Concrete Gravity + Rock Fill), 160 m long and 60 m high has been constructed on Neelum River at Village Nauseri, about 41 km North East of Muzaffarabad City. It has a gross storage capacity of 10.2 million cubic meter and three (3) Radial Spillway Gates. A sedimentation basin, with three bays, has been provided to trap the suspended sediments before entering the water into the Headrace Tunnel.

Headrace Tunnel

The diverted water maximum 280 cumecs enters into a Headrace Tunnel of 28.5 km linear length; 19.6 km stretch of which is twin tunnel having cross sectional area of 52 m^2 each and the remaining 8.94 km tunnel is a single tunnel of cross-sectional area 100 m2. About 10 km linear stretch of twin tunnels has been constructed through two Tunnel Boring Machines (TBMs). Total length of Headrace Tunnel is 48.5 km which is accessed through 7 Adits or access tunnels. It crosses Jhelum River approximately 200 m below from its bed level. Work on 48.5 km long Headrace Tunnel completed by the end of year 2017.

Power House

An underground Powerhouse (137 M Long x 25 M Wide x 54 M Deep) of the project has been constructed at Chattar Kalas, 22 km South of Muzaffarabad, where four (4) Vertical Shaft Francis Turbines have been installed. The diverted water of Neelum River enters into the Headrace Tunnel with a gross head of 420 m passes through the turbines, generates power and finally drops at Jhelum River through Tailrace Tunnel of about 3.5 km. Each of four (04) generating units takes 70 cumecs of water, producing 242.25 MW of power totaling 969 MW. All four units are functional and being commercially operated since synchronization with national grid in the year 2018.

Project Implementation

Employer

Neelum Jhelum Hydroelectric Company (NJHPC), Special Purpose Vehicle (SPV), is the executing agency of the project and a subsidiary of WAPDA.

Project Consultants

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, are the project consultants.

Contractor

The construction contract was awarded to M/s China Gezhouba Group of Companies China Machinery Engineering Corporation (CGGC-CMEC) consortium of China at the cost of Rs.90.90 billion. CGGC was the contractor of civil works while CMEC of Electrical Mechanical & Hydraulic Works.

Project Cost

The approved PC-1 cost of the project is Rs. 506.808 billion. The project has been completed less than the approved cost.

Project Financing

Financing for the project has been arranged as under:

- WAPDA Own Resources

Neelum Jhelum Hydroelectric Project

- Middle East Donors;
  - Islamic Development Bank (IDB)
  - Saudi Fund for Development (SFD)
  - OPEC Fund for Development (OFID)
  - Kuwait Fund for Development (KFD)

- China EXIM Bank
- NBP Consortium
- Neelum Jhelum Surcharge

Commissioning of the Project

The reservoir filling commenced on October 14, 2017, while the waterway system pressurizing commenced on March 03, 2018. The first unit was synchronized with National Grid successfully on April 09, 2018. The project was completed and inaugurated by the Prime Minister of Pakistan on April 13, 2018.

Power Generation

Synchronization of Units with National Grid:

- Unit # 4 on April 09, 2018
- Unit # 3 on April 22, 2018
- Unit # 2 on May 29, 2018
- Unit # 1 on August 14, 2018

The overall generated Units up to June, 2023 are 18,178.67 MkWh

Tailrace Tunnel Issue

On July 04, 2022, when the plant was running at its full capacity (969 MW), an abnormal increase in water leakage was observed in the powerhouse which was controlled through continuous drainage pumps. Upon investigation, high water pressure in the Tail Race Tunnel (TRT) was observed.

Accordingly, on July 05, 2022, it was concluded by the project consultants that abnormal increase in TRT pressure and water leakages/seepage in powerhouse are due to blockage in TRT. Considering safety of the power structure and all other equipment/machinery, Units were shutdown gradually. Resultantly, the powerhouse was shut down on July 06, 2022.

Immediately after this incident M/s China Gezhouba Group Company (CGGC), the contractor for construction of civil works was engaged for carrying out remedial works. The firm immediately mobilized to the site and started work as a result of signing of the Contract Agreement for the remedial works on August 25, 2022.

Remedial of TRT completed in July 2023 and on August 08, 2023 the project restarted power generation.

Principal Project Data

Diversion Dam		
Type	=	Composite Gravity Dam (Concrete + Rock Fill)
Height / Length	=	60 / 160 M
Crest Elevation	=	El. 1019 MASL
Total Volume of Reservoir	=	10.2 Million M^3
Live Storage of Reservoir	=	3.8 Million M^3
Radial Spillway Gates	=	03 Nos. (Size : 12 M x 15 M)
Flap Gates at Debris Channel	=	02 Nos. (Size: 9 M x 10 M)
Diversion to Power House		
Design Discharge	=	280 Cumecs
Maximum Gross Head	=	420 M
Desander		
Sedimentation Basin	=	01 No.
Bays	=	03 Nos.
Dimension of Bay (Each)	=	Width: 25.4 M & Depth: 25 M
Tunnel System		
Twin Tunnel	=	19.60 Km (Each)
Single Tunnel	=	8.94 Km
Tailrace Tunnel	=	3.55 Km
Surge Shaft	=	353 M
Under Ground Power House		
Dimension (LxWxD)	=	137 M x 25 M x 54 M
Number of Units	=	04
Maximum Total Output	=	969 MW
Annual Energy Generation	=	4663 GWh

Hydro Mechanical & Electrical Equipment

Penstock			**Turbines**			**Transformer**		
No. = 04			Type = Francis (Vertical Shaft)					
Thickness	=	28 ~ 42 MM	Number	=	04	Number	=	13 (one Spare)
Diameter	=	4.2 ~ 2.6 M	Turbine Maximum Power	=	242.25 MW	Types	=	Single Phase
Length	=	118 M				Rated Output	=	98 MVA

Kachhi Canal Extention Project

WATER DIVISIONS

WATER DIVISION (CENTRAL)

KACHHI CANAL PROJECT

Location of Project

Kachhi Canal takes off from Taunsa Barrage at Indus Punjab Province and will irrigate about 72,000 acres culturable command area (Phase-I) in Kachhi Plain (Balochistan Province). Before entering into Balochistan, Kachhi Canal runs parallel to existing D.G. Khan Canal and Dajal Branch on its right-hand side for about 162 km then after traversing further a long stretch of another 144 km in Punjab it enters in Balochistan. The Length of main Kachhi Canal within Balochistan province is 57 km. The command area lies in the District of Dera Bugti.

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:

Project Benefits

- Command Area Development of 72,000 acre land (Phase-I) in District Dera Bugti
- Recurring Agricultural Benefits @ 2.334 billion per annum
- Increase in Cropping Intensity from 4 % to 80%
- Drinking Water Facilities for about a million People
- Development of Agro-based Industry
- Enhancement in the value of Land/Cost of Land to about 200%
- Creation of new Job Opportunities

Water Availability

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 September 02, 2003

- Poverty Alleviation
- Increase in Export and Foreign Exchange Earnings due to Agriculture Products
- Reduction in Migration of Population from Dera Bugti area

Issues

- Early Release of PSDP Allocation

Physical Progress

Contract-wise Detail of Physical Progress is given in "Detail of Contracts" (attached).

Sailent Features

Main Canal				
Total Length of Main Canal (Phase-I)	363 Km (RD 0 to RD 1193)			
Unlined Canal	12 Km (RD 0 to RD 40) Punjab Province			
Lined Canal	351 Km (RD 40 to RD 1193) Punjab & Balochistan Provinces			
- Peak Discharge	6,000 Cusec			
- 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	87 Km			
- Gross Area	10,40,000 Acre			
- Total CCA	7,13,000 Acre			
- Total CCA (Phase-I)	72,000 Acre			
Structure (Main Canal) (Phase-I)				
- Head Regulator (at Taunsa)	1 No.			
- Road Bridges	56 No.			
- Railway Bridges	1 No.			
- Cross Drainage Structures	82 No.			
- Escape Structures	2 No.			
- Cross Regulators	3 No.			
- Head Regulators (Distributaries)	25 No.			
- Other Minor Structures	360 No.			
- Watercourse Crossings	407 No.			
- Sui Gas Pipeline Crossings	7 No.			
EIRR	11.58%			
Project Funding	Government of Pakistan			
Original PC-I	Rs. 31.204 Billion (Approved by ECNEC on September 27, 2003)			
1st Revised PC-I (Phase-I)	Rs. 57.562 Billion (Approved by ECNEC on December 31, 2013)			
2nd Revised PC-I (Phase-I)	Rs. 80.352 Billion (Approved by ECNEC on March 07, 2017)			
Executing Agency	WAPDA			
Consultants	Kachhi Canal Consultants Joint Venture of NESPAK/NDC/ACE/BARQAAB/EGC			
Date of Commencement	October 04, 2002			
Date of Completion	December 31, 2023			
Land Acquisition				
PUNJAB				
- Main Canal	306 Km	12,610 Acres		
BALOCHISTAN				
- Main Canal	57 Km	2400 Acres		
- Distribution System	87 Km	1688 Acres (Distt. Dera Bugti)		

Detailed Annual Plan WAPDA (Water Wing) 2022 - 23

Item	Name of Project	Unit	Total Quantity	Physical Targets for 2022 - 23	Actual Achievement for 2022 - 23	Physical Targets Fixed for 2023 - 24	Remarks
CANALS	Kachhi Canal						
	a. Consultancy	Man Month	10313.95	150	150	100	
	b. Land Acquisition	Acres	18492	2	---	2	
	c. Civil Works	---	---	---	---	---	
	i. Earthwork	Mcft.	4757.061	38.51	33.98	76.859	
	ii. Lining	Mcft.	66.692	0.44	0.48	1	
	iii. Stone Pitching	%cft.	193817.1	4978.680	3194.55	1784.130	
	iv. Structures	Nos.	974	1	1	1	
	v. Camps & Colony	Sqft.	349250	13500	---	13500	

Detail of Contracts

Contract	Cost (Rs. M)	Start/ Completion	Progress % Actual Schedule	Remarks
Phase – I				
Punjab Province				
KC-1 RD 20 to 40 (6 Km)	39	06-01-2003 / 30-06-2004	100 / 100	Completed
KC-2 RD 40 to 106 (20 Km)	1075.030	15-11-2003 / 31-12-2007	100 / 100	Completed
KC-3 RD 0 to 20 (6 Km)	3783.363	22-08-2007 / 31-12-2009	100 / 100	Completed
KC-4 RD 106 to 531 (129 Km)	16994.000	13-07-2005 / 14.09.2017	97.84/100	Contract was terminated under sub clause 49.4 of CoC w.e.f December 11, 2019
KC-4 (R) Outstanding & Remedial Works of Main Canal from RD 106 to RD 530+400 and Part of Structures from RD 40 to RD 106	2534.440	14.04.2021 / 31.12.2022	92.31/100	Work in Progress
KC-4A RD 39 to 106 (20 Km)	600.000	30-06-2011 / 30.06.2012	100/100	Completed
KC-4B Remaining Works of Contract KC-4 RD 106 to RD 531 and Structures from RD 40 to RD 106	641.477	01.02.2017 / 14.09.2017	93.10/100	Contract was terminated under sub clause 49.4 of CoC w..e.f December 14, 2019
KC-04B (R) Outstanding & Remedial Works of Main Canal and Structures from RD 106 to RD 530+400	44.000	28.01.2021 / 28.10.2021	100/100	Completed
KC-5 RD 531 to 1005 (145 Km)	13752	09.09.2006 / 31.12.2014	54/100	Work divided into Joint Venture Partners
KC-5A (R) RD 531 to 616+320 (29 Km) & RD 849 to 856 (30 Km)	2298.400	04.08.2016 / 03.02.2017	100/100	Completed
KC-5B RD 616+320 to RD 749 (40 Km)	1792.324	09.09.2006 30.09.2015	100/100	Completed
KC-5 C RD 749 to RD 848 (30 Km)	1049.115	09.09.2006 31.12.2015	100/100	Completed
KC-5 D RD 856 to RD 1005 (45 Km)	3095.549	09.09.2006 31.12.2016	100/100	Completed

Detail of Contracts

Contract	Cost (Rs. M)	Start/ Completion	Progress % Actual Schedule	Remarks
Baluchistan Province				
KC-6 A RD 1005 to 1126 (49 Km)	1622	28-03-2006 / 31-12-2010	93 / 100	Contractor released from further performance due to change in scope of work as per ECNEC decision. Remaining works of this contract were divided in to three new packages, KC-6A(1R), (2R) & (3R)
KC-6 B RD 1126 to 1322 (48 Km)	5657	08.11.2007 / 31.12.2008	9/100	Contractor released due to security reasons from further performance. Work divided into 4 new Packages i.e. KC-06 B (1R, 2R, 3R & 4R)
KC-6C 12 – Distributaries (72 Km)	2766.956	30.08.2007 / 01.03.2009	47/100	Contractor released from further performance due to change in scope of work as per ECNEC decision.
New Contracts				
KC-6A (1R)	2697.422	23.04.2015 / 18.12.2015	100/100%	Completed
KC-6A (2R)	2787.500	28.11.2014 / 19.12.2015	100/100%	Completed
KC-6A (3R)	2847.674	04.05.2015 / 28.01.2016	100/100%	Completed
KC-6B (1R)	5609.194	04.05.2016 / 30.10.2017	100/100%	Completed
KC-6C (1R)	631.888	18.04.2015 / 13.12.2015	100/100%	Completed

Allocations & Expenditures

(Rs. Million)

Year	Actual Allocation / Releases	Actual Expenditure
2002-03	300.000	348.889
2003-04	900.000	842.977
2004-05	1260.000	1240.376
2005-06	2588.354	2545.519
2006-07	6270.000	6040.059
2007-08	7375.000	7607.196
2008-09	3112.500	3464.161
2009-10	960.000	2172.298
2010-11	700.000	1380.174
2011-12	1900.000	2616.425
2012-13	6400.000	7617.147
2013-14	5235.000	4310.959
2014-15	12000.000	9139.702
2015-16	7131.343	6056.681
2016-17	9115.000	9249.540
2017-18	6500.000	7018.752
2018-19	2000.000	1957.782
2019-20	1320.960	1368.721
2020-21	600.000	600.000
2021-22	1302.000	1302.000
2022-23	1836.911	1836.911
Total	**78,807.07**	**78,716.27**

* Proportionate overhead, central payment and assets are included in the expenditure.

(%age) Phase-I	Planned	Actual
Physical Progress	100%	99.94%
Financial Progress	100%	97.96%

Remaining Works of Kachhi Canal Project (Phase-I) from RD 1193 to 1322 – (40 Km)

Salient Features

PC-I Cost	Rs. 22,921 Million (Approved by ECNEC on March 16, 2020)	
Command Area	30,000 Acres (District Dera Bugti)	
Length of Main Canal (Lined)	40 Km (RD 1193 to RD 1322)	
Distribution System	32 Km District DeraBugti	
Canal Capacity	6,000 Cusec	
PSDP Allocation FY: 2022-23	Rs. 7,150 Million	
Completion Period	03 Years	
Land Acquisition		
Main Canal	40 Km	1194 Acres (1030 Acres Dera Bugti & 164 Acres Naseerabad)
Distribution System	32 Km	1096 Acres (Distt: Dera Bugti

Contract Status

There are 03 No. Contract Packages of Main Canal and Distribution System KC-6B (2R), KC-06B (3R) and KC-06B (4R).

Contract KC-6B (2R) From RD 1193 to RD 1252 (18-Km)

Name of Contractor	M/s Ghulam Rasool Pvt Ltd (M/s GRC)
Contract Cost	Rs. 5,474.65 Million
Notice to Commence	March 26, 2021
Completion Period	15 Months (June 18, 2022) (EOT up to Feb 28, 2023 is under process for approval of Authority).
Defect Liability Period	12 Months
Closing Period	06 Months
Physical Progress	96.25%

Contract KC-6B(3R) From RD 1252 to RD 1286 (11-Km)

Name of Contractor	M/s GRC- KDC (JV)
Contract Cost	Rs. 7,429.20 Million
Notice to Commence	May 31, 2021
Completion Period	15 Months (August 31, 2022) (EOT up to Feb 28, 2023 is under process for approval of Authority)
Defect Liability Period	12 Months
Closing Period	06 Months
Physical Progress	88.20%

Contract KC-6B (4R) From RD 1286 to RD 1322 (11-Km)

Name of Contractor	M/s Ramzan & Sons Pvt Ltd - SWEG (JV)
Contract Cost	Rs. 6,600 Million
Notice to Commence	May 31, 2021
Completion Period	15 Months (August 31, 2022) (TOC issued w.e.f Nov 21, 2022 & EoT up to Nov 26, 2022 Approved)
Defect Liability Period	12 Months (August 31, 2023)
Closing Period	06 Months (Feb 28, 2024)
Physical Progress	99.85%

Financial Status

Up to date Expenditures	21,371.729 Million
Financial Progress	93.24%

Physical Status

Physical Progress (Overall)	94.32%

Scope of Phase-II & III

- The main incremental benefits of the project for irrigation of 611,000 acres land lies in Phase-II & III from RD 1322 to RD 1645.
- The provision of Rs. 120 million for detailed design, survey & investigation and preparation of PC-I for Phase-II has been prepared & submitted to Ministry of Water Resources for approval of competent forum.
- PC-I of Phase-III is under preparation with KCRWC.

Consultancy Services for Remaining Works of Phase-I

- The services of Consultants M/s MMP - DMC (JV) commenced on July 01, 2021.

Way Forward

- Adequate allocation and ensuring timely release of PSDP funds in order to complete the remaining works under Phase-I (RD 1193 to RD 1322) in time.

Remaining Works of Kachhi Canal Project (Phase-I)

Detail of Contracts

Contract	Cost (Rs. M)	Start/Expected Completion	Progress % Actual Schedule	Remarks
KC-06B (2R) RD 1193 – RD 1252, 18Km	5,474.650	26.03.2021/ 31.12.2024	96.25/100	Work in Progress
KC-06B (3R) RD 1252 – RD 1286, 11Km	7,429.208	31.05.2021/ 31.03.2024	88.20/100	Work in Progress
KC-06B (4R) RD 1286 – RD 1322, 11Km	6,600.000	31.05.2021/ 21.11.2022	99.85/100	TOC has been issued as of November 21, 2022

Allocations & Expenditures

(Rs. Million)

Year	Actual Allocation	Actual Expenditure
2020-21	2000	1821.729
2021-22	12,400	12,400
2022-23	7,150	7,150
Total	**21,550**	**21,371.729**

(%age) Phase-I	Planned	Actual
Physical Progress	100%	94.32%
Financial Progress	100%	93.24%

Detailed Annual Plan

Item	Name of Project	Unit	Total Quantity	Physical Targets for 2022 - 23	Actual Achievement for 2022 - 23	Remarks
CANALS	**Kachhi Canal Project Remaining Works of Phase-I**					
	1. Construction of Main Canal and Distribution System					
	a. Earthwork					
	i. Excavation	‰ Cft	925,785.00	933,692.08	916643.20	
	ii. Compaction	‰ Cft	219,831.00	97,821.02	95433.02	
	b. Concrete Lining	%Cft	65,043.00	65,158.00	61383.92	
	c. Structures					
	i. Concrete	%Cft	71,479.00	35,876.84	35661.17	
	ii. Stone Pitching Apron	%Cft	65,029.00	66,227.70	58181.55	
	iii. Piles	Rft	40,981.00	40,981.00	40981.00	

REMEDIAL MEASURES TO CONTROL WATER LOGGING DUE TO MUZAFFARGARH & T.P LINK CANALS

Aims & Objective

The project aims to Control Water Logging in District Muzaffargarh, bring the water logged area under cultivation and increase the yield of crops in the command area of Muzaffargarh Canal.

Brief History

Muzaffargarh and T.P Link Canals are taking off from Taunsa Barrage. After two year construction of Taunsa Barrage (1958) intensive seepage from the sandy banks of Muzaffargarh & T.P Link Canals took place and 35% area presented a picture of total devastation. Lands turned unproductive and farms income reduced to large extent.

Intensive seepage from Muzaffargarh & T.P Link Canals resulted negative impact on human life and inhabitants started to migrate to other area in search of livelihood. Lush green field badly damaged and agriculture production reduced to a significant level.

Water logging has negative impact on stability of buildings, roads etc. The ill effects are visible on road network where the pavements have settled. Ample national resources are being wasted on the maintenance of infrastructure, built in the affected area.

Inhabitants of the area started agitation against this core issue and approached public representative of the area for redressal of the same. Accordingly the concept of this project emerged.

The project area is inter connected with network of road & railways. There exists numbers of Sugar & Textile Mills besides Cotton & Ginning Factories. Most of the people of the area, however prefer farming being small land owners. But due to seepage, their land became water logged & yield has reduced. Implication of proposed remedial measures, will ultimately be beneficial to the inhabitants of the area, when Muzaffargarh & T.P Link Canals are lined, small land owners/farmers will be able to cultivate their land & subsequently increase their per-capita income.

Scope

- Lining of Muzaffargarh Canal from RD 0+000 to RD 206+700 (62 Km) and provision for Drainage System Under Lining
- Rehabilitation of Existing Structures
- Construction of Drains and Rehabilitation of Existing Drains along T.P Link Canal

Contract Packages

MGC-02 Construction of Earthwork, Lining of Canal and Rehabilitation of Allied Structures from RD 39+576 to 100+000.

MGC-03 Earthwork & PCC Lining with Drainage System Under Lining of Muzaffargarh Canal from RD 100+000 to RD 147+500. M/S Ghulam Rasul & Co. Multan

MGC-04 Earthwork & PCC Lining with Drainage System Under Lining of Muzaffargarh Canal from RD 147+00 to RD 206+700. M/S Ghulam Rasul & Co. Multan

TPC-01 Construction of New Drains and Rehabilitation of Existing Drains & Structures

Salient Features

Length of Canal	63 Km
Discharge	Muzaffargarh Canal - 8901 Cusec T.P Link Canal – 12000 Cusec
Project Area:	0.3 Million Acres of Total Command Area of 967000 Acres
Project Cost (Original):	Rs. 8,565.288 Million (Approved by ECNEC on Sep 13, 2013)
(1st Revised):	Rs. 16,017.034 Million (Ministry of PD & SI, Islamabad)
Date of Commencement	January 07, 2014
Expected Completion Date:	Implementation Period December 31, 2023 vide Minutes dated February 09, 2023
PSDP Allocation 2023-24	NIL
Up to Date Expenditure:	Rs. 7,925.793 Million

Consultants

M/s BARQAAB-Indus Associated Consultants Pvt. Limited JV were providing consultancy services w.e.f. May 01, 2014 for design and construction supervision of the project in the capacity of The Engineer and were responsible for the quality of works.

Present Status

- MGC-2 due to paucity of funds/approval of 1st Revised PC-I, contract could not be awarded.
- TPC-01 due to paucity of funds/approval of 1st Revised PC-I, Tendering process could not be started.
- Contract MGC-03 for Construction of Earthwork, Lining of Canal and Rehabilitation of allied structures (14 Km), has been completed.
- Contract MGC-04 for Construction of Earthwork, Lining of Canal and Rehabilitation of allied structures has been completed

Issues

- Early approval of 1st revised PC-1 amounting to Rs. 16,017.034 million would enable project authorities to complete the remaining works of the project; accordingly conceived benefits will be accrued.

Detailed Annual Plan WAPDA (Water Wing) 2022 - 23

Item	Name of Project	Unit	Physical Targets for 2022 - 23	Actual Achievement for 2022 - 23	Physical Targets Fixed for 2023 - 24
CANALS	Remedial Measures to Control Water Logging Due to Muzaffargarh & T.P.Link Canals				
	A. Consultancy	Man Month	20.000	--	20.000
	B. Land Acquisition	Acres	0.000	--	0.000
	C. Civil Works	--	--	--	--
	a. Earthwork	Mcft.	16.154	--	16.154
	b. Lining	Mcft.	0.809	--	0.809
	c. Stone Pitching	% Cft.	276.579	--	276.579
	d. Structures	Nos.	---	--	---
	i. Concrete	% Cft.	404.698	--	404.698
	ii. Steel	Ton	183.222	--	183.222
	iii. Piles	Meter	0.000	--	0.000
	e. Brick Work	% Cft.	72.600	--	72.600

Detail of Contracts

Contract	Cost (Rs. M)	Start/ Completion	Progress % Actual Schedule	Remarks
MGC-2 RD 39+576 to RD 100+000	4107.062	01.07.2018 30.06.2020	---	Tendering process could not be started due to 1st Revised PC-I under process
MGC-3 RD 100+000 to RD 147+500	4632.877	07.01.2014 30.04.2018	100 %	Completed
MGC-4 RD 147+500 to RD 206+700	2284.552	07.01.2014 31.01.2017	100 %	Contract Terminated w.e.f. January 31, 2017 due to paucity of funds
TPC-01 Construction of Drains & Rehabilitation of existing Drain along T.P. Link Canal	2028.555	01.01.2019 30.06.2020	---	Tendering process could not be started due to 1st Revised PC-I under process

REMEDIAL MEASURES TO CONTROL WATER LOGGING DUE TO MUZAFFARGARH & T.P.LINK CANALS RELEASES & EXPENDITURES (Rs. In Million)

Financial Year	Allocation	Expenditure
2012 - 2013	500	17.913
2013 - 2014	---	338.263
2014 - 2015	1450	1005.478
2015 - 2016	1300	1881.976
2016 - 2017	979.463	972.850
2017 - 2018	1770	1774.030
2018 - 2019	1500	1446.575
2019 - 2020	426.330	252.914
2020 - 2021	---	---
2021 - 2022	---	---
2022 - 2023	---	---
Total	**7925.793**	**7,689.999**

* Proportionate overhead, central payment and assets are included in the expenditure.

(% Age) Phase - I (Part - A)	Planned	Actual
Physical Progress	100 %	50 %
Financial Progress	48.00 %	*47.50 %

* 1st Revised PC-I amounting to Rs. 16,017.034 Million is under process.

INTERNATIONAL WATERLOGGING & SALINITY RESEARCH INSTITUTE (IWASRI)

Introduction

The International Water Logging and Salinity Research Institute (IWASRI) was established under the Ministry of Water and Power (MoWP), Government of Pakistan in 1986 to conduct and coordinate research pertaining to water logging, salinity, irrigation and drainage. The administrative control of IWASRI was given under WAPDA.

Objectives of IWASRI

The basic objective of IWASRI is to identify, manage and coordinate research; to develop economical solutions to problems of Water Logging and Salinity and to disseminate these solutions to beneficiaries. The Institute forms the nucleus for research in the fields of water logging, water management, groundwater and salinity. It is now recognized as an International Research Institute. The main objectives of the Institute are:

- To establish working relationships with all the National and International Institutes dealing with water logging and salinity in order to bring together the latest research and experience for; (i) review and dissemination, and (ii) to identify areas of fruitful research.
- To conduct and foster a comprehensive multi-disciplinary research program in a coordinated fashion on water logging and salinity problems, the solution of which would have a high potential for agricultural development and environmental improvement.
- To determine the program of investigations, survey and research of the national organizations dealing with the subjects and to prove technical assistance to them; and
- To improve the capacity of community organizations to utilize waterlogged and salt

affected lands and to manage irrigation and drainage systems.

Importance of IWASRI & Benefits
IWASRI is one of the research organizations working in the field of Water Resources Management, Water Logging & Salinity, and Groundwater and Environmental issues. IWASRI is working on these problems with the aim to develop economically feasible solutions and disseminate these solutions to the Planners of Federal and Provincial Departments, Ministry of Water Resources, Researchers, Universities, Students of M.Sc. /Ph.D. levels and other beneficiaries/farmers.

Research Activities
IWASRI conducts and controls its research program through four research management and development sections.

IWASRI Research Sections
(i) Drainage
(ii) Water Management & GIS
(iii) Salinity & Environment
(iv) Technology Transfer & Coordination

Current Activities
At present, IWASRI and Allied Office's (MREP & LIM Project) PC-II Titled "Quantification of Surface Water Losses and Soil Salinity Survey of Indus Basin Irrigation System" (4 years Project) is under process in Planning Commission, which includes following Research Studies as under:

1. Quantification of Unaccounted surface water through Indus Basin's unaccounted water and Assessing Lagtime in Critical River Reaches.
2. Soil Salinity Mapping of Indus Plain for Spatio-temporal Variation Assessment Using Remote Sensing and Machine Learning Tools.

Study # 1
Quantification of Unaccounted Surface Water through Indus Basin's unaccounted water and Assessing Lag-time in Critical River Reaches

Study Area
Whole IBIS d/s Tarbela till Kotri Barrage

Objectives
- To quantify different types of major water losses in IBIS downstream Tarbela till Kotri Barrage.
- To simulate and study the variation in quantum of losses under different river flow conditions in the backdrop of climate change
- To calculate lag time in critical reaches of Indus River and its tributaries for efficient water releases in the rivers & irrigation network and for proper flood control

Expected Outcomes
- For sound management of existing water resources of Pakistan
- Prioritizing water conservation strategies leading to significant water savings
- Saved water could be utilized to bring additional land under cultivation
- Increasing per unit productivity of available water, facilitating uplifting of living standards of farming community, leading to poverty alleviating in the irrigated areas
- Supportive in strengthening the national economy
- Similarly lag time computation is helping tool for IRSA, for justified water distribution among the provinces
- Useful for efficient flood risk management minimum life/infrastructure losses in flood areas

Study # 2
Soil Salinity Mapping of Indus Plain for Spatio-temporal Variation Assessment Using Remote Sensing & Machine Learning Tools

Study Area
Canal Command Area of Indus Basin Irrigation System (IBIS)

Objectives
- To check the current status of soil (Surface & Profile) salinity in the irrigated areas of IBIS
- To assess the spatial and temporal changes in soil salinity in comparison with the last surveys
- To classify irrigated areas of whole IBIS based on the severity of soil salinity for remedial measures and / or recommending appropriate land use options

Expected Outcomes
- For comparing the last survey findings (2001-03 by IWASRI)
- Highlighting the severity of soil salinity in different areas w.r.t. spatio temporal variation on account of prevalent climate change scenario.
- This info will be utilized for the zoning of whole Indus Plain based on soil salinity
- For developing policy guidelines for implementing a long term salinity management strategy for irrigated agriculture, rendering pronounced economic benefits

Way Forward
- PC-II has been cleared by SRC WAPDA.
- Will be submitted to MoWR after review/signatures of Member (Water) and Chairman WAPDA.
- Netherlands (ILRI) and Australian (ACIAR) Govts. are being contacted for technical collaboration with IWASRI.

Furthermore, IWASRI has proposed the following projects:

Project No. 1
Title: Use of Ravi River Channel for Aquifer Recharge
Duration: April-2023 to June-2023

Study Area
Ravi River d/s Ravi Syphon upto Sidhnai Barrage

Basis of Selection
- Bari Doab most depleted area in IBIS;
- >70% area is overly depleted (DTW>12m);
- Pumping is ~55% more than recharge from all sources;
- Lack of knowledge regarding aquifer lithology,hydrogeology, and total groundwater availability.

Objectives
1. Lithological mapping of aquifer in the selected areas of Bari Doab, following World Water Day 2022 theme of Making the Invisible Visible;
2. To evaluate aquifer's physical characteristics like permeability and specific yield etc. by setting up pumping tests at various locations;
3. Assessing total groundwater availability and groundwater recharge potential in the aquifer underneath Ravi River;
4. To quantify total surface water demand for use of Ravi River bed as recharge source.

Expected Outcomes
This study will help in highlighting the total groundwater recharge potential in the aquifer for future water availability, water budget, and 3D mapping of the aquifer. These results will be insightful for mitigating the accelerated groundwater depletion in Bari Doab and proposing the demand of water to release in Ravi River for aquifer recharge.

Project # 2
Title: Use of Sutlej River Channel for Aquifer Recharge

Objectives
1. Litho logical mapping of aquifer in the selected areas of Sutlej River Basin;
2. To evaluate aquifer's physical characteristics like permeability and specific yield etc. by setting up pumping tests at various locations;
3. Assessing total groundwater availability and groundwater recharge potential in the aquifer underneath Sutlej River.

Expected Outcomes
This study will help in highlighting the total groundwater recharge potential in the aquifer for future water availability, water budget, and 3D mapping of the aquifer. These results will be insightful for mitigating the accelerated groundwater depletion in Sutlej River Basin and proposing the demand of water to release in Sutlej River for aquifer recharge.

In addition to above, IWASRI participated in PCRWR's consultative workshop held in Lahore on the research study "Real time Ground Water Monitoring & Advisory Services in Chaj Doab". IWASRI also contributed in consultative meeting in Lahore regarding "Governance of Ground Water in Pakistan by Pakistan Council of Research in Water Resources (PCRWR). Further, IWASRI joined the session "Maintaining Productivity of Salinity-affected Landscapes in the Indus Basin" during Pakistan Water Week at Islamabad arranged by International Water Management Institute (IWMI), Pakistan.

MONA RECLAMATION EXPERIMENTAL PROJECT (MREP), BHALWAL

Background
The Pakistan Water and Power Development Authority (WAPDA) started the Programme of Salinity Control and Reclamation Projects (SCARPs) in 1959, to overcome the problems of waterlogging and salinity. Soon after the completion of many SCARPs, it was realized that with the increased water supplies, conveyance and application losses increased significantly and water quality was changed. In order to identify the problems related to SCARP's and to develop solutions, the Mona Reclamation Experimental Project (MREP) was established in 1965.

The Mona Reclamation Experimental Project (MREP) had done research activities in association with reputed National and International Research Institutes like Pakistan Agricultural Research Council (PARC), Pakistan Council of Research in Water Resources (PCRWR), Ayub Agricultural Research Institute (AARI), and Nuclear Institute for Agriculture and Biology (NIAB), International Water Management Institute (IWMI), Ghazi Barotha Hydropower Project (GBHP) etc.

Publication's Issued
So far, MREP has been credited for the following publications to date;

-	Technical Publications	294 Nos.
-	Internal Reports	48 Nos.
-	Technical Papers	137 Nos.

Management of MREP
The MREP is working under the guidance of General Manager (Central) Water and administratively under Director General (IWASRI) WAPDA. At the project level, the Project Director is in-charge of project affairs. Research Program of MREP is conducted through its research management section.

The Research Section (Agronomy) assists in developing technologies for the efficient use of land and water resources to enhance agricultural production. It constitutes Senior Research Officer, Research Officer & other Field Staff. The research team is responsible for planning and executing research studies in the fields of land utilization, crop management and water resources.

Research Activities
The proposed PC-II for Research Studies titled "Quantification of Unaccounted Surface Water and Soil Salinity Survey of Indus Basin Irrigation System" for IWASRI, LIM and MREP is under process.

Study-I
Quantification of Unaccounted Surface Water through Indus Basin's Unaccounted Water and Assessing Lag-Time in Critical River Reaches

Objectives
- To quantify unaccounted Surface Water including losses and gains in Indus Basin's unaccounted water
- To simulate and Study the variation in quantum of losses and gains under different River-Flow Conditions in the backdrop of Climate Change
- To validate the robustness/accuracy of existing Rating Curves for Discharge Calculation at different Control Structures
- To calculate Lag-time in Critical Reaches of Indus River and its Tributaries for efficient Water Releases in the Rivers & Irrigation Network and for Proper Flood Control

Study-II
Soil Salinity Mapping of Indus Plain for Spatio-temporal Variation Assessment Using Remote Sensing and Machine Learning Tools

Objectives
- To check the current status of Soil (Surface & Profile) Salinity in the Irrigated Areas of IBIS
- To assess the Spatial and Temporal Changes in Soil Salinity in comparison with the last Surveys
- To classify Irrigated Areas of whole IBIS based on the severity of Soil Salinity for Remedial Measures, and/or recommending Appropriate Land Use Options

LOWER INDUS WATER MANAGEMENT & RECLAMATION RESEARCH PROJECT (LIM), WAPDA, HYDERABAD

Introduction
LIM Project since 1980 is conducting field-oriented research on modest scale to develop technologies for the optimum use of land and water resources. LIM Project carries out research activities in the Lower Indus region on the farmers' fields through its two sections i.e. Soil and Water Quality Section, Water Management & Hydrology Section.

Objectives
- To investigate solutions through Research and Demonstration for usage of Saline Groundwater for Soil Reclamation
- To determine optimum Crop Input-Output Relationship
- To disseminate Research Findings to the End Users for Application
- To evaluate Economic Feasibility of Tested Technology

Achievements
So far, LIM Formation has carried-out research works on different Engineering core issues especially in Sindh and Balochistan Provinces, LIM has published 137 Research Reports,121 Interim Reports including Annual Reports, Status Reports, Annual Research Work Plan, Project Briefs, Research Proposals and 28 Technical Papers.

Completed Research Work (2017–2022)
PC-II amounting to Rs. 441.889 was approved by the Ministry of Water and Power (GOP), where in LIM Project share was Rs. 152.325 amounting to Rs. 182.394 million for research activities on "Devise Economical Canal Lining Technologies for adoption and evaluate their Prospects, difficulties in Irrigated Areas" for the period 2017-18 to 2020-2022. By taking hectic and vigorous steps by the LIM Office, the said research work was completed in June-2022 and the Final Report was disseminated to concerned quarters accordingly.

Proposed Research Work (2023–2027)

"QUANTIFICATION OF UNACCOUNTED SURFACE WATER & SOIL SALINITY SURVEY OF INDUS BASIN IRRIGATION SYSTEM"

(a) Study Area
Indus River, Guddu Barrage to Kotri Barrage (LIM Project Portion)

(b) Objectives of Study
- To quantify unaccounted Surface Water including

losses and gains in Indus Basin unaccounted water
- To simulate and Study the variation in quantum of losses and gains under different River Flows
- To validate the Robustness/Accuracy of existing Rating Curves for Discharge Calculation at different Control Structures
- To calculate Lag- time in Critical Reaches of Indus River and its Tributaries for efficient Water Releases in the River and Irrigation Networks and for proper Flood Control

(c) PC-II Cost
Rs.2,466.990 Million

(d) Status of the Proposed Study
The proposed study has been submitted to Ministry of Water Resources (MoWR), GoP which is under process of approval.

INTERNATIONAL SEDIMENTATION RESEARCH INSTITUTE, PAKISTAN (ISRIP)

WAPDA after obtaining Concept Clearance from GOP transformed the ACOP into an Institute, named International Sedimentation Research Institute of Pakistan (ISRIP) in 1993.

Objectives of ISRIP
The ISRIP's objective is to undertake research for developing means to manage sediment load through:
- Field Measurements
- Laboratory Analysis
- Data Processing
- Research Management using Modern Techniques.

Services Provided by ISRIP
- Hydraulic and Sedimentation Measurements
- Hydrographic Survey
- Bathymetric Survey
- Morphologic Survey
- Inspection of Under Water structure
- Seepage Analysis
- Chemical Analysis
- Training Programs

Projects have been Completed During Year 2022-23

1. **Sedimentation Survey of Hill Torrents, D.G Khan 2022 (5-Sites)**
Chief Engineer D.G Khan Zone, Dera Ghazi Khan requested International Sedimentation Research Institute, Pakistan (ISRIP) via office letter No. Works/2020/8160-64 dated July17, 2020 to continue sedimentation survey at following four Hill Torrents.

(i) Zinda Pir at Suri Lund Hill Torrents
ii) Saurah at Sanghar Hill Torrents
iii) Chachar Hill Torrents
iv) Vidore Hill Torrents
v) Bharti Hill Torrents

The work plan and cost estimate were prepared for carrying out the sedimentation survey. After acceptance of the work plan and cost estimate ISRIP field teams were mobilized.

After installation of camps at proposed sites, ISRIP field teams started the field activities for sedimentation study at above mentioned hill torrents.

Later on Sedimentation Study at Barthi Bridge Site was also included in scope of work and after approval from competent authority, camp was established near Barthi Bridge in the month of September, 2021.

This report (ISRIP-328) describes scope of work, methodology for discharge measurement, collection and analysis of sediment samples, presentation of results and conclusions.

2. **PSD & Mineralogical Test at Partab Bridge & Shatial Bridge**
General Manager (DBDC) from Diamer Basha Development Company (Pvt) Limited approached International Sedimentation Research Institute of Pakistan (ISRIP) to submit cost estimate for PSD analysis and Mineralogical Test at Partab Bridge/Bunji and Shatial Bridge. In response to it, ISRIP submitted cost estimate and after administrative approval from competent authority field team was mobilized on August 18, 2021. In order to establish the spatial and temporal variation in PSD and corresponding mineralogical composition of suspended sediments along Indus River, it was recommended that sampling may be carried out at two locations and for a period of one year covering both high and low flow season. The results of these tests will be used to estimate the spatial and temporal variation of abrasive minerals in suspended sediments and to maintain pre-impounding record.

After technical sanction suspended sediment sampling was started on August 18, 2021 and assigned task was completed on July 22, 2022.

This Report (ISRIP-329) is the outcome of ISRIP's activities carried out for PSD Analysis and Mineralogical Test at Partab Bridge/Bunji and Shatial Bridge.

3. **Discharge Measurement & Sediment Sampling from Ravi Syphon to New Ravi Bridge**

Ravi River Urban Development Project (RRUDP) is an urban development mega project in Lahore District. It comprises river front development on both sides of the Ravi River of about 46 km long stretch. This reach will be impounded with fresh perennial water. The project extends from 5 km downstream of Ravi Syphon to proposed location of barrage No. 3 in the vicinity of Sharaqpur Town, the project has planned to be implemented in three phases. Major developments under the project include three new barrages, islands, a network of connection roads/bridges and multipurpose building infrastructure etc.

For the development and calibration of the numerical model, flow measurements and sediment sampling of River Ravi is required. In this regard, the services of International Sedimentation Research Institute, Pakistan (ISRIP) are hired to achieve the objectives of project.

The ISRIP field team commenced the field activities as per schedule mentioned in TORs after receiving letter of commencement from Executive Director Engineering, RUDA dated August 03, 2022. The Discharge Reading will be provided on monthly basis.

4. **Sedimentation Study of Shtung Nallah Diversion Project Gilgit Balitistan**

General Manager Projects (NA), GPHP Colony, Hattian approached International Sedimentation Research Institute, Pakistan (ISRIP) to submit the cost estimate for Hydrographic Survey and Sedimentation Study of Shatung Nullah vide letter No.GMP(NA)/ SNDP/PC-II/Sediment Study/2313-14, dated July 08, 2021.

Accordingly ISRIP prepared and submitted the cost estimate to carry out the Hydrographic Survey and Sedimentation Study. After obtaining approval from the competent authority, the field team was moved to carry out the field activities. The field activities were completed within assigned time period.

This report (ISRIP-332) presents Objective of Study, Scope of Work, Field Procedures, Results of Hydrographic Survey and Sedimentation Study i.e. Cross Sectional Data and its Plotting, Storage Capacity, Thalweg Profile, Contour Plans of the Study Area, Discharge Rating Curve, Discharge Table, Suspended Sediment Analysis Data, Sediment Load and Sediment Rating Curve.

5. **Additional Cross-section Survey for Reservoir Sedimentation Study (Dasu HPP)**

Chief Engineer (S&D) Dasu HPP, WAPDA approached General Manager/PD (KCP/C) Water WAPDA to submit proposal for carrying out additional cross section survey of Dasu HPP. Letter of Chief Engineer (S&D) was forwarded to ISRIP's office to submit the cost estimate for performing additional cross section survey for reservoir sedimentation study at Dasu HPP vide letter No. GM/PD/DHPP/ S&D/MW-01/12962-64, dated September 29, 2022.

Accordingly ISRIP prepared and submitted the cost estimate to carry out the hydrographic survey. After obtaining approval from the competent authority and receiving funds, the field team was moved to carry out the field activities. The field activities were completed on within assigned time period.

This report (ISRIP-331) presents Objective of Study, Scope of Work, Field Procedures, Photo Gallery and the Results of Hydrographic Survey i.e. Cross Sectional Data and its Plotting and Thalweg Profile of the Indus River at surveyed portion.

6. **Bathymetric Studies of Stone Pitching at Kotri Barrage 2023**

Chief Engineer Irrigation Kotri Barrage, Hyderabad approached International Sedimentation Research Institute, Pakistan (ISRIP) to conduct Bathymetric Studies of Stone Pitching Sites of Kotri Barrage vide letter No. CDM/Bathymetric/Barrage/587/2023 dated July 05, 2023.

Accordingly ISRIP prepared to carry out the Bathymetric Studies. The field team was mobilized to carry out the field activities. The field activities were completed within assigned time period. This Draft report (ISRIP-333) Presents Objective of Study, Scope of Work, Field Procedures, Results of Bathymetric Studies and i.e. Cross Sectional Data and its Plotting, Observing Bed Level and Thalweg Profile.

7. **Discharge Measurement & Sediment Sampling at Mohmand Dam**

The agreement was signed between CGGC Mohmand Dam Hydropower Project Management in Pakistan and International

Sedimentation Research Institute of Pakistan (ISRIP-WAPDA).

Project Manager CGGC approach International Sedimentation Research Institute of Pakistan for taking suspended sediment samples from four different locations and their sediment analysis, Chemical Analysis and Petrography Analysis in ISRIP Laboratory. In response to it, ISRIP field team was mobilized and performed suspended sediment sampling at desired locations whose results are attached in this report.

This data report describes the scope of work, methodology of field work, equipment utilized, sediment analysis data and photo gallery.

8. **Underwater Inspection of Rawal Dam**
Executive Engineer Small Dams Cricle-I, Islamabad approached International Sedimentation Research Institute, Pakistan (ISRIP) to conduct Underwater Inspection of Upstream Face of Spillway Physical Condition of Filp Bucket of Rawal Dam vide letter No. PDC-I/2023/1415-1/RWD-1 dated May 11, 2023.

Accordingly ISRIP prepared and submitted the cost estimate to carry out the Underwater Inspection of Rawal Dam.

ISRIP field team was mobilized and performed underwater Inspection of Rawal Dam with the help ROV. The field activities were completed within assigned time period.

The Ongoing Projects During Year 2022

1. **Monitoring & Evaluation of Suspended Sediments & Bed Load Transport in Nara Canal**
The basic purpose of this project is to study the Monitoring and Evaluation of Suspended Sediments and Bed Load Transport in Nara Canal project. Physical activity is in Progress.

2. **Chemical Analysis**
Water chemical analysis is done in ISRIP laboratory of Surface Water Hydrology Project and CMTL (Central Material Testing Laboratory). The Complete detail data is submitted to client as receiving of these samples.

3. **Hydrographic Survey of Simly Dam 2022**
Objective of this study is Hydrographic Survey of Simly Dam. Field Work has been completed and final report writing is in progress.

4. **7th Hydrographic Survey of Chashma Reservoir 2022**
This project is started to know the updated capacity of Chashma Reservoir. Field work is completed and Final data report writing is in progress.

5. **Hydrographic Survey of Hub Dam Project**
The Cost Estimate is submitted and Technical Sanction has been accorded. Field work is in progress.

6. **Indus Basin Irrigation System (IBIS) Automation of 07 Key Side for Discharge Monitoring Projects**
Objective of this study is discharge measurement and sedimentation research. Field Work has been completed and final report writing is in progress.

7. **Indus Basin Irrigation System (IBIS) Automation of 18 Key Side for Discharge Monitoring Projects**
Objective of this study is discharge measurement and sedimentation research. Field Work has been completed and final report writing is in progress.

8. **Bathymetric Survey and Cross Sections Along the Indus River for Diamer Basha Dam Site**
In this deposit work cross-sectional survey of Bathymetric Survey and Cross Sections along the Indus River for Diamer Basha Dam Site. Field work is in progress.

SCARPS MONITORING ORGANIZATION (SMO)

Introduction

SCARPS Monitoring Organization (SMO) was established in 1968 to conduct pre and post project monitoring data for surface and sub-surface drainage projects. Presently, SMO is conducting hydrological monitoring; Depth to Water Table (DTW), Water Quality Monitoring(WQM) of 49 canal command of all provinces on bi-annual basis along Indus Basin Irrigation System (IBIS).

The Depth to Water Table and Water Quality Monitoring Data of entire 49 canal commands area of Punjab, KP, Sindh and Balochistan provinces are analysed and maps are developed using GIS technique. SMO-I Lahore Office is conducting hydrological and water quality monitoring of ground water in 26 canal command area of Punjab and 06 canal command area of KP and Surface Water as Lakes, Drains, River, Private Tube Wells and Tile Drainage Projects in Punjab and KP provinces whereas, SMO-II Hyderabad

Office is conducting hydrological and water quality monitoring of ground water in 14 canal commands of Sindh and 03 canal commands of Balochistan and Surface Water as Lakes, Drains, River, Private Tube Wells and Tile Drainage Projects.

Location of SMO Work Field

Presently SMO Office is established with two official setups; SMO-I Office Lahore and SMO-II Office at Hyderabad to monitor Depth to Water Table (DTW) and Water Quality Monitoring (WQM) along Upper and Lower Indus Basin Irrigation System respectively.

Objectives of SMO

1. Hydrological Monitoring; Depth to Water Table (DTW) of 49 canal commands (47.77 Million Acres) area on bi-annual basis of Punjab, KP, Sindh and Baluchistan provinces in order to determine the status of groundwater in Indus Basin Irrigation System (ISIB)

2. Water Quality Monitoring of tube wells, main drains, rivers, lakes and ponds to delineate the area / region as usable, marginal and hazardous zones

3. The SMO monitors the canal commands of Indus Basin Irrigation System (ISIB) in order to decide trends of waterlogging, safe water zone and highly water depleting areas. These crucial studies/monitoring help the decision makers for issuing guidelines/directions for controlling waterlogging and maintain ground water aquifer at safe depth

Project Financing

- The project is financed through PSDP funding approved by CWDP on prescribed PC- II proforma for four (04) year basis.

Scope of SMO PC-II

- Bi-annual (Pre and Post Monsoon) Hydrological monitoring of Depth to Water Table (DTW) of 49 canal commands of Punjab, KP, and Sindh and Baluchistan provinces in order to determine the status of groundwater in Indus Basin Irrigation System (ISIB)
- Water quality testing of samples from underground, drains, rivers, canals
- Installation of new deep observation wells/piezometers have been completed

Project Details

Item	Description
Project Name	Land & Water Monitoring /Evaluation of Indus Plains by SMO
Location	Irrigated areas of Indus Plain (all over Pakistan)
Salient Features	1. Hydrological Monitoring (DTW) of Indus Basin Irrigation System
	2. Water Quality Monitoring (WQM) of River Water, Tube wells, Drains, Lakes at Strategic Locations
	3. Installation of New Piezometer
Approval Status	PC-II Amounting to Rs. 410.00 Million Approved by CDWP on May 24, 2018
Commencement	July 01, 2019
Date of Completion	June 30, 2023

Physical Progress for 2022-23

Activities	Progress
Hydrological Monitoring (DTW)	● Monitoring of observation wells for Post-Monsoon 2022 and Pre-Monsoon 2023 has been completed
Water Quality Monitoring (WQM) of Ground Water	● Water samples from rivers, drains and canals were collected during Post-Monsoon – 2022 and Pre-Monsoon 2023 and their chemical analysis has been completed and results being prepared.
	● Water Chemical Analysis of samples from underground water, rivers, drains and canals collected during Post-Monsoon, 2022 and has been completed
Installation of Piezometers	● Installation of total 200 Nos. piezometers for financial year 2022-23 has been completed.
Publishing of Reports	● Land and Water Monitoring / Evaluation of Indus Plain by SMO
	● Ground Water Table and its quality fluctuations in Mardan Area KPK
	● Water Quality Monitoring of Rivers, its major canals and drains KPK and Punjab

Overall Physical Progress: 92.96 %

Year Wise Allocation, Release and Expenditures

Year	Allocation (As per PC-II)	PSDP Allocation	PSDP Releases	Expenditure (June 30, 2022)
2019-20	86.559	50.00	50.00	50.00
2020-21	99.414	108.00	108.00	108.00
2021-22	107.241	126.00	126.00	126.00
2022-23	116.786	126.00	126.00	126.00
Total	**410.00**	**410.00**	**410.00**	**410.00**

Financial Progress: 100%

WATER DIVISION (SOUTH)

LOWER INDUS RIGHT BANK IRRIGATION & DRAINAGE PROJECT STAGE-I (RBOD-I)

Location

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 & Jamshoro of Sindh Provinces.

Objectives of the Project

The project aims at providing the much-needed outfall 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 Creek. 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 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 covers 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.

Salient Features

Commencement Date	July, 1994		
Date of Completion	June 03, 1998 (As per Original PC-I) Completion as per 1st Revised PC-I is December 31, 2008 Completion as per 2nd Revised PC-I is June 30, 2020		
Gross Command Area	517,310 Acres		
Components			
Indus Link Widening and Construction	Length	:	17.87 Km
Balance Work of IL-1 including its widening from RD 0+000 to 22+017	Capacity	:	3500 Cusec
Contract No. R1(E)	Contract Cost	:	Rs.152 Million
	Progress	:	81.91%
Widening of IL-2 & IL-3 for 3500 Cusec from RD 22+017 to 80+282			
Contract No. R1(B).	Length	:	6.71 Km
	Capacity	:	3500 Cusec
	Contract Cost	:	Rs. 72.59 Million
	Progress	:	87.03%

Extension of RBOD Up to Miro Khan Zero Point Extension to MKZP from RD 0+000 to 132+600	Length Capacity Contract Cost Revised Progress	: : : : :	40.41 Km 2322 Cusec Rs. 609.547 Million (592.157) Million 85.60%
Remodeling of MNVD for 3500 Cusecs Drainage Effluent Remodeling of MNVD from RD 220+000 to 342+220. Contract No. R-III (a/1).	Length Capacity Contract Cost Progress	: : : :	37.25 Km 3500 Cusec Rs. 525 Million 100%, Work completed
Remodeling of MNVD from RD 110+000 to 220+000 Contract No. R-III (a/2)	Length Capacity Contract Cost Progress	: : : :	33.52 Km 3500 Cusec Rs. 315 Million 100%, Work completed
Remodeling of MNVD from RD 000+000 to 110+000. Contract No. R-III (a/3)	Length Capacity Cost Progress	: : : :	33.52 Km 3500 Cusec Rs. 367.569 Million 63%
Rehabilitation of Rato Dero Surface Drainage Project Balance Work of Rato Dero Pump Station Contract No. RTD-I (B)	Contract Cost Progress Work has been completed and handed over to Provincial Irrigation Department GoS on February 15, 2016	: :	Rs. 16.500 100%
Monitoring the Quality of Effluent of Project Area work is being carried out through SWHP as deposit work.	Work is being carried out by SWHP through Deposit Work		
New Hamal Regulator at RD 342 of MNVD Contract No. RIII (a/4).	Contract Cost Progress Work has been completed and handed over to Provincial Irrigation Department GoS on July 16, 2015	: :	Rs. 175.896 Million 100%

2. Balance Work of Remodeling of MNVD (RD 0 to 110) and Additional Structures from RD 110 to 220 Contract No. : Rem-RBOD-I (MNVD)	Length : 33.52 Km Capacity : 3500 Cusec Contract Cost : 504.036 Million Progress : 99.20% (The works completed and handing/ taking over is under process with GOS)
3. Balance Work of RBOD Extension (MNVD) i/c Additional Structures from RD 00 to RD 132+600 & from RD 220 to RD 342 Contract: RR-R1AI	Length : 40.41 Km Capacity : 2322 Cusec Contract Cost : 618.022 Million Progress : 99.10 (The works completed and handing/ taking over is under process with GOS)
4. Monitoring the Quality of Effluent of Project Area work is being carried out through SWHP as deposit work.	Work is substantially completed.
Project Cost	PC-I (Original) : Rs. 4,395.000 Million (Approved by ECNEC on September 18, 1994) PC-I (Revised) : Rs.14, 707.143 Million (Approved by ECNEC on November 30, 2006) 2nd Revised PC-I : Rs.17, 505.018 Million (Approved by ECNEC on July 26, 2017)
Project Funding	Government of Pakistan
Executing Agency	WAPDA
EIRR	19.3%
Consultants	M/s. NDC, BARQAAB & Ease-Pak and Consultancy Service expired on December 31, 2010. M/s G3 Engineering Consultants (Pvt.) Ltd
Expenditure up to 06/2023	Rs. 17,965.421 Million (Including WAPDA Bridge Financing amounting to Rs.460.403 Million)
Overall Physical Progress	100%
Overall Financial Progress	100%

Project Benefits

- The primary objectives of the works included in LIRB Project Stage-I Priority Works is to provide much needed outfall facilities for the existing and proposed 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.

Present Status / Remarks

- Handing / Taking Over process of RBOD-I was taken up with Irrigation Department, Govt. of Sindh in 2020. However, works are still not taken over by Irrigation Department Govt. of Sindh due to flood-2022 damages.
- PC-I for Restoration of Flood 2022 Damages comprising RBOD-I Project works with an amount of Rs. 8,332.342 million has been submitted to Ministry of Water Resources Government of Pakistan for its approval from Competent Forum, which has uploaded on IPAS on June 08, 2023.
- 3rd Revised PC-I comprising WAPDA Bridge Financing & Liabilities amounting to Rs. 18,277.434 million has been submitted Ministry of Water Resources for approval of Competent Forum.

DRAINAGE PROJECT BALUCHISTAN EFFLUENT DISPOSAL INTO RBOD (RBOD-III)

Location
Project is located on the right bank of River Indus lies between the latitude of 27°-54' & 28°-40' and longitude of 67°-39' and 68°-51' Mostly it is spread within the area of Districts Nasirabad and Jaffarabad of Baluchistan and District Jacobabad and Kambar-Shahdadkot of Sindh Province.

Scope of work
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. Conservation of Hamal and Mancher Lakes and environment condition will improve over Gross Commanded Area (GCA) of 287,106 hectares. The project comprising following components:

i. Hairdin Carrier Drain Extension from Chukhi to MKZP and 6 km North of Chukhi
ii. Construction of Irrigation Channel for Reutilization of 400 Cusec of Balochistan Effluent
iii. RBOD Extension from MKZP to Hairdin Pump Station
iv. Re-modeling of Shahdad Kot Main Drain
v. Surface Drainage System of Usta Muhammad Unit
   - Hadero Drainage Unit
   - Usta Muhammad Drainage Unit

vi. Balance Work of RBOD Extension Drain RD 161+000 to RD 284
vii. Balance Work of Hadero Branch Drainage System
viii. Balance Work of Usta Muhammad Main Drainage System

Status
Construction of Hairdin Carrier Drain Extension from Chukhi to MKZP and 6 km North of Chukhi

Salient Features

EIRR	14.80%
Executing Agency	WAPDA
Consultants	M/s G3 Consultants (Pvt.) Ltd. in Association with BM Consulting Engineers Lahore
Contractor	M/s Hasas-Tameer Associates (JV) M/s Tameer Associates – Hasas (JV) M/s Ramzan & Sons Pvt. Ltd.
Commencement Date	July 2004
Completion Date	June 30, 2021

Contract R-III (c). The portion pertaining to Govt. of Baluchistan handed over to Irrigation Department Govt. of Baluchistan whereas portion pertaining to Govt. of Sindh by Irrigation Department is under process with Govt. of Sindh.
Earth Work 141.360 Mcft.
Structure 36 Nos.

Construction of RBOD Extension from MKZP to Hairdin Pump Statio. According to Contract Clause 66.1 of GCC, contractor was released from further Performance of Contract R-III (b), due to financial constraints.
Earth Work 222.920 Mcft.
Structure 85 Nos.

Construction of Irrigation Channel up to Chitti River Contract R-III (f). The works completed & handed over to Govt. of Baluchistan).
Earth Work 46.991 Mcft.
Structure 79 Nos.

Construction of Hadero Drainage Unit Contract R-III (d/1). According to Contract Clause 66.1 of GCC, contractor was released from further performance due to financial constraints.
Earth Work 39.534 Mcft.
Structure 54 Nos.

Construction of Usta Muhammad Drainage Unit Contract R-III (d/2). According to Contract Clause 66.1 of GCC, contractor was released from further performance due to financial constraints.
Earth Work 43.050 Mcft.
Structure 77 Nos.

Re-modeling of Shahdad Kot Main Drain Contract No. R-III (b/1). The works completed & handing / taking over is under process with Govt. of Sindh.
Earth Work 132.019 Mcft.
Structure 31 Nos.

Arrangements for opening of Syphon No. 2 at Saifullah Magsi Canal Contract No. R-III (b/2). The works completed & handing – taking over is under process with Govt. of Sindh.
Earth Work 1 Mcft.
Structure 02 Nos.

Balance Work of RBOD Extension Drain RD 161+000 to 284+000. Contract No. R-III (b/3). The works completed & handing / taking over is under process with Govt. of Sindh.
Earth Work 120.300 Mcft.
Structure 28 Nos.

Financial Status	Local (Rs. Million)	FEC (Rs. Million)	Total (Rs. Million)
Approved PC-I Cost	4,485.200	---	4,485.200
1st Revised Updated PC-I Cost	10,804.540	(ECNEC Approved on July 26, 2017)	
PSDP Allocation 2021-2022	---	---	---
Overall Expenditure (as on 30 June, 2023)	10,946.081	---	*10,946.081

* Including IDC, Overhead & WAPDA Bridge Financing

Balance Work of Hadero Branch Drainage System Contract R-III (d/3). The works completed & handed over to Govt. of Baluchistan.

Earthwork 68.364 Mcft
Structure 216 Nos.

Balance Work of Usta Muhammad Drainage System Contract R-III (d/4). The works completed & handed over to Govt. of Baluchistan.

Earthwork 40.470 Mcft
Structure 206 Nos.

Status of Bridge Financing & Outstanding Liabilities

- During completion of works WAPDA used its own financial resources amounting to Rs. 151.903 million as WAPDA Bridge Financing.

Present Status / Remarks

- The completed works pertaining to Baluchistan Province have been handed over to Irrigation Department Govt. of Baluchistan. However, Irrigation Department Govt.of Sindh yet to take over the completed works in Sindh province.
- PC-I for Restoration of Flood 2022 Damages comprising of RBOD-III Project with an amount of Rs. 8,332.342 million has been submitted to Ministry of Water Resources Government of Pakistan for its approval from Competent Forum, which has uploaded on IPAS on June 08, 2023.
- 2nd Revised PC-I comprising WAPDA Bridge Financing & Liabilities amounting to Rs.11,065.426 million has been submitted Ministry of Water Resources for approval of competent forum.

NAULONG INTEGRATED WATER RESOURCES DEVELOPMENT PROJECT, JHAL MAGSI, BALOCHISTAN, PAKISTAN

Location

Naulong Multipurpose Dam Project is proposed to be constructed on Mula River about 30 km from Gandava Town in Tehsil and District Jhal Magsi, Balochistan Province.

Objectives

- Irrigated Agriculture Development of 47,000 Acres
- Flood Mitigation
- Power Generation of 26.60 GWh (4.4 MW)
- Command Area Development of 47000 Acres

Salient Features

Type of Dam	Zoned Earth fill
Height of Dam	186 ft
Catchments Area	2,890 Sq. miles
Gross Storage Capacity	242,163 AF
Live Storage Capacity	199,956 AF
Command Area (CCA)	47,000 Acres
Power Generation	4.4 MW
Annual Energy Generation	26.6 Gwh

- Hydropower Generation
- Drinking Water Supply to Local Population
- Socio-economic Uplift and Poverty Reduction in the Area

Background

- The project was originally to be financed by Govt. of Pakistan under PSDP. Original PC-I and subsequently 1st Revised PC-I of the project amounting to Rs. 11,699 million and Rs. 18,027 million were approved by the ECNEC on September 03, 2009 and August 16, 2012 respectively.
- WAPDA carried out 3 times Bidding Process (2010, 2013, 2015), however the same were annulled due to funds constraints (2010), abnormally higher bids received (2013) and requirements of ADB for procurement of project works a fresh (2015).
- CDWP while discussing 2nd Revised PC-I of the project on January 14, 2016, taken out the project from PSDP and directed to explore financing avenues for the project outside PSDP.
- As a follow up of CDWP decision, EAD approached various International Financial Institution e.g ADB, Kuwait Fund, EIB & AFD for funding of the project.
- ADB agreed for financing of the project and after Project Appraisal by their consultation mission issued Aide Memoire-01 & 02 on September 27, 2016 and May 18, 2017 respectively desiring for updating of already carried out studies by WAPDA along with undertaking some new studies and other actionable points by WAPDA and Govt. of Baluchistan
- As required by ADB, WAPDA through consultants started and partially completed ADB studies, however the same were not finalized due to financial issues and want of Revised PC-I approval. ADB funding process

could also not processed further due to non-fulfillment of actionable points on the part of Govt. of Baluchistan.

- Meantime WAPDA also prepared submitted updated 2nd Revised PC-I of the project for an amount of Rs. 28.465 million (based on 80% Funding by ADB and 20% Funding by Govt. of Pakistan).
- ECNEC approved the subject PC-I on March 26, 2020 with the direction that:
  (i) Command area development works will be included in the current PC-I cost and will be executed by WAPDA.
  (ii) Modified PC-I of the project will be prepared on fast-track basis.
  (iii) EAD may initiate negotiations with ADB for funding of the project, which however will be finalized after approval of modified PC-I.

Current Status of the Project

Modified 2nd Revised PC-I

- In compliance of ECNEC, ECNEC committee and pre-CDWP decisions, WAPDA prepared Modified 2nd Revised PC-I for Rs. 39,944 million (80% funding by ADB and 20% by Govt. of Pakistan/ Govt. of Baluchistan) including FEC of Rs. 8,723 million by incorporating the costs of Command Area Development, HEIS (Pilot Project) and Watershed Management components and submitted the same to Planning Commission, Govt. of Pakistan, Islamabad through Ministry of Water Resources on December 06, 2021.
- CDWP in its meeting held on January 10, 2022 discussed and recommended for approval by ECNEC. ECNEC in its meeting held on October 07, 2022 have approved the Modified 2nd Revised PC-I.

Loan Arrangements

- After consent by Govt. of Baluchistan regarding actionable points on their part and approval of updated 2nd Revised PC-I on March 26, 2020, Ministry of Water Resources /Economic Affairs Division and WAPDA again taken up case for financing of the project with ADB.
- ADB desired for completion/finalization of project studies; Consultants accordingly finalized ADB recommended studies and WAPDA shared the same with ADB on July 13 , 2020 and August 11, 2020 for their review and comments.
- On the request of WAPDA on February 12, 2020, March 23, 2020 and July 21, 2020, Ministry of Water Resources on March 03, 2020, April 22 , 2020 and July 28, 2020 respectively has requested EAD to approach ADB for preparation of Project Appraisal Document (PAD) and initiate negotiations for project financing.
- EAD vide their letters dated: March 20, 2020 and August 17, 2020 requested ADB for preparation of Project Appraisal Document for financing of the Project
- On the request of WAPDA on July 14, 2020 and September 21, 2020, Ministry of Water Resources also approached EAD on July 30, 2020 and October 20, 2020 respectively to arrange Project Readiness Financing (PRF) facility from ADB for project preparatory works.
- Economic Affairs Division, Govt. of Pakistan, Islamabad vide their letter No. 1(8) ADB-I/20 Dated: October 23, 2020 has consented ADB's Draft COBP 2021-23 provided that Naulong Dam Project is included in 2021 pipeline for financing.
- ADB during subject meeting held on April 01, 2021 and their letter dated: February 08, 2021 shared their comments on studies submitted by WAPDA in July-August, 2020 and desired for further activities/key information regarding agriculture, social, and climate, hydrological and environmental aspects of the project.
- Accordingly, WAPDA/Consultants completed all ADB recommended studies/requirements in October–December 2021 & March, 2022 and shared the same with ADB through MoWR/EAD.
- ADB have placed the project with Firm status in the year 2024 with initial allocation of US$ 100 million along with PRF of US$ 5 million in the year-2022 under its Draft Country Operation Business Plan (COBP-2022-24). ADB's Loan Fact Finding Mission visited Pakistan and conducted various meetings with the all stakeholders of the project.
- ADB's Loan Fact Finding Mission visited Pakistan and conducted various meetings with all stakeholder of the project from 13-23 May, 2022. During subject meetings various activities to be carried out under Project Readiness Financing (PRF) of 5 million USD were discussed and agreed
- Aide memoire has been issued by ADB on May 31, 2022 under which the commencement of project works is reflected in August-2024.
- ADB's proposed schedule for PRF Implementation is as under:

Loan Negotiations	**August, 2022**
PRF Approval by ADB's	**September, 2022**
PRF Loan Signing	**October, 2022**
PRF Loan Effectiveness	**January, 2023**
PRF Activities Completion	**June, 2025**
PRF Loan Closing	**December, 2025**

- ADB vide letter dated November 07, 2022 approved loan for an amount of $5.0 million for Project Readiness Financing of project.
- Loan Agreement signed with ADB for an amount of $5.0 million for Project Readiness Financing of project on December 15, 2022.
- ADB vide letter dated January 16, 2023 has declared the loan effective from December 26, 2022

Advance Actions Proposed by ADB for Procurement of Consultancy Services

Procurement of Consultancy Services for Review and Update of Detailed Design, Preparation of Procurement Documents, and Update of Safeguard Documents – (Consulting Package No. CS – 01).

- Contract Agreement has been signed with M/s Dolsar-MMP-JV on November 02, 2023.
- Consultants has commenced services on November 18, 2023.
- Implementation Period 28 Months (From November 18, 2023 to March 18, 2026)
- Working on deliverables is in progress.

Procurement of Consultancy Services from Individual Experts as Member of Dam Safety Panel of Experts– (Consulting Package No. CS – 02)

- Contract Agreement has been signed with following Experts Notice to Proceed will be issued soon:
  - Dam Specialist / Chairperson (Mr. Cesar – Germany)
  - Hydrology & Hydraulic Specialist (Mr. Antonio – Italy)
  - Hydro Electrical & Mechanical Specialist (Mr. Raju – Nepal)
  - Geotechnical Specialist (Mr. Muhammad Moeen)
- Implementation Period 07 Months (From December 2023 to July 2024)
- Individual Specialists will review Inception Report, Interim Design Report and draft Final Design Report prepared by DED Consultants.

Procurement of Consultancy Service for the Stakeholder's Engagement and Social Mobilization for Inclusive, Community and Gender Base Project Design (Consulting Package No. CS – 03)

- Contract Agreement has been signed with M/s BRSP on June 14, 2023
- Consultants has commenced Services on June 19, 2023.
- Implementation Period 12 Months (From June 19, 2023 to June 19, 2024)
- Working on deliverables is in progress.

Physical Hydraulic Model Study

- The operation/testing of comprehensive physical model have been carried out on July 19, 2022 and its draft report has been received and the same has been sent to the consultants for review and necessary amendments in the project design.

Land Acquisition

- Total Land area to be acquired is 4282.07 Acres
- Demarcation of project components has been completed through Survey Division WAPDA Peshawar.
- The former constituted committee for Joint survey was dissolved. The Deputy Commissioner Jhal Magsi has constituted new committee on December 16, 2023 for joint survey.
- GIS Experts has also been made part of the Land Acquisition Team.
- Govt. of Baluchistan has allocated Rs. 970.293 million for land acquisition, resettlement and security arrangements for the project under Provincial PSDP 2023-24.
- Finance Division Govt. of Baluchistan has released Rs. 291 million to Secretary, Irrigation Department Govt. of Baluchistan;
- Accordingly, Irrigation Department has deposited Rs. 291 million to Deputy Commissioner on December 13, 2023.
- Joint Survey for Section-4&5 of Land Acquisition for the project has been commenced on December 26, 2023

Implementation Schedule

Date of Commencement Year	Works not yet commenced
Date of Completion	(03) three years after commencement

Financial Status

PSDP Allocation FY-2022-23	Rs. 500 Million (L; 490, F:10)
GOP Releases in FY-2022-23	Rs. Nil
Expenditure in FY 2022-23	Rs. 137.548 Million
Financial Progress	2.51%
PSDP Allocation FY-2023-24	Rs. 110 Million (L; 100, F:10)

Issues/ Way Forward

- WAPDA to carry on the PRF activities as scheduled to proceed further with securing ADB's Main Loan for Construction of Project Works.

- Arrangement of funds by Govt. of Pakistan/Govt. of Baluchistan as per their proposed share.
- Section-4&5 for Land Acquisition 4282.07 Acres area to be acquired.

NAI GAJ DAM PROJECT

Introduction

Nai Gaj Dam Project is being constructed across Gaj River at Latitude 26°52' N & Longitude 67°19' E and is located 65 km North West of Dadu City in Sindh Province. Nai Gaj is a hill torrent, which originates from District Khuzdar in the Balochistan, and enters in Kirthar Range of Sindh.

The Nai Gaj Dam is a multi-purpose project having main objectives of:

- Irrigation of 28, 800 Acres of Culturable Command Area (CCA) with 295 Cusecs Capacity Canal
- 50 Cusecs assured Water Supply to Manchar Lake to Mitigate Ecological Issues
- 110 Cusecs Water Supply to Lower Riparian
- 4.2 MW Hydro Power Generation
- Prevention of Damages caused by the Flood Water in the Downstream Area of the Dam
- Fisheries Development
- Socio-economic uplift of Project Area including Emancipation of Women and Poor Community
- Recharge of Groundwater Aquifer for Drinking Purposes

Status of the Project

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 July 16, 2010. Letter of Acceptance (LOA) issued to M/s NEIE-SMADB-LILLEY-RMS (JV) on January 13, 2011 being lowest bidder amounting to Rs. 38.792 billion. Contract Agreement was signed on April 12, 2011. The work on the Nai Gaj Dam Project commenced on April 25, 2012 with reduced scope of work. 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 June, 2024.

Project Profile

Employer	WAPDA
Contractor	M/s NEIE-SMADB-LILLEY-RMS (JV)
Consultants	Techno Consultant-International (Pvt) Ltd. In association with Hydropower Engineering (HPE)
Contract Agreement	April 12, 2011
Commencement Date	April 25, 2012
Original Completion Date	April 24, 2015
Revised Completion Date	June 17, 2018 (As per 1st EOT)
Date of Contract Termination	August 29, 2018
Date of Re-commencement	October 28, 2021
Expected Completion Date	October 27, 2024
Contract Cost	Rs. 38,792.138 Million

1st Revised PC-I amounting to Rs. 26.236 billion was approved by ECNEC on August 16, 2012 deleting some items 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.

The progress of the project works was severely hampered due to inadequate allocation and release of PSDP funds. Resultantly, the contractor was granted with an extension of time up to June, 2018. In the meantime, the contractor was asked to submit renewed/ amended bank guarantee for the extended period of the project. However, during verification of the extended bank guarantee, it was revealed that the original bank guarantee submitted by the contractor was fake in nature. Subsequently, the contract was terminated by WAPDA (The Employer) after certification of default of contractor by the project engineer in accordance with Sub Clause 63.1 and 74.1 of CoC on August 29, 2018.

The contractor challenged the termination of the contract by WAPDA in the Sindh High Court Karachi on February 19, 2019 and on the directions of the High Court of Sindh, Arbitration process was carried out. After making Arbitral Award as Rule of the Court, MoU was signed between the employer and the contractor on September 21, 2021. As per MoU, contractor will complete the project in all respects within three years period.

The project works re-commenced w.e.f October 28, 2021 and were scheduled to be completed by October 2024. While construction activities on different components of the project were in progress, heavy rainfall and consequent floods in Baluchistan and Sindh Provinces during months of July-August 2022 resulted in submergence and damages of some portions of link road connecting Indus Highway (N-55) with dam site. Consequently, project works remained suspended for about five months. However, the contractor resumed the construction works with limited scope in the month of December, 2022 after some repair works of link road were carried out by Highway Department Govt. of Sindh.

Physical Progress

Overall physical progress of the project up to end of Fiscal Year 2022-23 w.r.t scope of work approved under 2nd Revised PC-I 45.89%

Component wise Progress

- Main Dam 43.15%
- Main Spillway 52.25%
- Auxiliary Spillway 38.47%
- Dykes 69.91%
- Irrigation System 34.37%
- Intake Structure 17.55%
- Access Road 3.89%

Financial Status

1st Revised PC-I of the project amounting Rs. 46.980 billion was approved by ECNEC on March 11, 2021, against which an expenditure of Rs. 17,692.52 million has been incurred up to June, 2023.

Initially PSDP allocation of Rs. 5000 million was made in FY 2022-23 for project; however, it was reduced to Rs. 3000 million due to suspension of works for five months during floods. Revised allocated amount of Rs. 3000 million was released and the same was fully utilized.

Land Acquisition

- Total Land Required for the Project - 7507.34 Acres
- Land Falling in Taluka Johi - 3353.22 Acres
- Land Falling in Taluka K. N Shah - 4154.12 Acres
- For acquisition of private land, notification under Section-IV of Land Acquisition Act (LAA-1894) has been issued for 369-20 Acres private land on May 22, 2023 and issuance of notification under Section-VI is in process.
- In order to acquire Public/State Land, WAPDA had already submitted a case for allotment/ reservation of State Land to the concerned department of Govt. of Sindh on April 06 & 07, 2016 which was duly verified by the concerned Revenue Authorities.
- The project office vide letter dated August 09, 2017 submitted proposed comprehensive Resettlement Action Plan (RAP) to District Administration for implementation in true letter and spirit.
- Project office is vehemently pursuing the matter of the Land Acquisition and implementation of the Resettlement Action Plan with District Administration for timely completion of the project.

Salient Features

	Components	Description
A)	**General**	65 km North West of Dadu
	Location	Nai Gaj
	River	Irrigation
	Purpose	
B)	**Reservoir**	7,019 Sq. km (2,710 Sq. miles)
	Catchment	21,106 Cumec (745,360 Cusec)
	Designed Flood	2,023 Ha (5000 Acres)
	Reservoir Area	0.3 MAF (Gross) & 0.16MAF (Live)
	Storage	100 years
	Life	
C)	**Dam**	Central Core Earth Fill Dam
	Type	59 Meter
	Height of Dam	1137 Meter
	Length of Dam	2.3 Meter
	Free Board	177.5 Meter AMSL
	Maximum Storage	148 Meter AMSL
	Dead Storage	125 Meter AMSL
	River Bed Level	2.5 H : 1.0V (Upstream) &
	Slope	2.5 H : 1.0V (Downstream)
D)	**Earthen Dykes**	
	08 Nos.	2 on Left Abutment & 6 on Right Abutment
	Height	9 to 26 Meter

	Components	Description
E)	**Spillway**	
	Main Spillway	
	Type	Labyrinth Un-gated
	Crest Elevation	177.5 Meter AMSL
	Width	241 Meter
	Discharge Capacity	12,048 Cumec
	Auxiliary Spillway	
	Type	Ogee Ungated
	Crest Elevation	178.5 Meter AMSL
	Width	540 M
	Discharge Capacity	7,046 Cumec
F)	**Irrigation System**	
	Gross Command Area	22,962 Hectare (56,739 Acre)
	Cultivable	11,655 Hectare (28,800 Acre)
	Cropping Intensity	107.5 %
	i) Main Canal	
	Design Discharge	8.35 Cumec (295 Cusec)
	ii) Canal Length	
	Main Canal	6.56 Km (4.07 Miles)
	Distributaries (Two)	33.095 Km (20.564 Miles)
	Minors (Three)	30.552 Km (18.98 Miles)
G)	**Power House**	42 M
	Rated Head	4.2 MW
	Maximum Total Output	17.67 Gwh
	Annual Energy Generation	
H)	**Assured Water Supplies to Manchar Lake**	52 Km Long of 0.7 and 1.0 M dia
	Gravity Water Main	(50 Cusecs)
I)	**RC Channel for Lower Riparian's & Live Stock**	
	Periodic Water Releases in Nai Gaj	3.11 Cumecs (110 Cusecs)
J)	**Access Road**	15 Km
	Access Road (Project Area)	
	Access Road (Project Colony)	
K)	**Cost (Approved by ECNEC)**	
	Original PC-I Cost	Pak Rs 16.924 Billion (2009)
	1st Revised PC-I Cost	Pak Rs. 26.236 Billion (2012)
	2nd Revised PC-I Cost	Pak Rs. 46.980 Billion (2021)

HUB DAM PROJECT

Background of the Project

The Hub River was identified as a source of irrigation water in the 1950s and the central engineering authority renovated the Bund Murad Khan scheme by the year 1958 to irrigate approximately 4000 acres of land on the left bank of river in district Karachi. This scheme could not be operated for long due to insufficient storage. Subsequently, to exploit new sources of water to create a green belt around Karachi, Government of Pakistan in October 1956, sanctioned the service schemes for the utilization of waters from the Hub and Malir Rivers. Immediately after the formation of WAPDA in 1958, studies, preparation of feasibility reports and construction of the project was entrusted to WAPDA. WAPDA appointed M/s. Associated Consulting Engineers (ACE) Ltd, as consultants who after carrying out surveys and investigations, prepared and submitted a feasibility report in 1960. Based on this report, PC-1 Proforma was submitted in 1960, which was approved by Central Government on May 06, 1961 and the West Pakistan Government on December 07, 1963 accorded administrative approval.

The preliminary works of Hub Dam, built across the Hub River, were commenced in September 1963. The project, completed in June 1981, was

meant to construct a storage reservoir for regulating the flows of Hub River for the purposes 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 original scheme, as envisaged in the year 1960, was purely an irrigation scheme with the basic objectives of creating and sustaining a green belt around Karachi and catering for the nutritional needs of the city. By the year 1967-68, demands for municipal and industrial water to augment existing water supply to the city of Karachi and Pakistan Steel, very much changed the concept and shifted the priorities and emphasis of the project from purely irrigation to urban water supply.
The Hub Dam Project was completed in June 1981 with capital cost of Rs.1191.806 million (excluding interest charges). In the end of year 1989, it was required to remodel the Main and Karachi Water Supply Canal for the supply of 100 MGD water to Karachi Water and Sewerage Board (KW & SB). The Supply Canal was then remodelled in 1992 with an expenditure of Rs. 26.703 million, thus the total capital cost of Hub Dam Project reached to Rs. 843.597 million.

The Hub Dam Project

Hub Dam Project located 45 km North-east of Karachi across the Hub River, 67°-5' E 25°-15' N just below the confluence of Shorin Nala and the Hub. The Hub River originates from Khirtar Range

Salient Features of Hub Dam

General Purpose	Storage of Hub River Flows for Regulated Releases of Municipal, Industrial and Irrigation Supplies
Location	45 Km North-east of Karachi in the Districts of Karachi (Sindh) and Lasbela (Balochistan)
Area	
a) Catchment	3,410 Square Miles
b) Reservoir	30 Square Miles (at EL. 339'.00")
Life of Dam	75 years
Type of Dam	Earthen Dam
Main Dam	
Max. Height of Dam	154'.00"
Length of Dam	15,640'.00"
Crest Road Level	352'.00"
Maximum Base Width	965'.00"
Saddle Dam	
Max. Height of Dam	66'.00"
Crest Length	5,762'.00"
Max. Base Width	340'.00"
Spillway	
Type	Un-gated Uncontrolled Concrete Ogee Type
Crest Length	6,020'.00"
Crest Elevation	339'.00"
Max. Outflow Capacity	458,000 cfs
Flood	
a) Maximum Anticipated	480,000 cfs
b) Maximum Recorded	521,000 cfs
Reservoir	
Full Reservoir Level	339'.00"
Maximum Reservoir Level	346'.00"
Dead Storage Level	276'.25"
Gross Reservoir Capacity	(Original) 857,000 AF
	(Revised) 687,276 AF
Live Storage Capacity	(Original) 760,000 AF
	(Revised) 645,470 AF
Dead Storage Capacity	(Original) 97,000 AF
	(Revised) 41,806 AF
Total Annual Releases	216,406 AF

at an elevation of about 6000' and passes through 220 miles of territory rock terrain before joining the Arabian Sea. In its lower reach it flows along the boundary of Karachi and Lasbela Districts. The Reservoir is fed by the Hub River, which has a total catchment area of about 3,410 sq miles up to the Dam Site and about 3,875 sq miles up to Arabian Sea. The whole of catchment area lies in arid zone of Balochistan and Sindh. A major part of this area is mountainous / hilly with a long and narrow shape. The catchment, bounded by Pab Range on right and Khirtar Range on left, has a North South orientation with far-most tip close to Khuzdar, and about 7000 ft. above NSL.

Creation of Hub Reservoir by completion of the dam utilizes almost entire water potential of the catchment, the part left downstream being only about 1.3%. The Reservoir provides carry over storage and is designed to supply 100 MGD of water to Karachi (Sindh) for municipal and industrial purposes and 15 MGD to Balochistan industries besides irrigation of 21,000 Acres (C.C.A.) in Balochistan and 1000 Acres in Sindh. Thus, the Reservoir-release of 216, 406 AF (Excluding Reservoir Evaporation and Seepage Losses) is shared by Sindh 63.3% and by Balochistan 36.7%. This supply is ensured for a period of 75 years. Thereafter, and up to 125 years of life of Reservoir, the supplies can be continued with some curtailment in irrigation. Again, up to about 175 years, the project can continue as a water supply scheme.

Major Components
The major components of the project are; Main and Saddle Dams, Gravel Terrace, Spillway, Flood Fused Channel, Reservoir Level Control (RLC) Structure, Irrigation Sluice and Canal System.

Main Dam
Main Dam built across the river valley and adjoining terraces, is a 15,640' long embankment spanning between gravel terrorist and foothills of a low hill range on the left bank. It is a rolled earth-fill, maximum height: 153' in the deepest riverbeds with a 28'-8" white clear roadway at crest EL at 352'. Out of its total length, 5,400' lies in Balochistan and 10,240' in Sindh (Considering Midstream of the River as the Boundary between Provinces on the basis of International Convention).

Except for 1400 ft. long closure reached across the main gorge, the entire embankment dam is of homogeneous built of silty sand. The zone section is the river closure reach has a central core of impervious material with pervious shoulders of rivers run sand and gravel on upstream and downstream sides. The embankment is provided with a central core trench extending to bedrock. The shoulders are founded on the stripped natural ground. A horizontal filter blanket is provided at natural ground level below the downstream shoulder terminating in a cobble-filled toe drain.

Saddle Dam
Saddle Dam spans between the left abutment of spillway and the gravel terrace. It is a semi-homogeneous rolled fill embankment 66 ft. high at the maximum section with a crest length of 5,742 ft., built of similar material and to the same slopes as the main dam. A filter blanket with a toe drain is provided below the downstream shoulder.

Spillway
Spillway is 6,020 ft. long concrete gravity structure without any gate control, adjoins the Saddle Dam on its left, designed to dispose of the probable maximum flood. It is capable of taking 458,000 cfs with 7 ft. surcharge over crest EL. 339 ft. The free over fall ogee section terminates in a stilling basin (EL. 320') provided with chute blocks, baffle blocks and end sill. A concrete cut-off wall extends down to EL. 305 ft. below the end sill. 145 ft. wide stone apron, a part of which on the right side is encased in wire nets, extends beyond the settling blocks.

Floods passing over the Spillway will be carried over a 6-mile reach of natural ground, discharging into Hub River about 3-miles downstream of the main dam.

This Spillway has experienced seven major floods since first impounding in the year 1984 and the Reservoir Level reached up to 344.30' AMSL.

Sluice
Sluice is a single barrel cut-and-cover conduit located at CH: 90 (6,640 ft. from the left abutment) of the main dam, is founded on a thick bed of hard compact and massive sandstone. The alignment of the sluice, fixed basically to suit the topography, is skew to the axis of the dam. The out-let works consist of a 234 ft. long reinforced concrete pressure conduit of 6 ft. x 7 ft.section between the intake structure and central control tower and a 197 ft. long 6 ft. x 6 ft. free flow reinforced concrete conduit between the control tower and the downstream end. The central tower accommodates a vertical lift fixed wheel gate and steel stop logs. The Sluice has a capacity of discharging the maximum release demand of 370 cusecs at full pool level 339 ft. with a partial gate opening up 1.52 ft. The planned normal operating range of sluice is between pool levels 339 ft and 285 ft. Working of Sluice above and below these elevations will be an extreme operating condition.

Gravel Terrace
About a mile long stretch between the right abutment on the Main Dam and the left abutment of the Saddle Dam is spanned by natural high ground locally called the Gravel Terrace. It forms the reservoir rim between the two dams.

Flood Fused Channel
The Channel was excavated in 1980 across the Gravel Terrace to restrict the Reservoir Level on EL. 305 ft. for the first phased impounding. The Channel is 2700 ft. long, 60 ft. wide at invert elevation 305 ft. An earth-fill plug (Crest EL. 315 ft. which was subsequently raised to Elevation 352 ft.) at the mouth prevents entry of water into the Channel.

Reservoir Level Control Structure (RLC)
Reservoir Level Control Structure has been built across the Flood Fused Channel at CH: 17+50 on the Gravel Terrace. It is concrete gravity and structure consists of three bays and fixed wheel gates of size 19 ft. x 14 ft. which can be operated by electric motor or manually. It has a maximum capacity of 25000 csf at head water EL. 339 ft. Constructed in 1986, this structure was meant to deplete the reservoir to a safe in case of emergency, i.e. lowering the reservoir to EL. 320 ft. Lowering of the reservoir from EL. 392 ft. to El. 320 ft. would take twenty days. In the event of the operation from the Channel will spread over the natural terrain.

Instruments
Instruments have been installed to provide continuous information on hydrostatic pressures in the dam foundation. Around 276 Piezometers have been installed at the Dam and Spillway. Most of these are standpipe Piezometers while a few having Casagrande pot tips.

As a major remedial measure to counter Piezometric Pressure rise in the dam foundation, 465 relief wells have been installed at the toe of the embankments. These wells are served by open drains along the dam toe, which convey the outflow to natural depressions/river. In addition, 7 numbers V-Notches and 4 numbers Collector Drain were constructed to measure the discharge from relief wells and collect the water from them respectively.

Canal System
The Main Canal having capacity of 370 cfs takes off from Hub Dam and bifurcates into two branches after following about 5.2 miles (8.32 Km). One branch mainly Lasbela Canal (21 Miles or 33.6 Km Long) with a design capacity of 160 cusecs supplies water for irrigation of 21000 Acres of Land in 15 MGD water for industries in Lasbela District, Balochistan. Bund Murad Minor (handed over to Government of Sindh on January 01, 1986) also takes off from Lasbela Canal to supply irrigation water on replacement basis, 1000 Acres of those agricultural farms which were under existence prior to the construction of Hub Dam Project. The Lasbela Canal is a 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 of 8 minors for irrigation purposes besides outlets for industrial water supply.

The second branch is known as Karachi Water Supply Canal with 210 cfs capacity. This is a very sensitive canal as it supplies 20% of the Municipal and Industrial water 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 Mangopir, Karachi. It is lined with concrete tiles and crosses a number of natural drainage channels that necessitated construction of aqueducts and drainage crossing, besides a road bridge and three village road bridges. There are also two fall structures at this canal.

Reservoir Operation
The purpose of Hub Dam Project as per finally approved PC-I is the conservation of Hub River flows for regulated releases of municipal/industrial/ irrigation supplies. The finally adopted supply pattern allocated about 193,000 AF of water per year, 140,000 AF per year to municipal and industrial areas in Karachi and Balochistan and 53,000 AF to an irrigation area of 22,000 Acres, of which 21,000 Acres lie in Balochistan and 1000 Acres in Sindh. These supplies were then enhanced to the tone of 216,406 AF after remodelling of canal in 1993 under the directives of then Prime Minister of Pakistan.

The project started functioning with the operation of Bund Murad Minor for supplying water to already existing farms on Karachi side in October 1981 followed by supplies is Lasbela Canal from end of February 1982 in supplies of drinking water to Karachi from October 1982. The first impounding of Hub Reservoir was done in the summer of 1979 when reservoir level raised up to 283 ft. against maximum design conservation level of 339 ft. During all successive reservoir fillings higher and higher peak levels were attained. Reservoir level reached up to 344.30 ft. as a result of large inflows during flood of 1984.

The total live storage of the Reservoir 6,46,000 AF is about 2 times planned annual withdrawal of 216,406 AF, considering Reservoir Losses (35%).

Greater Karachi Water Supply Scheme K - IV

Originally the project was envisaged to provide release of 193,000 AF of water per year which was revised and enhanced the tone of 216,406 AF after remodelling of Canal in February 1993.

Normally, the filling of Reservoir takes place during Monsoon Season, in the months of July and August. The catchment of Hub Dam Reservoir is entirely rain fed.

Hydrographic Survey of Hub Dam Reservoir (2009)
Hub Dam Reservoir was first impounded in 1979 and attained normal conservation level of 339 ft. first time in 1984. Since the first impounding, seven floods have been passed over the spillway with the following magnitude.

Table-1: Year wise Flood Data of Hub Dam Reservoir

Year	Outflow Flood Peak	Reservoir Level (ft.)
1984	288,000	344.30
1989	52,000	340.70
1992	89,000	341.50
1994	161,000	342.65
1995	199,000	343.20
2003	143,000	342.40
2007	42,000	340.50
2020	68,662	340.80
2022	169,639	343.05

* Source DSO, WAPDA Publication Report No: 851, Flood Data Since Impounding.

It is necessary that after the span of 5 years fresh hydro graphic survey would be conducted in order to reassess the capacity of Reservoir, thereby, minimum operating level is adjusted. In case of Hub Dam Reservoir, last survey was conducted in 2009 by ISRIP, WAPDA, thereafter according to the data mentioned in table-1, only one flood of 2020 has been passed and more sediment probably entered into the Reservoir. Presently during recent floods of August-2020 Hub Dam Reservoir attained its Maximum Conservation Level of 339.00 ft. after 13 years and Spill over of water through concrete Spillway with the column of 1.8 ft. Resultantly, Dam Safety Organization (DSO) carried-out the Special Inspection of Hub Dam Project on September 4 & 5, 2022 and recommended the Hydrographic Survey of Hub Reservoir. In this regard, ISRIP WAPDA has framed the Cost Estimate; however, the Chief Engineer/PD after necessary scrutiny of the cost estimate accorded Administrative Approval. The Technical Sanction has also been given by the Director General (ISRIP) WAPDA in order to carry-out the Hydrographic Survey of Hub Dam Reservoir. However, the work will be got conducted from ISRIP after necessary arrangement of funds.

GREATER KARACHI WATER SUPPLY SCHEME - K-IV (Phase-I) 260 MGD

Introduction

The efforts for the K-IV Project started as early as 2002 when the PC-II (Feasibility was prepared and submitted to the Government of Sindh (GoS). The detailed Feasibility Study for Greater Karachi Bulk Water Supply Scheme (K-IV) was carried out in the year 2006-07, which studied nine (9) different routes (1,000 ft. Corridor) for bulk water supply of 650 Million Gallons per Day (MGD). As the Right of Way (ROW) available for the Karachi Water Transmission Lines was fully exhausted after the implementation of the K-III Project, the scope of the K-IV Feasibility Study also included the identification and selection of improvement/ refinement of route and corridor.

The Feasibility Study was completed in 2007 and the improvement/refinement of route for bulk water supply and long-term expansion was proposed. The study suggested a canal on a hilly terrain alignment almost parallel to the Kirthar Range. The detailed design, PC-I and the tender documents were prepared in 2014. It was planned to execute the project in three phases as under:

Phase	Capacity	Original Plan
K-IV Phase – 1	260 MGD	2011 to 2015
K-IV Phase – 2	260 MGD	2016 to 2020
K-IV Phase – 3	130 MGD	2020 to 2025

The contract for construction of the project (Phase-I, 260 MGD) was awarded to Frontier Works Organization (FWO) in June 2016. After the execution of about 50% of transmission works by the end of 2018, the work could not proceed further due to serious technical & administrative issues that surfaced during project implementation.

Meanwhile, the Federal Government, under an arrangement with Sindh Government, had taken up the implementation of the project as part of the Prime Minister's Package for Karachi and directed Water and Power Development Authority (WAPDA) to take over the implementation responsibilities of the project on September 21, 2020.

Location

The Greater Karachi Bulk Water Supply Scheme K-IV is planned to supply bulk water to the mega city of Karachi at three termination points i.e. Pipri, NEK, and Manghopir, from its source at Keenjhar Lake located at Thatta District of Sindh Province.

Objectives

a) Provide dependable and sustainable water transmission system from its more than 100 kilometers away source of Keenjhar Lake to three reservoirs around the city to feed Karachi Water Supply and Distribution Network
b) Enable the water supply system to meet the requirements for public, commercial, and industrial activities
c) To facilitate the improvement in health and hygiene sectors of the city by providing safe and clean water to the residents of Karachi
d) To support economic activities and poverty alleviation by ensuring the required water supplies for existing and future industries in Karachi

Scope of Work as per Revised PC-I

- Intake Structure for 650 MGD at Keenjhar Lake
- Keenjhar Pumping Complex with 2 Pumping Stations of 130 MGD each
- Pressurized Pipeline System 2x130 MGD Capacity, 84" Diameter MS Pipes with all appurtenant equipment and structures
- 260 MGD Pipeline starting from Keenjhar Pumping Complex and Terminate at Pipri, NEK and Mangopir
- K-IV-FP1, R1 Water Filtration Plant and Reservoir (65 MGD) Near Pipri / Eastern Bypass
- K-IV-FP2, R2 Water Filtration Plant and Reservoir (130 MGD) Near old NEK Filtration Plant
- K-IV-FP3, R3 Water Filtration Plant and Reservoir (65 MGD) Near Hub Dam Road / Northern Bypass

Salient Features of K-IV Project

Contract Package No. K-IV AW		
Contractor	:	M/s. Ramzan and Sons (Pvt.) Ltd.
Commencement Date	:	May 18, 2022
Planned Completion Period	:	16 Months
Contract Cost	:	Rs. 2,670,147,491/-
Salient Features		
Staff Colony	:	Rest House
		Bungalows (06 Nos.)
		Flats (24 Nos.)
		Mosque
		Commercial Area
		Dispensary
		Water Filtration Plant (40,000 GPD) and Sewage Treatment Plant (32,000 GPD)
Pumping Complex	:	Admin Building
		Energy Audit Lab
		Warehouse and Workshop
Access Road	:	Chillia Head Works to Staff Colony 10.5 Km
Contract Package No. K-IV-IW		
Contractor	:	M/s. TES-KGL (J.V)
Commencement Date	:	June 15, 2022
Planned Completion Period	:	16 Months
Contract Cost	:	Rs. 2,976,621,374 /-
Salient Features		
Intake Structure		
Type of Intake	:	Gated Head Regular
Design Capacity	:	650 MGD
No. of Gates / Bays	:	04 Nos.

Guide & Main Embankment		
Length on Right Side	:	135 M
Length on Left Side	:	312 M
Type	:	Central Core Earthfill
RCC Conduit		
Length	:	375 M
Cells	:	05 (130 MGD Each)
Size	:	3 M X 3 M
Contract Package No. K-IV-PS		
Contractor	:	M/s. Descon Engineering Limited
Award Date	:	01 June, 2022
Planned Completion Period	:	18 Months
Contract Cost	:	Rs. 17,401,981,315/-
Salient Features		
Pumping Stations	:	2 Nos. (130 MGD Each)
Type of Pump	:	Centrifugal
No. of Pumps	:	12 (8 Duty & 4 Standby)
Capacity of Each Pump	:	32.5 MGD
Rating of Each Pump	:	5 to 5.5 MW
Pump Head at Duty Point	:	219 M
Contract Package No. K-IV-PL1		
Contractor	:	M/s. CHEC-AFI (J.V)
Award Date	:	31 May, 2022
Planned Completion Period	:	17 Months
Contract Cost	:	Rs. 52,270,913,909/-
Salient Features		
Pipe Type	:	Twin MS Steel Pipe (X-42 Grade)
Diameter of Pipe	:	84 Inch & 52 Inch
Length of Both Pipes	:	128.4 Km & 1 Km
Contract Package No. K-IV-PL2		
Contractor	:	M/s. CHEC-AFI (J.V)
Award Date	:	31 May, 2022
Planned Completion Period	:	16 Months
Contract Cost	:	Rs. 28,846,178,428/-
Salient Features		
Pipe Type	:	Twin MS Steel Pipe (X-42 Grade)
Diameter of Pipe	:	84 Inch & 68 Inch
Length of Both Pipes	:	32 Km & 47.5 Km
Contract Package No. K-IV-FP1		
Contractor	:	M/s. CGICOP-MEFA (J.V)
Award Date	:	16 June, 2022
Planned Completion Period	:	16 Months
Contract Cost	:	Rs. 6,615,942,908/-
Salient Features of Water Filtration Plant		
Water Filtration Plant	:	65 MGD Capacity
Reservoir	:	65 MGD Capacity
• Raw Water Reservoir		
• Distribution Chamber		
• Coagulation Chamber		
• Rapid Gravity Sand Filter Beds		
Contract Package No. K-IV-FP2		
Contractor	:	M/s. ACEG-MPPL-TES (J.V)
Award Date	:	16 June, 2022
Planned Completion Period	:	16 Months
Contract Cost	:	Rs. 12,997,750,656/-

Salient Features of K-IV Project

Water Filtration Plant	:	130 MGD Capacity
Reservoir	:	130 MGD Capacity
• Raw Water Reservoir		
• Distribution Chamber		
• Coagulation Chamber		
• Rapid Gravity Sand Filter Beds		
Contract Package No. K-IV-FP3		
Contractor	:	M/s. CGICOP-MEFA (J.V)
Award Date	:	June16 , 2022
Planned Completion Period	:	16 Months
Contract Cost	:	Rs. 6,536,126,745/-
Salient Features		
Water Filtration Plant	:	65 MGD Capacity
Reservoir	:	65 MGD Capacity
• Raw Water Reservoir		
• Distribution Chamber		
• Coagulation Chamber		
• Rapid Gravity Sand Filter Beds		
Project Profile		
• Employer	:	WAPDA
• Unified Consultant	:	M/s. Techno Consult International-Mott MacDonald Pakistan-Ingenieurgemeinschaft Lässer-Feizlmayr (Austria) (TCI-MMP-ILF) (J.V)
• Date of Commencement	:	July 15, 2021
• Scheduled Completion of Project	:	October, 2024 (subject to Timely Releases of PSDP Fund)
PC-I COST		
• Original PC-I	:	Rs. 25,510 Million (ECNEC July 18, 2014)
• Modified Revised PC-I	:	Rs. 126,404.751 Million (Approved by ECNEC on January 31, 2022)
Funding		
As per Original PC-I (2014)		
50:50 Cost Sharing by GoP & GoS		
• GoP- PSDP 50 %	:	Rs. 12,775.885 Million
• GoS- ADP 50%	:	Rs. 12,775.885 Million
As per Modified Revised PC-I (2022)		
• GoP- PSDP	:	Rs. 113,628.866 Million
• GoS- ADP	:	Rs. 12,775.885 Million
Financial Status		
• Expenditure up to 30 June, 2023	:	Rs. 35,912 Million
• Financial Progress up to 30 June, 2023	:	32.14 %
Completion Dates		
• October, 2023 (Planned)		
• October, 2024 (Likely)		
Issues and Way Forward		
• Timely Releases of PSDP Funds as per project requirement		
• Govt. of Sindh to Implement Augmentation & Distribution Plan in Synchronization with Matching Timelines of K-IV Project		
• Govt. of Sindh to Ensure Provision of Uninterrupted Power Supply through STDC/HESCO for the successful Implementation of the Project.		
• Govt. of Sindh to Ensure to Provide ROW		

FEASIBILITY STUDY, DETAILED ENGINEERING DESIGN, TENDER DOCUMENTS & PC-I FOR JACOBABAD, SHIKARPUR AND KASHMORE DRAINAGE PROJECT

Location
Jacobabad, Kashmore and Shikarpur Districts of Sindh Province.

Scope of Work
To provide new surface drainage in Jacobabad & Kashmore and up-gradation of existing drainage network in the project area of Shikarpur to cater water logging and salinity problems of about 697,912 hectares gross area of the Jacobabad, Shikarpur and Kashmore Districts.

Present Status

- Inception Report along with ESIA was submitted by the consultants after incorporating the project office comments on January 16, 2023 and the same was also shared with Secretary Irrigation Department, GoS on February 17, 2023 for Review and comments.
- Draft Mid-term report, submitted by consultants which has been shared to stakeholders i.e. Secretary Irrigation Govt. of Sindh Karachi for review & comments for preparation of Draft Feasibility Report.
- Condition survey, Hydrological studies, Agriculture studies, digital mapping and data collection from other Govt. Departments have almost been completed under mid-term task of feasibility study.
- Groundwater studies, Environmental studies, Resettlement studies and soil & water quality field testing, testing, geo-tech investigation and strip survey of project areas are in progress whereas Drainage alignments and Disposal options are being finalized with the help of Stake holders i-e Govt. of Sindh and Locals.

Financial Progress 40%
Overall Physical Progress 76%

Executing Agency	WAPDA
Date of Approval of PC-II	May 21, 2021 (A-A issued on July 09, 2021)
Consultants	M/s MM Pakistan – BARQAAB Consulting Services (Pvt.) Ltd. (J.V).
Consultancy Cost	Rs. 190.738. Million
Commencement Date	May, 2022
Completion Date (Expected)	June, 2024
Feasibility to be accomplished in Different Task	Inception Report, Mid Term Report, Draft Feasibility Report, Feasibility Report, Detailed Engineering Design/Tender Documents and PC-I.
Various Studies to be carried out by the Consultants	Detailed Topographic Survey, Socio Economic Survey, Geotechnical Study, Agriculture Study, Soil Study, Resettlement Plan, Environmental & Social Impact Assessment, Water Quality and Ground Water Study etc.

Financial Phasing of the Project (Rs. In Million)

Year	Phasing as per Original PC-II		PSDP Allocation		Actual Amount Released	
	Total	FEC	Total	FEC	Total	FEC
2021-22	410.330	---	30	---	30	---
2022-23	170.902	---	100	---	100	---
Total	**581.232**	**---**	**130**	**---**	**130**	**---**

FEASIBILITY STUDY, DETAILED ENGINEERING DESIGN, TENDER DOCUMENTS AND PC-I FOR CONSTRUCTION OF DRAINAGE NETWORK IN TALUKA UBAURO, DAHARKI, KHANGARH, MIRPUR MATHELO OF DISTRICT GHOTKI SINDH

Location
Taluka Ubauro, Daharki, Khangarh, Mirpur Mathelo, Ghotki District of Sindh Province.

Scope of Work
To procure the consultants for preparation of Feasibility Study for developing surface drainage network in the different areas of District Ghotki and disposal of SCARP-VI effluent to cater water logging and salinity problems of about 271,836 hectares gross area of the Ghotki District by developing Surface Drainage Network and disposal of SCARP-VI effluent.

Present Status
- Inception Report along with ESIA was submitted by the consultants after incorporating the project office comments on January 23, 2023 and the same was also shared with Secretary Irrigation Department, Government of Sindh on February 17, 2023.
- Draft Mid-term Report has been submitted by the consultants which has been shared to stakeholders i.e. Secretary Irrigation Govt. of Sindh & Commander Engineers 5-Corps Karachi for review & comments for preparation of Draft Feasibility Report.
- Condition Survey, Hydrological studies, Agriculture studies, digital mapping and data collection from other Govt. Departments have almost been completed under mid-term task of feasibility study.
- Groundwater studies, Environmental studies, Resettlement studies and soil & water quality field testing, Geo-tech investigation and strip survey of project areas are in progress whereas drainage alignments and disposal options are being finalized with the help of stake holders i-e Govt. of Sindh, Locals and Army.

Financial Progress	40%
Overall Physical Progress	75%

Executing Agency	WAPDA
Date of Approval of PC-II	May 21, 2021 (A-A issued on July 09, 2021)
Consultants	M/s MM Pakistan – BARQAAB Consulting Services (Pvt.) Ltd. (J.V).
Consultancy Cost	Rs. 155.560 Million
Commencement Date	May, 2022
Completion Date (Expected)	June, 2024
Feasibility to be accomplished in Different Tasks	Inception Report, Mid Term Report, Draft Feasibility Report, Feasibility Report, Detailed Engineering Design/Tender Documents and PC-I.
Various Studies to be carried out by the Consultants	Detailed Topographic Survey, Socio Economic Survey, Geotechnical Study, Agriculture Study, Soil Study, Resettlement Plan, Environmental & Social Impact Assessment, Water Quality and Ground Water Study etc.

Financial Phasing of the Project (Rs. In Million)

Year	Phasing as per Original PC-II		PSDP Allocation		Actual Amount Released	
	Total	FEC	Total	FEC	Total	FEC
2021-22	280.975	---	50	---	30	---
2022-23	117.015	---	100	---	100	---
Total	**397.990**	**---**	**150**	**---**	**130**	**---**

WATER DIVISION (NORTH)

GOMAL ZAM DAM MULTIPURPOSE PROJECT

The 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 Pakhtoonkhwa (KPK). 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 "Gulkach 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 downstream, thereby tapping the biggest tributaries Zhob River and WanaToi. Further studies were conducted by WAPDA during the period 1960-1990 through firstly by M/s Energoprojeckt (Yugoslavia) in 1963, then by M/s Coyne et Bellier, (France) during 1983 – 1990. PC-I prepared by WAPDA in 1993 included irrigation works and a tunnel intake in view of Stage II – Hydropower. However another feasibility study was conducted within the framework of a contract signed between the Government of NWFP now KPK 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 August 31, 2001.

Benefits

- **Direct and Indirect Benefits**
  Benefits, being accrued from construction of the dam and hydropower component are, generation of 17.4 MW electricity and from Irrigation System are, increased agriculture production, ensured water supply for irrigation and drinking purpose, boost in trade and commerce, thus increase in income of the local farmers, resulting a better living standard.

- **Irrigation Benefits**
  The project provides ensured supply of water supply for irrigation and drinking purpose. Overall annual cropping intensity will increase from 15.8% to 86.5%.

- **Non-Agricultural Benefits**
  Other benefits include: Employment Opportunities, Installation of Agro-based Industries thus leading a better living standard, better health of the locals on account of nutritional food and fresh drinking water. Overall improvement is made of the environment due to plantation and lush green crops. Fisheries are the other benefit for the locals.

- **Hydropower Benefits**
  Cheaper power as compared to thermal power, has been provided through a hydropower station at dam site with a generation capacity of 17.4 MW.

Salient Features

Hydrology		
River	Gomal	
Catchment	20196 Km^2 (11316 $Mile^2$) (At Khajuri Kach)	
Average Annual Flow	511 Mm^3	
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 Meters	(437 Ft.)
Length	231 Meters	(758 Ft.)
Spillway Discharge	5000 Cumecs	
Power House		
Installed Capacity	17.4 MW	
Irrigation System		
a. Command Area		
Perennial Water Rights	12,072 Ha.	(29,830 Acres)
Flood Water Rights	65,281 Ha.	(161,309 Acres)
Total Irrigated Area	77,353 Ha.	(191,139 Acres)
b. Main Canal		
Length	60.5 Km	(37.8 Miles)
Capacity	24 Cumecs	(848 Cfs)
c. Distributaries		
Length	369 Km	(230.6 Miles)
d. Barrage		
Length	189 Meters	(620 Ft.)
Discharge Capacity including Breaching Section	5000 Cumecs	(176565 Cfs)

Gomal Zam Dam

Socio – Environmental Implications

- **Resettlement**
  No resettlement problem was observed in reservoir area. However, a nominal effect to the built-up property falling within the ROW of main canal and distributaries was taken care through LACs Offices, by compensating the affectees.

- **Socio-Economic Impact**
  The most important is saving of human lives, land, built up property. Livestock and infrastructures from the flashy floods, normally remain occurring during pre-project period.

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 June 17, 2002. The works included design and construction of: dam; spillway; hydropower station; transmission line to Tank Grid Station; diversion barrage, concrete lined main canal and distributaries; surface drains; and flood protection works. This contract stood terminated on April 14, 2006 and this EPC Contract was awarded to FWO on March 09, 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
  - Construction of Double Circuit 132 kV Transmission Line, about 55 km, by PESCO through deposit work

Project Cost

The estimated cost as per original PC-1 (August, 2001) was Rs.12829 million, which has now been revised. The cost of 1st revised PC-I is Rs.20626 million which was approved by the ECNEC on March 06, 2014.The 2nd revision of PC-I amounting

to Rs. 25928 million was submitted to Ministry of Water Resources in February 2019. The 2nd revised PC-I has been discussed in the CDWP meeting which was held on January 10, 2022 in Islamabad and approved by Chairman CDWP. The case was submitted to ECNEC by Planning Commission for administrative approval which is still awaited.

Total project expenditure up to ending June, 2022 is Rs. 25,073.643 million including Rs. 9 ,546.595 million FEC.

Project Status

Contract No. GZD-01 (Terminated on April 14, 2006)

This contract was awarded to M/s CWHEC-HPE JV of P.R China in June 2002. After commencement on July 15, 2002 the work continued till October 09, 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 April 14, 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 achievement on this component 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

To re-start the works, in the ECC meeting of the Cabinet in Islamabad held on April 14, 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 March 09, 2007 to complete the works within 3 Years & 120 days with effect from the commencement date notified as June 11, 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 AREAA of Turkey. The works were scheduled to be completed within a period of 3 years and 120 days to be reckoned from June 11, 2007, the notified commencement date with date of completion as October 08, 2010.

Unfortunately, the progress suffered badly due to paucity of funds, precarious Law & Order situation in the area and extraordinary wet season of Monsoon July/August 2010. However, hectic efforts were made for funds and after negotiation of about 06 months, finally USAID agreed to grant of US $ 45 million for Dam & Hydropower Component. In this context agreement was signed in January 2011 and till July 2014, US $ 45.0 million had been released by USAID in instalments as per payment schedule. Dam and Hydropower Component have since been completed and TOC issued.

Similar efforts had been made for USAID funding for completion of Irrigation and Flood Protection Component. After lengthy negotiations, 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 for both the components (Dam & Hydropower and Irrigation) and till June 2015, US $ 40.0 million have been released by USAID for Irrigation and Flood Protection Component in instalments as per payment schedule. Physical progress of Irrigation Component up to September, 2015 is 100%. In addition to that USAID financed US $ 11.52 million to clear the outstanding payments of Irrigation Component.

Contract No. GZD-03

Moreover, USAID also 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 July 30, 2012 and further WAPDA had requested for enhancement of this grant up to US $ 28.5 million because of high bid price. During the visit from June 09, 2015 to June 12, 2015 of USAID Team to check the physical progress of construction work at site, they agreed principally to Finance US$ 20.16 million for construction of Waran Canal System and Minors.

WAPDA has submitted disbursement payment schedule amounting US $ 20.16 million as per PIL requirement which had since been approved by USAID and payments are being released as per milestones duly verified by their technical experts and project paid to the contractor as per IPC's.

Present Status
Now adequate dam reservoir storage (EL.719.07 Meters) has been achieved to generate electricity and till ending June 2023, 331.557639 million units have been generated. Moreover, the diversion barrage and irrigation network have been handed over to Irrigation Department of KP. The handing/ taking process with Irrigation Department had completed so far.

Physical Progress
Components-Wise Progress achieved so far ending June, 2023 are as under:

Dam & Spillway	100% against the Target of 100%
Hydropower Component	100% against the Target of 100%
Irrigation and Flood Component	100% against the Target of 100%
Waran Canal System	100% against the Target of 100%
Overall Progress of the Project	100% against the Target of 100%

Financial Progress

Financial Progress (Project) up to June 30, 2023	=	123.25% of the approved PC-I Cost i.e. Rs. 20,626 Million

2nd Revised PC-1
The 2nd Revised PC-1 amounting to Rs. 25928.355 million has been cleared by CDWP and submitted to ECNEC by Planning Commission for Administrative approval which is awaited.

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, and 55 km of Double Circuit 132 kV Transmission Line, stand completed.

CHASHMA RIGHT BANK CANAL PROJECT

General
Chashma Right Bank Canal is an interprovincial Irrigation Project. It commands a total area of about 6,06,000 acres of land on the right bank of River Indus in the Khyber Pakhtunkhwa (KP) 3,66,000 acres and 2,40,000 acres in Punjab Province. The canal is 170 miles long (106 Miles in KP & 64 Miles in Punjab). It takesoff from right bank of existing Chashma Barrage and extends south ward upto Taunsa Barrage on the Indus River. The canal has total discharge capacity of 4879 cusecs at its head (3079 Cs for KPK & 1800 Cs for Punjab).

The project was planned to be constructed in three stages Stage-I,II &III, which has been completed since Dec. 2002.

Stage – I
Stage-I of CRBC is 52 miles long. First 24 miles of canal has earthen section whereas remaining 28 miles is brick tile & concrete lined. It commands 1,50,000 acres of land for which water allocation is 1226 cusecs. Work on Stage–I, commenced in July 1978 and was completed in Dec. 1986 at a cost of Rs. 2,491 million. The financing up to 79% was provided by Asian Development Bank (ADB) whereas Govt of Pakistan share was 21%. The area under command is inclusive of 4000 acres in Distt. Mianwali.

Stage – II
Stage-II of CRBC is 24 miles long. Entire section is concrete lined. It commands an area of 94, 000 acres. The discharge allocation is 820 cusecs. Work on stage-II commenced in August 1988 and was completed in September 1994, at a cost of Rs. 2,334 million. Donors were the same as for Stage-I.

Stage – III
Stage-III of CRBC is 94 miles long (30 Miles in D.I.Khan and 64 Miles in D.G Khan). Area commanded by the Canal in Stage –III, is 3,62,000 acres, which includes 1,26,000 acres of D.I.Khan & 2,36,000 acres of D.G Khan. Discharge allocation for Stage-III, is 2780 cusecs, which includes a share of 980 cusecs of KP and remaining 1,800 cusecs for Punjab. The work on Stage-III commenced in February 1995 and completed in December 2002. Financing by ADB and KfW is 65% and 14% respectively whereas GOP share is 21%. The cost of Stage-III is Rs. 12,272 million as provided in the approved 4th Revised PC-I of December 1999. **(Total Project Cost of Stage-I, II & III is Rs. 17,096.865 Million).**

Current Status
The project is now at operation and maintenance

stage under O&M Cost Sharing Agreement – 2002 signed between WAPDA and provinces of Punjab & Khyber Pakhtunkhwa (KP).

Decision of 42nd Meeting of the Council of Common Interests (CCI)
However, CCI in its 42nd meeting dated August 06, 2020 decided to hand over the control of CRBC to respective Provinces.

"Duly in pursuance of CCI Decision taken on August 06, 2020, the lower portion of CRB Main Canal has been handed over to Punjab Irrigation Department on dated: March 14, 2022. Moreover, the process of handing over of Upper Portion (KP Portion) is underway and in this regard, Tripartite Draft Agreement has been floated amongst the stake holders by KP Irrigation Department".

In Compliance, the Punjab portion of the canal was handed over to Irrigation Department, Government of Punjab on March 14, 2022. However, the handing/taking of KP portion of the canal to Irrigation Department, Government of KP is yet to be carried out.

CHASHMA RIGHT BANK CANAL (LIFT-CUM-GRAVITY) PROJECT

CRBC (LCG) Project
Chashma Right Bank Canal (Lift-Cum-Gravity) Project is located in piedmont flood plain of the hill torrents emerging from Suleman Range to debouch into Indus River. Command area is located approximately between 310 – 15' to 320 – 30' North and 700 – 15' to 710 – 30' East in D. I Khan district of Khyber Pakhtunkhwa (KP).

Background
After signing of Inter-provincial Water Apportionment Accord (WAA) 1991, Government of Pakistan requested the Government of Japan (GOJ) to provide financial assistance for 'The Feasibility Study of Chashma Right Bank 1st Lift Irrigation Project'. Consequently, the feasibility study was undertaken by Japanese Consultants, Nippon Giken Inc. in association with Nippon Koei Ltd, with financial assistance from Japanese International Cooperation Agency (JICA). This study, on behalf of Government of NWFP (Now KPK), was completed in March 1995, corresponding to a lift of 60 ft. considering that performance of pumps in this range was optimal. The resultant Lift-Cum-Gravity Project envisaged irrigation of an area of 285,644 acres (115,600 ha) contiguous with CRBIP (Gravity).

On PC-II Proforma for detailed engineering studies and tender documents of the project prepared by WAPDA was approved by CDWP in September 2000 for an amount of Rs. 135 million. WAPDA engaged consultants to prepare detailed designs and tender documents for the project as part of its Vision 2025 Programme funded from its own resources. Contract for consultancy services was signed on June 2002 between WAPDA and a Joint Venture (JV) of eight local consulting firms led by National Development Consultants (NDC). As a result of review of the feasibility study, consultants eliminated the regulation ponds due to their obvious demerits. With elimination of these ponds, CCA of the project increased to 286,140 acres instead of 285,640 acres in 1995 feasibility study.

WAPDA engaged Consultants Joint Venture comprising four consulting firms led by National Engineering Services Pakistan (NESPAK) in June 2021 to update detailed engineering design, bidding documents and PC-I Proforma for the project.

Salient Features

Feeder Canal	
- Capacity	2,570 Cusecs
- Length	40.14 Km
Pumping Station	
- Capacity	2,557 Cusecs
- Lift	66.64 Ft.
Pumping Units	8 Units
Capacity	6x353 CFS & 2x212 CFS
Type	Vertical Mixed Flow Pump
Main Canal (Gravity Flow)	
- Capacity	2,556 Cusecs
- Length	130.76 Km
- Command Area	295,774 Acres
- Total Water Requirement	1.187 MAF
Distributaries	
- No. of Distributaries	28 Nos.
- Length	147.30 Miles
- Length of Minors	73.7 Miles
Execution by	WAPDA
Consultants	- M/s NESPAK (JV Lead Firm), M/s ACE, M/s SILT and M/s ECPAK for Review of Feasibility Study, Preparation of Detailed Engineering Design, Bidding Documents & PC-I - Procurement of Supervision Consultants is under process.
Funding Agency	65% by Federal Govt. and 35% by Khyber
PC-I Cost	Pakhtunkhwa Govt. Approved by ECNEC on October 07, 2022 for Rs. 189,606.428 Million including FEC of Rs. 18,030.580 Million
Construction Period	5 years

Accordingly, ECNEC on October 07, 2022 approved the project for Rs. 189,606.428 million including FEC of Rs. 18,030.580 million.

Benefits

Benefits of this water sector project are development of land and water resources in an under developed region of the country to increase agricultural production particularly in the context of food security. A total of 295,774 acres (CCA) will receive benefits from this project with a net value of product (NVP) as Rs. 334.35 million on full development of irrigation system and corresponding command area. The project shall contribute towards achieving the following basic objectives:

i. Provision of 1.187 MAF of water is available for perennial irrigation of 295,774 acres of presently 'Rod Kohi' cultivated land in D.I Khan District of KP through lift-cum-gravity canal system with head discharge of 3,050 cusecs
ii. Increase in cropped area (Kharif and Rabi) from 44,312 acres to 443,518 acres

Contracts

Consultancy Agreement was awarded to M/s NESPAK (JV) on June 28, 2021 and the consultants mobilized on July 01, 2021. The consultancy agreement has been extended up to June 30, 2023. Consultants have submitted the Design Report, Project Planning Report, Environmental & Social Impact Assessment Report, PC-I Proforma, Feasibility Study of Solar Panels PV Power Plant and 07 Nos. Contract Package Bidding Documents have been finalized.

Procurement of Construction Supervision Consultants (CSC) for construction supervision, contract management and contract administration is in progress. Award of consultancy services is expected in the 1st week of July, 2024. CSC will carry out design review of the project and start procurement process for 03 months and 06 months, respectively. Main contracts are expected to be commenced by end of March, 2025. COST

Project Status

1. This consultancy agreement was awarded to M/s NESPAK (JV) on June 28, 2021 and the consultants mobilized at site on July 01, 2021. The consultancy agreement has been extended up to June 30, 2023. Consultants have submitted the Design Report, Project Planning Report, Environmental & Social Impact Assessment Report, PC-I Proforma, Feasibility Study of Solar Panels PV Power Plant and 07 Nos. Contract Package Bidding Documents have been finalized.
2. Process for conducting the public hearing on the EIA Report of this project going to be held at D.I Khan City on April 03, 2024.
3. Procurement of Construction Supervision Consultants (CSC) for Construction Supervision, Contract Management and Contract Administration is in progress. Award of consultancy services is expected in the 1st week of July, 2024.
4. As per Prime Minister Directives, Pre-Qualification Documents for contractors have also been prepared. Pre-qualification process will be initiated soon.
5. Construction Supervision Consultants (CSC) will carry out design review of the project and start procurement process for 03 months and 06 months, respectively. Contractor is expected to be mobilized by end of March, 2025.

GOLEN GOL HYDROPOWER PROJECT

Golen Gol Hydropower project is a Mega Dam project, initially planned under vision 2025 to meet Electric power demand of the country. The Installed capacity of the project is 108 MW and annual energy 476 GWH. The project is located near Babukka Village, Tehsil and District Chitral.

PC -1 Cost

PC-I cost for the project was approved for Rs.7,035.128 million, on 02.09.2002 by ECNEC. At first the project was scheduled to be started earlier, but owing to many factors including arrangement of Funds/Security reason, the project couldn't be started in time. Finally the work on project was started in February 2011. As a result of escalation in rates/prices of materials, inclusion of work which were not envisaged in PC-1(e.g. construction of O&M staff colony) 1st Revised PC-1 for Rs. 29,077.172 million was approved by ECNEC on September 30, 2016. Approval of 2nd revised PC-1 amounting to Rs. 42,002.00 million is under process.

Consultancy Services

The Joint Venture lead by M/s Fitchner had been appointed as Golen Gol Hydropower Project consultant for supervision and monitoring of project works. The consultancy agreement was signed in May, 2011. The payment to the consultant is made through Donor Saudi Fund for Development (SFD).

GLOF and Avalanche Events

The project was completed in December, 2018 and connected with National Grid in Timergara for power dispersal from the project. Powerhouse was in operation when unprecedented GLOFs (Glacial Lake Outburst Flood) occurred in July, 2019, &

July 2020 which damaged major components of the project. Similarly, Avalanches at Lowari Top Area damaged the 132 kV Transmission Line several times.

Reservoir, flushing section and fish ladder was filled up with sand, debris and boulders. All the 3 Nos. bridges abutments were washed away, the access Road to Weir site was also damaged at various reaches. The Bed load traps/check dams constructed at 200 m and 800 m upstream of the weir were buried.

Temporary Rehabilitation Works

Temporary rehabilitation works were carried out at cost of 43.00 million to operate powerhouse on partial load. The access road were temporary restored and Intake/flushing section was cleared from debris and boulders and water was diverted to power house.

Permanent Rehabilitation Works

Project office has planned permanent rehabilitation works to reinstate the power house on full load. The work plan, tentative cost and updated status of permanent rehabilitation works are as under.

Work Plan

It was decided that due to shortage of funds the permanent rehabilitation works may be divided into two phases/priorities:

Phase-1 (Urgent) Works

a. Clearance of Intake, Reservoir Area
b. Rehabilitation of damaged 11 kV Line
c. Rehabilitation of Water Supply to Wapda Colony

Phase-2 Works

a. Rehabilitation of bridges/access road
b. Re-routing of 132 KV T/Line at LowariTop
c. Monitoring and Alarming System

Status of Permanent Rehabilitation Works at GGHPP, Chitral up to June-2023:

Description of Work	Cost (M)	Current Status
Phase-1 (Urgent) Works		
Clearance of debris / boulders from reservoir area including 2 no. bed load traps	332.81	Contractor, M/s Mushtaq Ali and M/s Asmar Khan JV has been mobilized to Intake Site and work has been commenced since August 04, 2022. The clearance work is in progress and approximately 208,270 m^3 out of total 238,000 m^3 quantities has been excavated so far. Assessment of land/property for Bed Load Trap at 500 m U/S has been carried out.
Restoration of 11 KV Line from switchyard to Intake	32.52	The Consultant JV submitted final evaluation report to project office on February 02, 2023. M/s Margalla were evaluated as technically sound and financially lowest bidder. LOA was issued to M/s Margalla on March 27, 2023. However, the Contractor has not submitted the Performance Security; Therefore, the Bid has been annulled on June 06, 2023.
Restoration of water supply line to Wapda Colony	5.90	The restoration of Water supply was given to Public Health on deposit work, however, the locals due to water right issue stopped the work. Worthy Chairman Wapda directed CE/PD GGHPP, Chitral during GMs/PDs conference dated February 7 & 8, 2023 to re-arrange meeting with the locals and resume the works of water supply pipeline as per previous option from the source near surge chamber above Power house. A meeting was held on March 08, 2023 with the representative of the local community to discuss & resolve the issue. Meanwhile, DC Lower Chitral has been requested vide letter June 19, 2023 to arrange a meeting among all the stake holders at the earliest to settle the issue amicably once for all.
Phase-2 Works		
Rehabilitation of bridges and access roads from Power House to Intake of Golen Gol Hydropower Project Chitral	144.536	The Consultants JV submitted the revised bidding documents dated November 03, 2022 but have not vetted the bridges design/drawings prepared by CDO. Vetting of the designs of bridges is the responsibility of the Consultants JV. The Project office vide letter dated May 03, 2023 advised Consultants JV to update/review the design in light of results/outcomes of comprehensive GLOF study (performed by Consultants) and MoM issued on December 26, 2022. In response, the Consultants JV vide letter June 01, 2023 stated that in case WAPDA is interested in pursuing a full new design and profile for the access road and bridges, then a new Amendment#7 to the Consultancy Agreement will need to be signed. As per advice of Advisor Project, the Project office vide letter dated June 27, 2023 requested GM CDO (W) & Consultants JV that a meeting regarding the subject matter is proposed on July 05, 2023 at 10.00 AM in the liaison office of GM (Projects) North, Room No. 57, WAPDA House, Lahore to resolve the matter.

Golen Gol Hydropower Project

Description of Work	Cost (M)	Current Status
GLOF Monitoring / Alarming System	68.50	The work being of deposit nature will be executed through GMRC once the permanent rehabilitation works are executed/ completed.
Re-routing of 132 KV Transmission Line at Lowari Top	65.00	3 No. unprecedented Avalanche events hit Tower No.53 of 132 kV Golen Gol T/L near Lowari Top area on 23.01.2019, 14.01.2020 & 25.01.2023 due to which adjacent Towers were also got damaged/effected. The connection of Golen Gol Hydel Power Station was cut off from the National Grid and the Powerhouse was operated on isolation mode. The Contractors were engaged on emergent basis & rectification of Towers was completed on direct contract basis on 23.05.2019, 10.07.2020 & 05.06.2023 respectively & T/L was connected with the National Grid successfully.
		A team of CDO (W) Engineers conducted site visit of Lowari Top area on directions of Member (P) from 17.05.2023 to 20.05.2023 regarding protective measures for affected towers of 132 kV Transmission Line and in this regard a report was submitted by CDO (W) vide letter 26.05.2023 in which 6 No. options/protective measures were proposed for safeguarding the affected towers of 132 kV Transmission Line at Lowari Top area.
		Later on upon the directions of Worthy Chairman Wapda during an In-House Discussion held at Wapda House Lahore dated 14.06.2023, a report regarding Design Proposal for Deflector Wall & Wedge Wall for protection of Tower No.53 was submitted by CDO (W) vide letter dated 21.06.2023 with the recommendation to submit the reports to Consultants JV for vetting/review.

Salient Features

Weir Height	Weir Height 12 M (39.37 ft.)			
Head Race Tunnel Length	3.8 Km			
Gross Head				
Design Discharge	(1,427.15 ft.)			
Installed Capacity	30 M^3/Sec			
Annual Energy	108 MW			
Objectives	476 GWh			
Execution by:	To Generate Electricity			
Consultants:	WAPDA			
Commencement Date:	JV of M/s Fechner Germany (Lead Firm), M/s PES Pakistan, M/s BAK Pakistan & M/s DMC Pakistan			
Completion Date:	As per original PC-I July-2002 / Actual February-2011			
	As per original PC-I June-2006 / Actual December-2018			
	(1st Unit Commercial Operation was started on January 23, 2018)			
Detail of Donors:	Saudi Fund (SFD) (US$ 97.8 M), Kuwait Fund (KFD) (US$ 37 M & 15.5 M), OFID (US$ 30 M), US Aid (US$ 35.6 M)			
	Description	**Local**	**Foreign**	**Total**
	Original PC-I	4,397.008	2,638.120	7,035.128
	1st Revised PC-I	18,397.288	10,679.88	29,077.17
	PSDP Allocation 2022-23	2,618.000	200.00	2,818.000
	Current F/Y Expenditures	181.884	---	181.884
	Up to date Cumulative Expenditures	16,034.092	21,930.31	37,964.4

KURRAM TANGI DAM PROJECT STAGE I

Introduction / History

The multi-purpose Kurram Tangi Dam Project is located in the tribal belt of the KPK Province. The project comprises of 05 power houses, 05 canals for irrigation and 03 weirs as its major components. The project aims to provide power and agricultural opportunities in the under-developed area. The Kurram Tangi multipurpose dam is an extremely vital project with its inception dating back to the early 1940. At present, the need for the project is even greater as it would aim to diminish the woes of a looming energy crisis in Pakistan. The project is expected to provide a sustainable irrigation system in addition to a sweeping change in the economic and aesthetic outlook of the area. The project is a key milestone towards the infrastructure development in the tribal belt.

Location

Kurram Tangi Dam site is located in a narrow gorge on Kurram River in North Waziristan Tribal District about 14 km upstream of Kurram Garhi Headworks and 32 km North of Bannu City. The reservoir lies in North Waziristan Tribal District and the new areas to be irrigated lie in Bannu, Lakki Marwat and Karak Districts.

Background

Kurram Tangi Dam Project has been under active consideration since 1955. Construction of Kurram Garhi Headworks complex was started in 1952 and completed in 1962 consisting of an extended system of off-take channels. In 1960, WAPDA prepared Kurram River Planning Report recommending a dam on Kurram River. Pre-feasibility study carried out in 1991 and feasibility Report prepared in June, 2004. PC-I approved by ECNEC in 2005 for Rs. 17.2 billion. PC-I was revised in 2011 with new dam height to cater for provincial irrigation needs and increased power generation. Works could not commence due to various reasons on record.

Project Objectives/Benefits

Kurram Tangi Dam is a multipurpose project aimed at objectives of Govt. of Pakistan under WAPDA's Vision-2025 in Water, Power and Socio-economic Sectors. Objectives of project are;

- Purposeful and Effective Use of Water of Kurram and Kaitu Rivers
- Irrigate New Areas in Sheratalla, Spaira Ragha and Thal Plains
- Improvement in Cropping Intensity of Civil and Marwat Canals
- Generation of Cost Effective and Environment Friendly 83 MW Hydropower
- Flood Mitigation and Infrastructure Development
- Employment Opportunities & Socio-economic Uplift of Backward Areas of FATA and KPK

Project Stages

For ease of planning, execution and availability of requisite funding, the project has been divided into two stages on June 22, 2012.

KTDP Stage-I

Package – A
Kaitu Weir, Spaira Ragha Canal (4080 Acres), Sheratalla Canal (12,300 Acres), Feeder Channel/ Tunnel, Powerhouse IV & V (18.4 MW), 132 kV Transmission Line

Location
Kaitu weir is to be constructed across, Kaitu River in North Waziristan Tribal District. The site is at a distance of 28 km from Mirali, (Tehsil H.Q of NWD) on Mirali - Thal Road near Spinwam Bridge and 68 km from Bannu District KPK.

(Package – B) Construction of Colonies
- 32 Kanal Land for WAPDA Colony at Bannu has been awarded on February 09, 2018.
- Construction of boundary wall, Office Building, Official Hostel, Masjid and Dispensary has been completed.
- Construction of Officer Hostel, Rest House Building, Recreational Building and Overhead Water Tank, are under progress.
- Current progress on 32 Kanal Colony Bannu is 75%.
- Similarly land has been acquired for establishing site camp at spinwam and site camp has been established.

(Package – C) Construction of 132 kV Transmission Line
A 45 km 132 kV Transmission Line will be constructed from Powerhouse IV to Domel Grid Bannu en-route Powerhouse I, II and III for future use in Stage-II of the project, as well. The load flow study has been carried out by NTDC. Tribal Area Electricity Company (TESCO) has been awarded the contract on October 20, 2021 as deposit work to construct 45.503-km 132 kV Transmission Line from 220 kV Grid Station Domail (Bannu) to Kurram Tangi., PC-1 cost approved is Rs.1316.518 million. Payment of Rs. 880 million has been made to TESCO by project office. Demarcation of towers location # 01 to 155 has been completed.

Project Cost and Financing of Stage – I
- Revised PC-I of Rs. 21,059 million approved by ECNEC on April 22, 2016 with following funding:
- USAID US $ 81 million (Rs. 8.5 Billion)
- E&M Works US $ 44 million (100 % of E&M Works)
- Civil Works US $ 37 million (45% of total Civil Works Amount)
- Italian Cooperation US $ 45 million (Rs. 5.1 Billion) Loan for Command Area Development

Salient Features of Stage-I

Kaitu Weir	
Type of Weir	Reinforced Cement Concrete
Discharge (Design Flood)	78,000 Cusecs
Length	302 Ft.
Height of Weir	13 Ft.
Crest Elevation of Main Weir	2353 Ft. AMSL
Floor RL Stilling Basin	U/S Floor Elevation Main Weir = 2340 Ft. Under Sluices = 2340 Ft. Stilling Basin Level Main Weir = 2326.4 Ft. AMSL Under Sluices = 2322.5 Ft. AMSL
Right Under Sluice Crest Level	2345 Ft.
Feeder Tunnel	
Length	6,840 Ft. (2040 Ft. Portion through Cut & Cover Method)
Discharge Capacity	1200 Cusecs
Power House – IV	
Installed Capacity	18 MW
Head	197 Ft.
Type of Turbine	Francis (Vertical Shaft)
No. of Units	02
Design Discharge (Each Turbine)	600 Cuecs
Annual Generation	12.410 GWh (will depend on the Availability of Surplus Water / Flood Water)
Power House No. V	
Installed Capacity	0.4 MW
Head	104.50 Ft.
Type of Turbine	Francis (Horizontal Shaft)
No. of Units	02
Design Discharge	56 Cusecs
Spaira Ragha Canal	
Culturable Command Area (CCA)	4,080 Acres
Discharge at Head	29.15 Cusec
Length of Main Canal	8.1 Miles
Length of Distributes + Minors	3.52 Miles
Bed Width	3.5 Ft.
Depth	2.19 Ft.
Side Slope	1: 1.5 (Main), 1:1 (Distributaries)
Sheratalla Canal	
Culturable Command Area (CCA)	12300 Acres
Discharge at Head	83.21 Cusec
Length of Main Canal	16.43 Miles
Length of Distributes + Minors	34 Miles
Bed Width	4 Ft.
Depth	3.43 Ft.
Side Slope	1: 1.5 (Main), 1:1 (Distributes)

Separate PC-I & Funding Arrangements in process by KPK Agriculture Department
- Balance amount of Rs. 7.5 billion from Government of Pakistan under PSDP
- Contract signed on June 07, 2016 and Contractor Mobilized on July 12, 2016
- Economic Internal Rate of Return 14.17 %
- Cost Benefit Ratio 1:1.16 %

Project Consultants
M/s Mot McDonalds-JV

Project Contractors
M/s FWO_DESCON - JV

Project Commencement
July, 2016

Project Completion
December 31, 2024 as per EOT-3

Estimated Completion Date
March 2027

- 2nd Revised PC-I for Stage-I amounting to Rs. 42750 million on dated January 04, 2024 uploaded on I-PAS of Ministry of Water Resources Islamabad and submitted in hard form as well vide this office letter No. CE & PD/KTDP/W-6/9511 dated January 04, 2024, which was returned to project office on February 06, 2024 with comments from Ministry of Water Resources and was forwarded to consultants for rectification and early submission.
- The consultants finalized 2nd Revised PC-I on April 29, 2024 and was re-submitted to Ministry of Water Resources, which is again received with some comments which were responded and updated PC-I submitted to Ministry of Water Resources through I-PAS on June 14, 2024 along with hard copies to Ministry of Water Resources on the same date through GM (P) North.

Current Status of PC-I
The response of project office for comments of Ministry of Water Resources received to project office vide letter #1(153)2014-AC dated July 31, 2024 has been responded via GM(P)North letter dated August 13, 2024 .

Land Acquisition Status up to June 30, 2024:
- Total Land Required 785.48 Acres
- Total Land Acquired 561.78 Acres
- Land need to be Acquired 223.70 Acres

Current Status
- The contractors is mobilized at site & work is in progress. Overall physical progress upto June 30, 2024 is 75.70%.
- Kaitu weir undersluices portion, Kaitu weir all blocks from 1-6, Spaira Ragha Canal Head Regulator, Sheratalla Canal Head Regulator and Sediment Excluder along with connecting channel has been completed .
- On Spaira Ragha Canal up to RD 35+800, excavation, hard rock cutting & embankment has been almost been completed. Construction of structures on the canal i.e. Culverts, Syphon and Aqueduct is in progress.
- Earthwork at upper and lower Sheratalla Canal is in progress. Excavation for Sheratalla proposed Tunnel pf Length 2.85 km has been in progress. Sub -Contractor for the construction of tunnel has mobilized at site and access to Inlet and Outlet portal of the tunnel is in progress.
- At PH-V, Earthwork for power house building, Forebay and penstock is in progress.
- Inlet and outlet portal of the Feeder tunnel has been completed. From Inlet portal, 2036 ft. and from Outlet portal 1167 ft. excavation has been completed out of total length of 4800 ft. At cut and cover portion of 2040 ft. excavation has been completed and lining of 1367 ft. has been completed.
- Construction activities on Main building of power house IV and installation of E&M works is in progress. Earthwork for Forebay, Spill Channel, Tailrace Channel and Switch Yard has been completed. Lining of Tailrace Channel has been completed.
- Construction activities on Forebay, spill channel and switchyard is in progress. Earthwork for penstock has been completed whereas installation of Penstock is in progress.
- At Headrace Channel for PH-IV , 100 % of the total earthwork and lining has been completed whereas only cross drainage structures are remaining and are in progress.

Project Progress (Stage-I)

Topographic Survey (main canals)	Completed
Topographic Survey (Distributaries and minors)	Completed
Geo Technical investigations	Completed
IFC drawings	95% issued
Coffer Dam – I & II and Dewatering	100 %
Kaitu Weir , Undersluices and silt Excluder	100 %
Feeder Tunnel	79.75 %
Spaira Ragha Canal	83.10 %
Sheratalla Canal & PH-V	25.32 %
Access road (Spinwam to Main Dam)	35.50%
Powerhouse IV & Access Roads	98.90 %.
Land Acquired out of total 785.48 Acres	561.78 Acres
Overall Physical Progress up to 30.06.2024	75.70 %
Overall Financial Progress up to 30.06.2024	101.177 % as per 1st Revised PC-I amounting to 21059 million

Issues & Recommendations
- Restriction on free movement of staff due to Precarious law & order situation/curfew in North Waziristan Tribal District.
- Acquisition of land in different areas is cumbersome due to ownership issues among the locals.

- Access Road from Kaitu Bridge to main Dam Site is included in the USAID PIL. Project office faced agitation from Locals while conducting survey of the said road and Project Office stopped it on the direction of Local Administration and Pak Army. Now, Project Office will try to start the work again on Access road within one month, after having negotiation with the Locals and meeting with the Commissioner Bannu Division / GOC 07 Division Meeran Shah.
- Fixation of less rates for Acres by District Administration, North Waziristan Tribal District.

Different Issues /Reasons of Slow Progress

- Precarious law and order situation in the Project Area
- Land Survey for acquisition of land for Access Road beyond 7+500 RD to RD 15+000.
- Restricted/limited working hours at site due to security conditions
- Non-release of PSDP fund resulting in financial constraint since January 2022
- Funds are not being released from PSDP allocation due to non approval of revised PC-1
- 2nd Revised PC-I is under review by Mo PD&SI since February 12, 2023
- An inquiry was held ,Convene by CE(DSC) o/o CEA/CFFC to identify the reasons for delay in completion of the project and fix responsibility for inability to complete the project after revision on the PC-I
- Committee was constituted by MoWR dated May 30, 2023, Headed by Chief Engineer (Dams & safety) O/o CEA/CFFC, Accordingly the committee concluded its report with conclusion dated December 08, 2023 to take appropriate action against Detailed Engineering Design consultants
- Poor Performance of Detailed Engineering Design Consultants , lack of meaningful coordination among Project stakeholders and precarious law & order situation in the area are mainly responsible for delay in completion of the Project after 1st revision
- 2nd Revised PC-1 was returned on February 06, 2024 and was forwarded to consultants for rectification and early submission
- The consultants finalized 2nd revised PC-I on April 29, 2024 and was re-submitted to MoWR, which is again received with some comments which were responded and updated PC-I submitted to MoWR through I-PAS on June 14, 2024 along with hard copies to MoWR on the same date through GM(P)North

Achievement for Next 3 Years Plan

- Completion of Land Acquisition for Stage-I and Construction of Office/Colonies at Bannu and site Spinwam.
- Completion of both irrigation and power components of Stage-I Command Area to be developed by KPK Agriculture department for operation
- Approval of 2nd Revised PC-I & Stage-II PC-I from ECNEC and arrangement of funds
- Land Acquisition and Initiation of work on different lots of Stage-II
- Completion of 132 KV Transmission Line from Project to Domel Grid Bannu
- Completion of CBM work in Stage –I and also the priority work of Stage –II
- Access / Approach Road Spinwam Bridge to Dam site

Financial Status

The PC-II Performa was approved by CDWP at rationalized cost of PKR 1536.808 in its meeting held on June 05, 2021 and minutes of meeting conveyed on Auguts 13, 2021. Administrative approval accorded on November09, 2021.

Updation of Feasibility Study

- The study is under progress by the Consultants M/s DOLSAR JV hired by ADB under grant 1, 8 USD million.
- Commenced on April 23, 2021
- Initial Time period for completion 12 months
- 1st extension by ADB September 30, 2023
- 2nd extension by ADB November 30, 2024
- Draft feasibility study has been submitted by the Consultant in April, 2024.
- It is anticipated that final feasibility study will be finalized in September, 2024.

- Physical Progress = 90%
- Financial Progress = 75%

Detailed Engineering Design

- Consultancy Agreement between WAPDA Authority & M/s DOLSAR Inc. for Detailed Engineering Design, Up-dation of PC – I, LARP PC – I and Preparation of Tender Documents, has been signed on September 01, 2023
- Client's Notice to commence the services yet not issued
- Consultancy period is 22 Months
- Detail Engineering design team will review the reports developed during feasibility study
- A Joint Venture of:
  - DOLSAR Engineering Inc. Co. (Ankara, Turkey)
  - Al Kasib Group of Engineering Services (AGES) (Peshawar, Pakistan)
  - Pakistan Engineering Services (PES) Pvt.Ltd.(Lahore, Pakistan)
  - BAK Consulting Engineers Pvt.Ltd. Peshawar Pakistan

Salient Features of Stage-II

Reservoir:	
Catchment Area	6381.7 Sq Km
Full supply level (FRL)	2127 ft (SPD)
Dead Storage Level	2001 ft (SPD)
Reservoir capacity (Gross storage)	1.2 MAF
Live storage	0.9 MAF
Dead Storage	0.3 MAF
Reservoir Area	10939 Acres
Probable Maximum flood	187000 cusecs
Average Annual Inflow at Dam Site	837000 cusecs
Reservoir effective life (time at loss of 80 % loss Capacity)	225 Years
Main Dam	
Dam Type	Concrete Faced Rock fill Dam (CFRD)
Crest Elevation	2142 (SPD)
Free Board	15 ft
Crest Width	45 ft
Dam height	322 ft.
Dam length	1035 ft
Spillway	
Crest elevation	2097 ft (SPD)
Number size of radial gates (Four Gates)	44.75*40 (ft*ft)
Discharge Capacity at FRL	141145 cusecs
Irrigation System	
Improvement of existing irrigation system	
Civil Canal	
CCA	107500 acres
Marwat Canal	
CCA	170500 acres
New irrigation system	
Thal Canal	
Irrigated command area	68000 acres
Designed discharge	343.6 cusuces
Length of main canal	77.34 km
Off-take point	Kurram Garhi H/W Left Flank
Power Houses	
PH-I	47.60 MW
PH-II	11.14 MW
PH-III	16.68 MW
Total Generation	75.4 MW
Annual Generation	384 GWh

- Physical Progress = Nil
- Financial Progress = Ni

Land Status Regarding Stage-II

- 90 Acres of land has been acquired in FR Bannu for Main Thal Canal of Stage-II at an amount of Rs. 16.96 million.

CHASHMA BARRAGE & CJ-LINK CANAL PROJECT WAPDA CHASHMA

CHASHMA BARRAGE

Chashma Barrage has been constructed over River Indus and has been operational since 1971. Serving as a regulator of discharge, it facilitates water diversion for the Chashma Right Bank Canal (CRBC) on the right side and the CJ-Link Canal on the left. Additionally, the barrage acts as a re-regulatory storage facility for water releases from the Tarbela Dam. During the fiscal year, 2022-23 the reservoir stored 2.198 MAF (Million Acre-Feet) of water and released 2.130 MAF. In terms of river flow, the total inflow through Chashma Barrage during 2022-23 was 78.090 MAF, while the outflow was 75.275 MAF, with water released downstream of the Indus River. Specifically, 2.462 MAF was diverted into the CJ-Link Canal, and 1.007 MAF was directed into the Chashma Right Bank Canal. The outflow through the Chashma Barrage gates during the same period amounted to 34.695 MAF. Of this, 28.804 MAF was channeled to the Chashma Power House for energy generation. Additionally, 1.960 MAF of water was supplied for the cooling requirements of the Chashma Nuclear Power Plant (Pakistan Atomic Energy Commission, PAEC) at Kundian, with this water ultimately returning to the river. The 6th periodic inspection of the Chashma Barrage, along with its associated structures and river training works, was conducted in 2017 by the Dam Safety Organization of WAPDA.

The final report of the 6th hydrographic survey, carried out by ISRIP, indicated that the storage capacity had decreased to 0.3 MAF, compared to the original capacity of 0.870 MAF. Routine maintenance and upkeep of the barrage and its components continued throughout the year, with the regulation of the barrage being carried out in accordance with the indents received from the Indus River System Authority (IRSA).

Chashma Barrage Benefits

Since commissioning of Chashma Barrage 98.711 MAF of water was released from the storage.

CHASHMA JHELUM LINK CANAL

The CJ-Link Canal is an earthen channel that takes off from left bank of the River Indus at Chashma Barrage to divert its water to River Jhelum. The canal has a total discharge capacity of 21,700 cusecs, in addition to a continuous supply of 3,540 cusecs to the Pakistan Atomic Energy Commission (PAEC) for its four nuclear plants (C1, C2, C3, and C4). This supply is maintained year-round through the impounding of water at the Thal Regulator, located at RD 34+387. The canal also fulfills the water requirements of the Trimmu Headworks as per Indus River System Authority (IRSA) indent.

At RD 180+222 of the CJ-Link Canal, the Greater Thal Canal branches takes off to meet the irrigation demands of the Thal Desert. The canal predominantly traverses sandy terrain, with a significant section,

Satpara Dam

from RD 160+000 to RD 215+000, constructed in filling which has led to excessive seepage, resulting in the waterlogging of low-lying areas such as Adhikot, Chan, and Rangpur Villages.

To cater for waterlogging and salinity, Water and Power Development Authority (WAPDA) has installed 25 tube wells, each with a capacity of 3 cusecs, in the Adhikot area in 1971. Additionally, 15 tube wells, each with a capacity of 1.5 cusecs, were installed in the Chan Area in 1975. These measures were implemented as part of an anti-waterlogging strategy and are operated and maintained by the Punjab Irrigation Department. Furthermore, in 1985, WAPDA installed 21 centrifugal pumps with a total discharge capacity of 51.5 cusecs across five pumping stations to address the seepage problems in the surrounding areas. These pumps, along with their associated infrastructure and drains, are operated and maintained by WAPDA. This comprehensive infrastructure aims to mitigate the adverse effects of seepage and ensure the sustainable management of water resources in the region.

WATER DIVISION (NORTHERN AREAS)

SATPARA DAM PROJECT

Satpara Dam is a multipurpose Dam constructed on the Satpara Lake providing clean drinking water; irrigation water and cheap environment friendly electricity to Skardu City. The construction of Satpara Dam Project started in 2003 under Federal PSDP, executed by WAPDA. The commercial operation of PH-1 started in October-2007 and PH-2 in Dec-2008. Power House # 3 & 4 were not part of the original PC-I but were made part of the project in 1st Revised PC-I as a supplementary agreement funded by USAID.

The construction of power houses 3 & 4 commenced in June, 2011 and were commissioned in May, 2013 & June 2013 respectively. The stakeholders of 12 Mouzas did not allow diverting water for operation of PH-3 & 4 even for its test run/reliability run, however, with the cooperation of the local administration 72 hrs. trial run and 30 days reliability run were completed on May 08, 2014. The Power Plants were again shutdown on May 12, 2014 as the local refused to allow water for further operation of Power Houses due to non- existence of escape channel and water right issue. Moreover, upon strenuous efforts of this office escape channel for PH-3 was constructed with the collaboration of Local Administration through an NGO and Power House # 3 was made operational on September 09, 2015.

The Power Houses have cumulatively generated 523.949 GWh energy up to June 30, 2023.

Irrigation System

Irrigation System consisting of two main canals namely Left Bank Canal (LBC) and Right Bank Canal (RBC) to irrigate 15000 acres of land as per detail below:

Dam Type	Reservoir Storage Capacity		Maximum Conservation Level	Date of Completion
	Gross	Dead		
Earth and Rock Fill	93,310 Acre Ft.	37,962 Acre Ft.	8740 FASL	October-2010

Timeline Power House # 1 & 2
(PH-1 Head = 92.92 M and PH-2 Head = 165 M)

Description	PH-1	PH-2
Installed Capacity	4.86 MW	8.74 MW
Head	90.92 M	165 M
Commissioning Date	October-2007	December-2008
No. of Units	2 Units of 2.43 MW Each	2 Units of 4.37 MW Each
Turbine Type	Francis Turbines	Francis Turbines
Present Status	Both Units Operational	Both Units Operational
Units Generated so far	129.348 GWh	369.241 GWh

Detail of Irrigation System

Description	Discharge Capacity	Length	Command Area
Left Bank Canal	135 Cusecs	51,933 ft.	10,400 Acre
Right Bank Canal	52 Cusecs	58,000 ft.	4,600 Acre

Timeline Power House # 3 & 4
(PH-3 Head = 73.52 M and PH-4 Head = 43.28 M)

Description	PH-3	PH-4
Installed Capacity	2.36 MW	1.40 MW
Head	73.52 M	43.28 M
Commissioning Date	May-2013	June-2013
No. of Units	2 Units of 1.18 MW Each	2 Units of 0.70 MW EACH
Turbine Type	Compact Francis	Compact Francis
Present Status	Both Units Operational	Power House No. 04 is under shutdown w.e.f May 12, 2014 due to water rights issue & non-existence of escape channel.
Units Generated so far	25.329 GWh	0.120 GWh (During Trail Run and Reliability Run)

ALLAI KHWAR HYDROPOWER PROJECT

The project has been constructed on Allai Khwar (Allai Nullah), a Left Bank Tributary of River Indus near Besham Town in District Battgram of Khyber Pakhtunkhwa Province. It is 265 km from Islamabad and 365 km from Peshawar.

The project stands completed. The powerhouse generates 121 MW hydel power by drawing 21 cumecs water through 2366-meter-long Pressure Tunnel and utilizing maximum head of 687 meter. PC-I of the project was approved by ECNEC on September 2, 2002 with a total cost of Rs. 8,577.824 million that includes Rs. 3,453.540 million as foreign exchange component. 1st Revised PC-I was considered / approved by ECNEC on July 29, 2011 for a total cost of Rs. 13,834.948 million that includes Rs. 6,522.261 million as foreign exchange component. 2nd Revised PC-I is under process. 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. Commercial operation of the powerhouse commenced on March 25, 2013 with cumulative generation of 4634.05 MkWh as on June 30, 2023.

KHAN KHWAR HYDROPOWER PROJECT

The project has been constructed on Khan Khwar (Khan Nullah), a Right Bank Tributary of River Indus near Besham Town in District Shangla of Khyber Pakhtunkhwa Province. It is 265 km from Islamabad and 350 km from Peshawar.

The project stands completed. The powerhouse generates 72 MW of hydel power by drawing 35 cumecs water through 4517-meter-long Tunnel and utilizing maximum head of 257 meter. PC-I of the project was approved by ECNEC on September 2, 2002 with a total cost of Rs. 5,362.705 million that includes Rs. 2,644.098 million as foreign exchange component. 1st Revised PC-I was considered / approved by ECNEC on August 20, 2009 for a total cost of Rs. 8,301.479 million that includes Rs. 3,727.791 million as foreign exchange component. 2nd Revised PC-I is under process. IDB 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. Commercial operation of the powerhouse commenced on November 8, 2010 with cumulative generation of 2699.15 MkWh as on June 30, 2023.

DUBER KHWAR HYDROPOWER PROJECT

The project has been constructed on Duber Khwar (Duber Nullah), a Right Bank Tributary of River Indus near Pattan Town in District Kohistan of Khyber Pakhtunkhwa Province. It is 300 km from Islamabad and 400 km from Peshawar.

The project stands completed. It generates 130 MW of hydel power by drawing 29 cumecs water through 4873- meter- long Tunnel and utilizing maximum head of 540 meter. PC-I of the project was approved by ECNEC on September 2, 2002 with a total cost of Rs. 9,754.260 million that includes Rs. 4,147.510 million as foreign exchange component. 1st Revised PC-I was considered / approved by ECNEC on August 20, 2009 for a total cost of Rs. 16,324.476 million that includes Rs. 8,255.821 million as foreign exchange component. 2nd Revised PC-I is under process.

Contract for Civil and Hydraulic Steel (C&HS) Works was awarded to M/s China National Water Resources and Hydropower Engineer 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. Commercial Operation of powerhouse commenced on March 17, 2014 with cumulative generation of 5566.26 MkWh as on June 30, 2023.

Evacuation of Power: All the three High Head Projects are connected to National Grid through construction of 132/220 kV Transmission Line of 232 km in length.

GHAZI BAROTHA HYDROPOWER PROJECT

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. Under Sluices 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 Under Sluices 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 Head Ponds with a combined live storage capacity of approximately 25.5 million cubic meters, 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 Hydel Power Stations, due to low reservoir levels, Ghazi Barotha provides peak production of 1450 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 1450 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 supply, sewerage, schools, mosques 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.

GBHP Spillway, Barrage and Reservoir

Project Implementation

In the Feasibility Report, the time for project implementation of Civil and M&E Contracts was estimated as 63 months starting from April 01, 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 August 19, 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 project was substantially completed in June, 2006.

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 US $ 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.

Status of the Project During 2022-23

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:

-	Total Units generated during FY 2022-23	6,886.475 MkWh
-	Projected Annual Generation as per PC-I	6,600.000 MkWh
-	Cumulative Generation since Commissioning	134,035.283 MkWh
-	Powerhouse Peak Load during FY 2022-23	1450 MW

Principal Project Data

BARRAGE	
Normal Pond Level	340.0 M
Pond Volume (Gross)	71 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	332.2 M
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
Super Passages	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	

POWER COMPLEX		
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
Stop Logs		
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	

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 Powerhouse intake structures and draft tubes of different units was carried out after taking shut down from concerned agencies.
- Annual Inspection of the project was carried out by WAPDA Dams Safety Organization (DSO) w.e.f. October 12, 2022 to October 21, 2022.

Land Acquisition Status

Total land required for the project was 85168 Kanals, out of which 85125 Kanals have been acquired and awards of the remaining land for 43 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. 4415.409 million have been disbursed to the affectees. The remaining amount will be disbursed as and when the awards are completed.

Resale of land at spoil banks is in progress and upto date 2356 Kanals have been sold out to 90 Nos. PAPs in KPK. resale of land on spoil banks falling in Punjab province is pending due to non-issuance of NOC by the Punjab Government.

Updating of Supplementary Environmental & Social (SES) Study of Indus River Reach between Ghazi Barrage & Khairabad Bridge

The Honourable Speaker, National Assembly of Pakistan called for a detailed briefing regarding the measures to be taken to compensate the people affected by Ghazi Barotha Hydropower Project. The said meeting was held on September 07, 2018. Subsequently, a Joint Committee was formed under the chairmanship of Mr. Omar Ayub, Federal Minister for Energy (Power Division) with participation from representatives of Ministry of Water Resources, WAPDA and local parliamentarians/public representatives.

In a meeting held on November 05, 2018 under the chairmanship of Speaker National Assembly, the committee decided to carry out a study through PSDP on environmental and social issues of the area, outcome of which will help deciding future course of actions, to resolve the matter on long term basis. CDWP in its meeting held on August 06, 2019 approved the PC-II for Rs. 112 million.

Subsequently, the Consultancy Contract for the subject Study was signed with M/s Mott MacDonalds Pakistan (Pvt) Ltd on January 08, 2021 with the approval of Authority and subsequently 'Letter of Commencement' was issued on January 18, 2021. The firm had mobilized its resources w.e.f. January 22, 2021. As on June 30, 2023, physical progress of the Study was 99%.

FEASIBILITY STUDY OF SHATUNG NULLAH DIVERSION PROJECT

Background

Initially Shatung Nullah Diversion (LOT-4) was part of Original PC-I of Satpara Dam Project (2002).

Due to strong reservations from local NGOs (WWF, IUCN), Shatung Nullah Diversion (SND) was deferred in 2004 by Member Water, which was later approved by the WAPDA Authority in 2009.

2nd Revised PC-I for Satpara Dam Project (without SND) was submitted in MoW&P in 2012.

It was decided by MoW&P (now MoWR) on April 26, 2016 to again make SND a part of Satpara Dam Project PC-I. Accordingly, the PC-I was updated and submitted to MoWR in November 2018, which was further sent to Planning Commission on February 14, 2019.

Planning Commission returned the PC-I on January 28, 2021 with the direction to submit two separate PC-Is for Satpara Dam Project and Shatung Nullah Diversion Project.

Location

The Shatung Nullah Diversion Project is located in Deosai Plains at an altitude of around 4,000 m.a.s.l (13,000 Ft.). It is about 27 km (16.8 Miles) towards the south of Satpara Dam Project, which is about 6 km (3.7 Miles) from Skardu Town.

Project Benefits

The main scope of study is to divert water from Shatung Nullah to Satpara lake for the following objectives/benefits:

- Availability of Flows during Crop Sowing Season
- Additional Energy Generation
- Increased Water Supply requirement of Skardu Town

Scope of Work

The scope of project includes:

- Detailed in House Study regarding Topographic Survey and Mapping, Geological and Geotechnical Investigations, Sedimentation Study,
- Installation of complete Hydro Metrological Station (Automatic) for River Discharges and River Levels at Shatung Nullah, and
- Hydrological Studies and Seismic Studies through engaging Consultants to get a bankable Feasibility Study and Feasibility Level Design

Consultants	M/s PES - BARQAAB - MMP JV
Donor Agency	Government of Pakistan
Execution by	WAPDA
Commencement Date	July 2021 (As per PC-II)/ June 2022 (Actual)
Completion Date	Jan 2023 (As per PC-II)/ Dec 2023 (Expected)

Physical Progress on June 30, 2023 **66.00%**
Financial Progress on June 30, 2023 **58.88%**

Status As on June 30, 2023

- Sedimentation Study by International Sedimentation Research Institute of Pakistan completed.
- Topographic Survey completed by WAPDA.
- Geotechnical Investigations are in progress by WAPDA.

Financial Status

Financial Status	Local	Foreign	Total (M. Rs.)
PC-II Approved by DDWP on May21, 2021	259.460	---	259.460
Expenditure till June 30, 2023	152.779	---	152.779

Consultants Progress

Task-I: Inception Report

Review of Existing Surveys	Completed
Review of Field Investigations	Completed
Review of Existing Reports (WAPDA)	Completed
Review of Existing Reports (Others)	Completed
Legal Feasibility Frame Workshop	Completed
Preparation of Inception Report	
- Water Availability Study	Completed
- Alternative Project Layouts (Inception)	Completed

Task-II: Feasibility Report

Additional Surveys/ Investigations	In Progress
Review of Existing Reports (Others)	Completed
Water Demand Study	In Progress
Project Layouts/ Sizing	Completed
Firming Up of Design Parameters	In Progress
Costing/ Financial Analyses	Not Started
ESIA/ ESMP/ LA/ RAP	In Progress
ECIA/ CHA & Flora/ Fauna	In Progress

KEYAL KHWAR HYDROPOWER PROJECT, PATTAN, KOHISTAN

Location

The project is located in the Khyber Pakhtunkhwa (KP) province of Pakistan on Keyal Khwar in Kohistan (Lower) District, 310 km from Islamabad. Keyal Khwar is the right bank tributary of River Indus.

Project Cost

Original PC-I of Keyal Khwar HPP, amounting to Rs. 7,066.961 million was approved on Jan 07, 2004 by ECNEC, based on the draft Feasibility Study prepared by SHYDO – GTZ in 2000.

- 1st Revised PC-I of Keyal Khwar HPP, amounting to Rs. 27,803.010 million was approved on September 12, 2014 by ECNEC.
- 2nd Revised PC-I of Keyal Khwar HPP, amounting to Rs. 26,084.178 million was approved on January 29, 2016 by ECNEC.
- 3rd Revision of PC-I amounting to Rs. 49,648.67 million (approx.) was submitted to CEA/CFFC (MoWR) on January13, 2021, which is under process but as per present inflation, devaluation and price escalation the amount will increase. Pre-CDWP meeting was held on December 09, 2021. Planning Commission has asked to resubmit the 3rd Revised PC-I as per costs after finalization of bids for the two Contracts (Civil & E&M) in order to avoid further revisions.
- As per abnormal escalation / inflation the amount of revised PC-I may increase to the tune of Rs. 90 billion.

Donor Agencies

- KfW (Germany) Euro 97 Million
- AFD (France) Euro 120 Million

Financing

- WAPDA Equity 21%
- Foreign Loan 79%

Project Consultants

Keyal Hydropower Consultants (KHC), a Joint Venture of M/s Tractebel Engineering GmbH, Germany (Former Lahmeyer International), National Development Consultants (NDC) & EASE-Pak.

Main Features

- Installed Capacity (MW) 128
- Gross Head (M) 737.5
- Design Discharge (M^3/Sec) 20
- Mean Annual Energy (GWh) 418
- No. & Type of Turbine 02 (Pelton)
- Plant Factor (%) 38

Project Benefits

- The project will generate 418.0 GWh of energy annually which will assist in meeting power demand of the country.
- The high head hydropower will provide cheaper hydroelectric power at competitively low cost.
- To provide adequate facilities for the generation, transmission and distribution of electrical energy keeping in view the future requirements for the industrial, agricultural and economic development of the country.
- Employment Opportunities for the Locals.

Project Timeline (As Per Revised Schedule Submitted by Consultants)

Main Civil Works Contract KKHPP-02 (48 Month Period)

- Expected Date of Award June, 2024
- Expected Date of Completion August, 2028

Main E&M Works Contract KKHPP-03 (45 Month Period)

- Expected Date of Award September, 2024
- Expected Date of Completions August, 2028

Project Progress

- Overall Physical Progress 11 %
- Financial Progress 18%

Land Acquisition

The required Land of 940 Kanals and 06 Marlas, for Keyal Khwar HPP have been acquired at a cost

Keyal Khwar Hydropower Dam Site

of Rs. 568.9 million. Mutation of the said land in the name of WAPDA has also been completed. The devastating flood in August, 2022, washed-out major patches of the already proposed alignment of the Keyal Valley Road (KVR) providing access to dam site, which necessitated the realignment and redesign of said road. The Keyal Khwar Consultants (KHC) redesigned the KVR as per the new post flood survey data, on an elevated safer alignment. This new alignment requires an acquisition of 261 Kanal & 17 Marla of additional land.

O&M Colony Pattan
Construction of WAPDA Colony at Pattan has almost been completed.

Contract-01
The Contract for Ventilation Tunnel of Powerhouse was completed in May 2014 at a cost of Rs.112.88 million.

Civil Works Contract
Due to termination of Main Civil Works Contract in 2017 because of Contractor's Non-performance, the retendering process for both Major Contracts (Civil and E&M) was initiated. Evaluation of Pre-qualification applications for Civil Works has been completed. KfW has issued No Objection Letter for Pre-Qualification Evaluation Report on September 23, 2022. WAPDA Authority in its meeting held on October 19, 2022 has accorded approval to the PQ Evaluation for the Pre-qualified companies viz;

1. M/s China International Water & Electric Corporation (CIWEC)
2. M/s Power Construction Corporation of China Ltd. (PCCCL)

Bidding documents have been sent to the donor, KfW, for issuance of NOL, in the mid of December 2022. However, KfW proposed vide email dated January 24, 2023, that WAPDA and the Consultant (KHC) must prepare a preliminary access road concept as per post flood data and prepare all the necessary bidding documents pertaining to Keyal Valley Road, being part of the Main Civil Works Contract. In this regard, all the requisite changes have been incorporated in the bidding documents and submitted to KfW on June 16, 2023 for issuance of NOL, which is still awaited. Once the NOL on bidding documents is issued, the tendering process will be proceeded further.

Electrical & Mechanical (E&M) Contract
Pre-Qualification Evaluation Report for contractors on E&M Contract was submitted to KfW on January13, 2023 for issuance of NOC which is awaited.

Financial Status
Loan Agreement of Euro 97 million with KfW is already intact and Loan Agreement of Euro 120 million was signed between EAD (GoP) and AFD on January 16, 2023.

Budget Approved
An amount of Rs.1045 million (Foreign 400 M and Local 645 M) has been approved in PSDP allocation 2023-24.

Expenditure
An amount of Rs. 4,734.66 million (with Local Component of Rs.3,828.69 million & Foreign Component of Rs.905.97 million) has been spent till June 2023 on account of land acquisition, Ventilation Tunnel, O&M Colony, Consultant's fee & Supervisory Charges and Admin Expenditure.

HARPO HYDROPOWER PROJECT

Introduction
The Pakistan Water and Power Development Authority in line with its mandate is working hard on development of water and hydropower resources throughout Pakistan. The idea is to use the natural resources in an efficient manner to generate clean electricity besides development of water storages and mitigation of flood hazards. Therefore, in order to meet the requirements of the country both in water and hydropower sectors WAPDA has under taken several multi-dimensional projects throughout the country from large storage dams to small hydropower projects. These projects will not only be beneficial at national level but will also bring prosperity in the remote and less developed regions of the country where the projects are located. One of such projects in the long list of WAPDA is Harpo Hydropower Project located in Gilgit-Baltistan. It is one of the largest Hydro Power Projects under construction in the entire history of Gilgit-Baltistan after Diamer Basha Dam. It has therefore immense importance and would have far reaching benefits for the people of Gilgit-Baltistan in particular and Pakistan in general.

Location
The Harpo Hydropower Project is located on Harpo Nala (Lungma), a left tributary of Indus River in Rondu Area, District Skardu, Gilgit-Baltistan about 75 km North-West of Skardu Town and 670 km North-east of Islamabad.

Project Benefits

Financial Benefits
The project will supply 34.5 MW of cheaper hydel power and generate 170 GWh of energy annually, which will help in eradicating the problem of Load Shedding in the area and also contribute in savings on purchase of fuel.

Social Benefits
The project will improve the living standard of the area by providing alternate source of income through employment opportunities both during and after construction of project along with improving standards of health, education and infrastructure facilities in the area.

Salient Features

Installed Capacity	34.5 MW
Energy Generated	170 GWh
Gross Head	723 M
Sponsoring Agency	Ministry of Water Resources
Executing Agency	Pakistan Water & Power Development Authority (WAPDA)
Project Consultants	Harpo Consultants (JV of M/s Tractebel, Germany (Former M/s Lahmeyer International) and M/s NDC Pakistan)
Consultancy Cost	- Phase-I (Detailed Engineering Design, Preparation of Tender Documents and Tendering): Rs. 235.375/- million including Provisional Sum for TAXES - Phase-II (Construction and Commissioning of Lot-2, Lot-3 and Lot-4): Rs.701.099/- million including Provisional Sum for Taxes - Grand Total (Phase-I + Phase-II) = Rs. 936.474/-
Implementation Period	Phase-I (Scheduled to be completed in Jan, 2024) Phase-II (Scheduled to be completed in Jan, 2028) (48 Months after Issuance of Letter to Commence)

Project Accompanying Measures
AFD and KfW have kept additional funds of Euro 1.5 million for capacity building component from Asian Infrastructure Facility (AIF) by the European Union.

Measures Finalized for Implementation
- Establishment of Hydro Electric Workshop at Skardu
- Community Development Measures
  - Upgradation of C-Class Dispensary to A-Class Dispensary at Harpo
  - Upgradation of Road from Weir Site to Upper Harpo Villages
  - Upgradation of Girls Primary School to Girls High School at Harpo
- Capacity Building of Project and GBPWD Staff

Note: Accompanying Measures are under taken directly by Govt. of Gilgit-Baltistan.

Project Funding
- PC-I amounting to Rs.9, 522.801 million approved by ECNEC on March 28, 2014.
- KfW Loan = Euro 20 million (Loan Agreement signed on December 24, 2013).
- AFD Loan = Euro 50 million (Loan Agreement signed on April 02, 2014).
- The additional cost required for the project will

be met from PSDP through Govt. of Gilgit-Baltistan as per Development & Operation Agreement with GoGB signed on December 23, 2015.
- German Govt. Grant = Euro 1.5 million (For Accompanying Measures of the Project)

Current Status
- The Consultancy Agreement signed in April, 2019 with Harpo Consultants and commenced w.e.f July 25, 2019.
- Additional Field Investigations, Topographic & Sedimentation Surveys, Geological Mappings completed in August, 2021.
- Detailed Engineering Design submitted by Harpo Consultants in June, 2022.
- RAP, IEE, ESMP for Generation and Transmission Line Components submitted by Harpo Consultants in August, 2023.
- NOL Request for Tender Documents of HHPP-02, HHPP-03 and HHPP-04 sent to Project Donors on December 20, 2022, March 15, 2023 and April 18, 2023 respectively and is still awaited.
- NOL Request sent to project Donors for Prequalification Evaluation Reports for HHPP-02, HHPP-03 and HHPP-04 in 2nd & 3rd week of April, 2023 respectively.
- NOL received from KfW for Prequalification Evaluation Reports for HHPP-02, HHPP-03 and HHPP-04 in 2nd week of October, 2023.
- WAPDA Authority gave approval for Prequalification Evaluation Reports for HHPP-02, HHPP-03 and HHPP-04 on November 01, 2023.
- Prequalified Firms/Applicants for HHPP-02, HHPP-03 & HHPP-04 notified on November 14, 2023.
- Preparation of 1st Revised PC-I is under process.
- Request for extension of implementation period up to January 15, 2028 has been submitted to MoWR on August 28, 2023. In DDWP meeting on December 12, 2023, Extension for implementation granted upto June, 2024 and minutes of said meeting are still awaited.
- Subsequent upon issuance of Section-4 on September 16, 2022, land acquisition (Assessment of Land/Trees/Structures) started through revenue department w.e.f May 15, 2023.

Land Acquisition

An amount of Rs. 70.137 million kept on account of Land Compensation in approved PC-1 of the project. District Commissioner Skardu was requested on August 31, 2022 to start the land acquisition process for the project and accordingly Section-4 has been issued on September 16, 2022. Subsequent upon issuance of Section-4, the demarcation of land in coordination with District Administration completed on December 12, 2022. An amount of Rs. 70.00 million on account of land compensation advances paid to Collector Skardu on April 17, 2023 and June 22, 2023. Accordingly, Land Acquisition (Assessment of Land/Trees/ Structures) started through Revenue Department w.e.f May 15, 2023.

ATTABAD LAKE HYDROPOWER PROJECT

Background

Attabad Lake was created due to a huge land slide in January, 2010. Water and Power Department of Gilgit-Baltistan conducted a prefeasibility study for the capacity of 32.5 MW through local consultants to develop Hydropower Project of appropriate capacity.

In November, 2015, the then Prime Minister announced the construction of Attabad Lake HPP. Accordingly, Ministry of Water and Power, Gilgit-Baltistan undertook its feasibility study and proposed 32.5 MW installed capacity of the project.

Financial Status of Harpo HPP

Financial Status	Local	Foreign	Total (M. Rs.)
Original PC-I Approved by ECNEC on March 28, 2014	3,420.189	6,102.613	9,522.801
Expenditure on June 30, 2023	382.40	238.972	621.372

Land Requirement Details of Harpo HPP

Project Component	Footprint Area in Acres		
	Permanent	Temporary	Total
Access Road	87.87	---	87.87
Weir and Forebay	20.53	6.37	26.90
Penstock	8.87	19.77	28.64
Powerhouse	5.88	---	5.88
Spoil Dumping Area	9.56	---	9.56
Contractors Camp	---	31.01	31.01
Total	**132.71**	**57.15**	**189.86**

Salient Features

Installed Power	54 MW
Mean Annual Energy	373.69 GWh
Gross Head	111.7 M
Net Head	105.5 M
Design Discharge	60 M^3/S
Headrace Tunnel Length	2300 M, 5.5 M dia
Penstock Length	450 M, 3.6 M dia
Plant Factor	79 %
Project Cost (as per PC-I)	Rs. 21,246.166 Million
Implementation Period	36 Months

The feasibility study conducted by GB Water & Power was shared with WAPDA for expert opinion. In this connection, in August 2019, a meeting was held between Chairman WAPDA and Chief Secretary Gilgit Baltistan wherein it was mutually agreed that WAPDA will review the feasibility study and will also act as the executing agency of the project.

Hydro Planning Organization of WAPDA completed feasibility study of the project with an enhanced capacity of 54 MW.

Location

The project is located on Hunza River, 27 km upstream of Aliabad ,130 km from Gilgit and 740 km North-east of Islamabad.

Project Layout Plan

The project Layout is planned on left side of Hunza River.

Project Benefits

The project has an installed capacity of 54 MW, and will generate 373.69 GWh of clean energy, annually, which will help in eradicating load shedding in the area. The project will improve the living standard of the area by providing alternate source of income through employment opportunities both during and after construction of project along with improving standards of health, education and infrastructure facilities in the area.

Present Status

- **Consultancy Services**
  - Contract was signed between WAPDA and the Attabad Hydropower Consultants (AHMC at a consultancy cost of Rs. 970.60 million for Management Consultancy Services for Review of feasibility study, Procurement of EPC Contractor and Contract Management & Administration of Attabad Lake Hydropower Project on June 08, 2022.
  - Management Consultants commenced their services from July 07, 2022.
  - Consultants submitted Validation/Review Report of feasibility study on October 19, 2022 and the same were sent to different WAPDA Formations for comments on October 26, 2022. Comments received from WAPDA Formations have been sent to AHMC for finalization of Report.
  - The prequalification process for procurement of EPC contractors is in progress. The pre-application meeting of both the packages of the project was held on May 05, 2023. The queries and observations raised by the applicants have been addressed and addendums have been issued. The date for submission of PQDs has been extended from May 23, 2023 to July 11, 2023 and corrigendum has been published in newspapers.

- **Land Acquisition/Others**
  - The process of Land Acquisition has been initiated. Section-IV regarding acquisition of land has been issued by the District Administration on August 04, 2022.
  - The Project Layout has been finalized and review of requirement of land provided in PC-I/ feasibility report for acquisition purpose has been completed by the consultants. Maps needed for demarcation of land have been prepared and demarcation of land has been completed. Measurement of the land downstream of the weir structure has been completed jointly by a team comprised of Revenue Department, Hunza and WAPDA Staff.

Overall Progress

- Financial Progress = 0.75% (as on June 30, 2023)
- Physical Progress = Nil

Financial Status

Financial Status (Rs. Million)	Local	FEC	Total (M. Rs.)
Approved PC-I Cost	15,360.187	5,885.975	21,246.166
PSDP Allocation for 2022-23	100.00	---	100.00
Expenditure during of June, 2023	30.868	---	30.868
Current FY Expenditure 2022-23	100.00	---	100.00
Expenditure upto June 30, 2023	160.000	---	160.000

Tarbela Hydel Power Station

POWER WING

Hydel Energy Generation

Ghazi Barotha Hydel Power Station

HYDEL ENERGY GENERATION

The total installed generating capacity of 21 WAPDA Hydroelectric Power Stations is 8490 MW (Table-1). These Power Stations produced 31,286 MkWh of Net Electrical Energy during FY 2022-23. The station-wise performance is as under:

TARBELA POWER STATION

The annual generation parameters of the Power Station having total installed capacity of 3478 MW (10 Units of 175 MW and 4 Units of 432 MW each) are as follows:

Net Electrical Output 2022-23	12,445.83 MkWh
Maximum Monthly Generation during August, 2022	2522.534 MkWh
Maximum daily Generation on August 28, 2022	84.133 MkWh
Maximum Load attained on July 29, 2022	3,478 MW
Cumulative Generation up to June 30, 2023	546,710.631 MkWh

Brief Description of Major Works carried out during FY 2022-23:

Annual Maintenance of Units

Biannual Maintenance of 04 Units of Units (1-10) & Annual Maintenance 04 Units of (11-14) along with associated equipment were carried out as per prescribed check sheets.

Runner Replacement

Upgradation/replacement of old worn-out vertical Francis Turbine Runner with vibration/cavitation free X-profile vertical Francis Turbine runner along with rehabilitation of submerged allied parts carried out w.e.f September 12, 2022 to July 08, 2023.

GHAZI BAROTHA POWER STATION

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 2022-23	6,812.157 MkWh
Maximum Monthly Generation during July, 2022	761.50 MkWh
Maximum daily Generation on September 25, 2022	26.725 MkWh
Maximum Load attained on July 22, 2022	1,450 MW
Cumulative Generation up to June 30, 2023	134,035.283 MkWh

Brief Description of Major Works carried out during FY 2022-23:

Maintenance of Units

- Annual Maintenance of Two (02) Units along with associated equipment was carried out as per prescribed check sheets.

- Biennial Maintenance of Three (03) Units along with associated equipment was carried out as per prescribed check sheets.

MANGLA POWER STATION

The total installed capacity of Mangla HPS has been enhanced from 1000 MW (10 Units of 100 MW each) to 1070 MW after refurbishment of Unit No. 5 & 6 (Refurbished with Capacity from 100 MW to 135 MW each) since April 01, 2022, also declared & tested by CPPA(G). The annual generation parameters are as follows:

Net Electrical Output FY 2022-23	3838.378 MkWh
Maximum Monthly Generation during October, 2022	602.600 MkWh
Maximum Daily Generation on October 12, 2022	22.944 MkWh
Maximum Load attained on October 10, 2022	960 MW
Cumulative Generation up to June 30, 2023	254,795.845 MkWh

Brief Description of Major Works carried out during FY 2022-23:

Annual Maintenance of Units

Biennial Maintenance of two (02) Units along with associated equipment was carried out as per prescribed check sheets.

Refurbishment of Units 3 & 4

Unit No. 3 & 4 are under Shutdown w.e.f. April 20, 2022 for their refurbishment / up-gradation under Mangla Refurbishment Project.

WARSAK POWER STATION

The annual generation parameters of the Hydel Power Station having total installed capacity of 242.96 MW ((04 Units of 40 MW and 02 Units of 41.48 MW each) are as follows:

Net Electrical Output during Financial year 2022-23.	898.588 MkWh
Maximum Monthly Generation attained during May, 2023	121.59 MkWh
Maximum Daily Generation attained on Aug 05,2022	5.207 MkWh
Maximum Load attained on July 07,2022	218 MW
Cumulative Generation upto June 30, 2023	50140.785 MkWh

Major Overhauling of Units

Major overhauling of Unit No. 2 carried out w.e.f November 16, 2022 to June 11, 2023 as per check sheets.

Annual Maintenance of Units

Annual Maintenance of all 05 Units along with associated equipment was carried out as per prescribed check sheets.

CHASHMA POWER STATION

The annual generation parameters of the Hydel Power Station having total installed capacity of 184 MW (8 Units of 23 MW each) are as follows:

Brief Description of Major Works carried out during FY 2022-23:

Net Electrical Output during FY 2022-23	876.338 MkWh
Maximum Monthly Generation attained during May-2023	98.647 MkWh
Maximum Daily Generation attained on October 14, 2022	3.1814 MkWh
Maximum Load attained on September 15, 2022	161 MW
Cumulative Generation up to June 30, 2023	20,996.783 MkWh

Annual Maintenance of Units

Annual Maintenance of Units # 01, 03, 04, 06, 07 & 08 along with associated equipment were carried out according to the prescribed schedule.

Upgradation of Governing System and installation of Condition Monitoring System of Unit # 08 was also carried out.

Major Overhauling of Unit 2 & 8

Unit # 02 is under PTW for major overhauling through contract agreement signed with OEM (M/s Voith) on March 05, 2021.

Unit # 08 is under commercial operation since 05 September, 2022 after its major overhauling.

KHAN KHWAR POWER STATION

The annual generation parameters of the Hydel 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 2022-23	267.647871 MkWh
Maximum Monthly Generation during May 2023	38.940800 MkWh
Maximum Daily Generation on 07 May 2023	1.699660 MkWh
Maximum Load attained on 07 May 2023	72.0 MW
Cumulative Generation up to June 30, 2023	2705.102030 MkWh

Brief Description of Major Works carried out during FY 2022-23:

Annual Maintenance of Units

Annual Maintenance of all the three (03) Units along with associated equipment was carried out as per prescribed check sheets.

ALLAI KHWAR POWER STATION

The annual generation parameters of the Hydel Power Station having total installed capacity of 121 MW (2 Units of 60.5 MW) are as follows:

Net Electrical Output during FY 2022-23	485.37 MkWh
Maximum Monthly Generation during Aug, 2022	71.59 MkWh
Maximum Daily Generation on Aug 01, 2022	2.92 MkWh
Maximum Load attained on Aug 01, 2022	121 MW
Cumulative Generation up to June 30, 2023	4,647.74 MkWh

Brief Description of Major Works carried out during FY 2022-23:

Turbine Nozzles of Unit No.02
All the Needle Tips & Seat Rings of Unit # 02 were found damaged due to sand abrasion which was completely dismantled for the Inspection of inner parts. All Needle Tips & Seat Rings of 06 Nos. nozzles for the above-mentioned Unit were replaced with new spare ones from the O&M store and all nozzles reinstalled at their original position.

Annual Maintenance of Units
Annual Maintenance of both Units along with associated equipment was carried out as per prescribed check sheets.

DUBER KHWAR POWER STATION

The annual generation parameters of the Power Station having total installed capacity of 130 MW (2 Units of 65 MW) are as follows:

Net Electric Output during FY 2022-23	494.98 MkWh
Maximum Monthly Generation during July 2022	97.25 MkWh
Maximum Daily Generation during July 07, 2022	3.15 MkWh
Maximum Load attained on July 07, 2022	130 MW
Cumulative Generation up to June 30, 2023	5,571.88 MkWh

Brief Description of Major Works carried out during FY 2022-23:

Annual Maintenance of Units
Annual Maintenance of two (02) Units along with associated equipment was carried out as per prescribed check sheets.

Replacement of Needle Tips & Seat Rings
Damaged Needle Tips & Seat Rings were replaced of both Units.

JINNAH POWER STATION

The annual generation parameters of the Power Station having total installed capacity of 96 MW (8 Units of 12 MW) are as follows:

Net Electrical Output during FY 2022-23	206.702 MkWh
Maximum Monthly Generation during Nov, 2022	26.59 MkWh
Maximum Daily Generation during Dec 16, 2022	1.0912 MkWh
Maximum Load attained on Dec 16, 2022	48.00 MW
Cumulative Generation up to June 30, 2023	2,663.7655 MkWh

Brief Description of Major Works carried out during FY 2022-23:

Major Works
Unit No. 1 remained under forced shut down since November 24, 2015 due to damage of speed increaser. New Speed Increaser has been installed and after successful testing & commissioning, the Unit has been started at it rated capacity with effect from December 14, 2022.

Unit No. 02 & 05 are under forced shut down since February 09, 2021 & August 02, 2019 due to presence of metal particles in oil filters of Speed Increaser of each Unit. As the repair of the Speed Increaser is not possible at homeland, therefore, approval of Authority for procurement new Speed Increasers has been accorded and procurement is under process.

Unit No. 08 is under forced shut down since February 05, 2023. On starting after annual maintenance of the Unit, an abnormal sound and leakage of oil were observed from its Runner side. Rectification of fault is under process.

Annual Maintenance of Units
Annual maintenance of generating Units No. 03,04,07 & 08 along with associated equipment/ auxiliaries were carried out on January 31, 2023, April 28, 2023, February 21, 2023 & December 31, 2023 respectively.

Trash Cleaning
A heavy accumulated trash (Surface + Underwater) travels with river water and at intake of Power House especially during flood and rainy seasons. All the available trash disposable resources remained fully intact in order to achieve maximum generation.

TARBELA 4th EXTENSION

The annual generation parameter of Tarbela 4th Extension having total installed capacity of 1410 MW (3 Units of 470 each) is as follow:

Net Electrical Output 2022-23	4426.932 MkWh
Maximum Monthly Generation during Aug, 2022	1018.121 MkWh
Maximum Daily Generation on Sep 12, 2022	33.964 MkWh
Maximum Load attained on July 24, 2022	1410 MW
Cumulative Generation up to Jun 30, 2023	149,141.325 MkWh

Brief Description of Major Works carried out during FY 2022-23:

Annual Maintenance of Units
Preventive Annual Maintenance of all 03 Units along with associated equipment were carried out as per prescribed check sheets.

GOLEN GOL HYDROPOWER PROJECT

Golen Gol Hydropower Project, 108 MW (3 Units of 36 MW each) is located on Golen River, a major tributary of Matsu River, in the district Chitral of Khyber Pakhtunkhwa (KPK).

The annual generation parameters of the Power Station having total installed capacity of 108 MW (3 Units of 36 MW each) are as follows:

Net Electrical Output during FY 2022-23	131.938341MkWh
Maximum Monthly Generation during June, 2023	22.7995 MkWh
Maximum Daily Generation on June 28, 2023	1.90325 MkWh
Maximum Load attained on June 28, 2023	90 MW
Cumulative generation up to June 30, 2023	569.28775 MkWh

Brief Description of Major Works carried out during FY 2022-23

Rehabilitation Work at Intake

132 kV National Grid both Circuits I & II, which were damaged at Lawari area on January 23, 2023 due to heavy snow fall, repaired/restored on June 05, 2023.

Post Flood-2019 Major Rehabilitation work at Intake was carried out by the office of CE/PD. Main Flushing Gates which were stuck since GLOF Event on July 07, 2019 make operational after clearance of deposited debris materials.

Annual Maintenance of Units

Annual Maintenance of all 03 Units along with associated equipment were carried out as per prescribed check sheets.

SMALL HYDEL POWER STATIONS

Ten (10) Small Hydel Power Stations Rasul (22 MW), Jabban (22 MW), Dargai (20 MW), Gomal Zam (17.4 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 128 MW collectively generated 409.4 MkWh during the Fiscal (FY) year.

Installed Capacity of Hydel Power Station 2022 - 23

Table - 1

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)	Disttt. 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	135	270	Apr. 2022
			7~8	100	200	Jul. 1981
			9~10	100	200	1993-1994
				TOTAL	**1070**	
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**	

Station	Water Way (River/Canal)	Location	Installed Capacity (MW)			Date of Commissioning
			Units No.	Capacity of Each Unit (MW)	Installed Capacity (MW)	
DUBER KHWAR	INDUS TRIBUTARY	District Kohistan	1	65	65	Mar. 2014
			2	65	65	
				TOTAL	**130**	
ALLAI KHWAR	RANYAL	District Battagram	1	60.5	60.5	Mar. 2013
			2	60.5	60.5	Mar. 2013
				TOTAL	**121**	
JINNAH	INDUS JINNAH BARRAGE	District Mianwali	1	12	12	Jan. 2012
			2	12	12	Aug. 2012
			3	12	12	Jun. 2012
			4	12	12	Mar. 2013
			5	12	12	Mar. 2013
			6	12	12	Aug. 2013
			7	12	12	Sep. 2013
			8	12	12	May 2013
				TOTAL	**96**	
KHAN KHWAR	RANYAL	District Shangla	1	34	34	Nov. 2010
			2	34	34	Nov. 2010
			3	4	4	Jul. 2012
				TOTAL	**72**	
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	LUTKO	Chitral City	1~2	0.3	0.6	1975
			3~4	0.2	0.4	1982
				TOTAL	**1.0**	
JABBAN	BARKIT TUNNEL	Malakand	1	5.5	5.5	Jul. 2013
			2	5.5	5.5	Oct. 2013
			3	5.5	5.5	Nov. 2013
			4	5.5	5.5	Dec. 2013
				TOTAL	**22.0**	
GOMAL ZAM DAM	GOMAL RIVER	South Waziristan	1~2	8.7	17.4	Jun. 2013
				TOTAL	**17.4**	
GOLEN GOL	GOLEN GOL RIVER	Chitral KPK	3	36	**108.0**	Jan. 2018
T4	TARBELA, INDUS	Swabi/Haripur	3	470	**1410.0**	Mar. 2018
				Total Hydel Installed Capacity	**8420**	

* : Upper Jhelum Canal from River Jhelum
** : Swat Canal from River Swat
*** : Upper Chenab Canal from River Chenab
**** : Kachkot Canal from River Kurram
***** : Lower Bari Doab Canal from Balloki Headworks on River Ravi

REFURBISHMENT & UP-GRADATION OF GENERATING UNITS OF MANGLA HYDEL POWER STATION

Mangla Dam/Hydel Power Station is located on River Jhelum at about 120 km from Islamabad, is a multipurpose project, constructed in 1967 primarily for Irrigation. The other by products are Power Generation, Fish Culture and Tourism.

Mangla Power House was completed in four different stages. The initial phase comprising four Units of 100 MW each was completed in 1967-69. The first extension of Units No. 5 & 6 (2X100 MW) was completed in 1974 while second extension comprising Unit No. 7 & 8 (2X100 MW) was completed in 1981. The project attained its maximum capacity of 1000 MW with the final extension of Unit No. 9 & 10 (2X100 MW) in 1993-94.

Mangla reservoir had initial gross capacity of 5.88 MAF, which reduced to 4.674 MAF with the passage of time due to sediment deposition. Keeping in view the capacity loss due to sedimentation and provision for raising in the original design, Raising of Mangla Dam was started in 2004 and the project was completed in 2009. The dam height has been raised by 30 feet while maximum conservation level increased from 1,202 feet to 1,242 feet corresponding to additional water storage capacity of 2.88 MAF. There will be Average Annual Incremental Energy of 1632 GWh due to availability of more water and rise in net head of machines.

There are four age groups of Mangla Machines Units 1~4 (50 Years), Units 5~6 (43 Years), Units 7~8 (36 Years) & Units 9~10 (24 Years). Units1~6 with age of 40~50 years have outlived their useful life which has hampered their operational reliability apart from more expenditures on their maintenance due to obsolete equipment. Efficiency of Turbines has reduced from their designed values and the Hydraulic/Mechanical Equipment became unreliable due to aging. Dam life has enhanced after completion of the Dam Raising Project but the old generating Units do not have life compatibility with the dam.

WAPDA planned to carry out up-gradation & refurbishment of the old generating Units and allied equipment to ensure their optimized operational life in the post Raised Mangla Dam scenario. As a first step, feasibility study was carried out by WAPDA through the consultants MWH-NESPAK JV (MRP JV) and Final Feasibility Report was submitted in December, 2011. Based on the results of extensive studies, MRP JV recommended up-gradation from 1,000 to 1,310 MW at 0.8 Power Factor as it satisfies all the objectives of Scope of Work. Refurbishment Works have been divided into eleven (11) Packages for ease of implementation.

Present Status

PC-I amounting to PKR 52,224.31 million (US$ 483.56 million) approved by ECNEC on December 31, 2013.

USAID is providing grant amounting to $ 150 million for Package-I (Units 5 & 6) and Balance of Plant. Out of which Project Implementation Letter (PIL-I) amounting to $ 72 million was signed on March 06, 2014. PIL-II amounting to $ 78 million was signed on December 12, 2018.

AFD France is providing loan amounting to € 90 million for Package-VII (Units 1~4). Credit Facility Agreement (CFA) has been signed on July 20, 2017.

Contract for Package-I & VII was awarded to M/s G.E Hydro France on August 29, 2016 amounting to PKR 10.8 billion. Units 5 & 6 has been commissioned on February 28, 2022. Units 5 & 6 handed over to WAPDA on April 01, 2022. Assembling of Units 3 & 4 is in progress.
Physical Progress: 90%

Contract for Package-II (Power House Cranes) amounting to PKR 348,486,355 awarded to M/s Zirva-ISIK-Petrocon JV on November 10, 2015. Refurbishment works has been completed.
Physical Progress: 100%

Contract for Package-III-A for Main Power Transformers Units 3,4,5,6 amounting to PKR 534,172,385 awarded to M/s Chint, China on March 11, 2016. All Transformers has been received at site.
Physical Progress: 100%

Contract for Package III-B (Transformer Unit 1~2 was awarded to M/s Baoding Tianwei Baobian Electric Co. Ltd., China on July 18, 2021 for at a total cost of USD 2,711,600 (Eq. PKR 412,841,100). Work is in progress
Physical Progress: 93%

Contract for Package-IV-a for Supply of Turbine Inlet Valves of Unit 1~6 amounting to JPY 686,624,116 awarded to M/s Kokusai Commerce Co., (KC) Ltd Japan (nominated Contractor of M/s HM Hydro Japan, Original Equipment Manufacturer) on March 11, 2016. All equipment has been received at site.
Physical Progress: 100%

Contract for Package-V for Balance of Plant Mechanical) amounting to PKR 3,031,015,173 was awarded to M/s Zhejiang Orient Engineering Company Limited, China on June 19, 2019.
Physical Progress: 78.9%

Contract for Package-VI+VIII for Balance of Plant Electrical & Control systems amounting to PKR 3,818,086,574.00 was awarded to M/s Sino Hydro China on January 08, 2019.
Physical Progress: 45.1%

Contract for Package-IX for Switchyard amounting to PKR 1,683,865,473 was awarded to M/s China CAMC Engineering Co. Ltd. On September 17, 2018.
Physical Progress: 91.2%

Bidding process of Package-X (Units 7-8) will be started in 2023-24. AFD has shown interest to finance the Package.

Contract for Package-XI, was awarded to M/s G.E Hydro France on January 10,2023 at a total cost of PKR 11.922 billion.
Physical progress 3.6%

WARSAK HYDROELECTRIC POWER STATION 2nd REHABILITATION PROJECT

Warsak Dam/Hydroelectric Power Station is located on River Kabul in Khyber/Mohmand Agencies, 30 km from the city of Peshawar, Khyber Pakhtunkwa. Project was financed by the Canadian Government under Colombo Plan. The First Phase completed in 1960-61 consisted of Dam, Irrigation Tunnels, Four Generating Units, each of 40 MW (Total 160 MW) and 132 kV Transmission Lines. In the Second Phase of construction (1980-81), two more Units of 41.48 MW each were added, the total capacity thus raised to 242.96 MW (Say 243 MW). Presently, the dam has almost silted up and the Power Station is now practically operating as run-of-river project.

Phase-I Rehabilitation was carried out due to two major reasons. Structural deformation due to Alkali Aggregate Reaction (AAR) and secondly, severe erosion of the hydraulic equipment due to abrasive nature of silt carried in the Kabul River. Governments of Pakistan and Canada jointly carried out the Rehabilitation Project under CIDA Grant of CD 27 million during 1996~2006. The Civil Structures became stable, besides, the reduced capacity of Power Station increased from 150 MW to about 220 MW as a result of rehabilitation.

The aging problems of E&M Equipment aggravated further with the passage of time, and generating capacity reduced to 193 MW along with reduced reliability of the station. Second (2nd) Rehabilitation of Warsak Hydroelectric Power planned with the objective to overcome the aging problems, regain the capacity loss of 50 MW with reliable annual energy generation of 1,144 GWh, by upgrading and modernizing the old system in order to achieve another life cycle of 30 to 40 years.

Present Status
Feasibility Study, Tender Documents and Detail Design were completed by the consultants RSWI (Canada)-DCE (Pakistan) JV in July, 2013.

PC-I of the project was approved by ECNEC on July 09, 2015 and administrative approval of the project issued by Ministry of Water & Power on October 27, 2015.

AFD / KfW / EIB (EDPs) are providing a loan of Euro 130 million for the project. Loan Agreements have been singed with donors during September and November 2015.

AFD is also providing additional finances in the form of EU Grant amounting Euro 4.5 million for Community Development, Flood Management Action, Sediment Management Action, Enhancement of Maintenance Workshop etc.

The Project Management and Construction Supervision Consultants, a joint venture of M/s Dolsar (Turkey), COBA (Portugal), DMC and BAK (Pakistan) jointly called Warsak Rehabilitation Consultants (WRC) have taken up the review of detailed engineering design, reframing of contracting strategy and finalization of bidding documents for the project while hiring of consultancy services for grant components are in progress.

Civil Works Contract
Civil works Contract was awarded to M/s Technicon Enterprises (Pvt.) Ltd on April 12, 2021. The contractor mobilized to site in the end of May 2021. The following activities are ongoing /carried out:

- Flexible wire mesh installation activities in the Switch yard area for rock face protection works have been resumed.
- Core Drilling / Water Pressure Tests for post tensioned anchors in the Powerhouse are in progress. Thirty-one (31) Core Drilling Holes have been completed so far.
- Crack Repair Works in the northern and southern stair case are in progress.
- Concrete and Reinforcement Works in the oil/water separator tank have been completed. Checkered plate fabrication is in progress at Technicon Workshop Peshawar.
  Physical Progress= 21.04%

E&M Contract

- E&M Contract signed with M/s GE Hydro France and M/s Sino Hydro China JV on November 05, 2021.
- Generator Assessment tests of Unit No. 06 started on June 02, 2023 are in progress. The following tests have been carried out:
  - Dynamic Test at No Load
  - Open Circuit Test
  - Short Circuit test
  - Stator and Rotor Winding Resistance Test
  - Stator Polarization Index Test
  - Instrumentation Tests
  - Rotor Insulation Resistance Test
- The E&M contractor performed grounded resistance test and Main Crane Certification Test in the Powerhouse.
- Generator stator bar FAT has been performed from May 29 to June 12, 2023 in Switzerland under the surveillance of the Employer and the Engineer.
- Unit 5 & 6 Runner FAT has been performed from June 7 to June 16, 2023 in China under the surveillance of the Employer and the Engineer.

  Physical Progress = 15.07%

Status of Eu Grant

Heavy Mechanical Workshop Equipment:

Lot 1

Plano Milling Machine received to Main Store on June 22, 2022 and its installation and commissioning carried out on August 22, 2022.

Vertical Lathe Machine arrived at site on April 17, 2023.

Lot 2

Radial Drilling Machine received to Main Store on August 30, 2022 and its installation and commissioning carried out on January 20, 2023.

Portable Magnetic Base Drilling Machine received to Main Store on April 28, 2022 and commissioned accordingly.

Lot-3

Screw Type Compressor and Air Tank with Dryer & Accessories were received to Main Store February 23, 2021. Its installation and commissioning carried out on April 21, 2021

Lot-4

Heavy Duty Horizontal Lathe Machine received to Main Store on October 16, 2022.

Lot-5

Universal Portable Drilling Machine received to Main Store on September 14, 2022 and its installation and commissioning carried out on January 18, 2023.

Flood Component

- All the flood and weather forecasting stations have been installed.
- Post Flood Damages Report was submitted by PD (H&R) on December 13, 2022 which was reviewed by Project Office and comments were raised on December 19, 2022. The revised unsigned version of Post Flood Damages Report was submitted on February 08, 2023 and Project Office commented on February 22, 2023 to share the signed version to proceed further.

Establishing a Sustainable Sediment Management

- The consultant M/s GLM-NESPAK-HBP JV carried out 1st experimental flushing of Warsak reservoir in July, 2022. The draft experimental flushing report has been submitted by the consultant which has been shared with the Donor Agency AFD vide email dated January 30, 2023.
- Contact (Pck-1) signed with M/s C-Digital on April 06, 2023 for sediment measurement equipment.
- Contract (Pck-2) signed with M/s C-Digital on May 17, 2023 for sediment measurement equipment.
- The equipment for both packages will be arrived at Warsak Site on July 15, 2023.

Community Development Programme

- Contract for package-4 (Solarization) of Community Development Programme with M/s Akhunzada Associates has been signed on January 05, 2023.
- For the procurement of remaining packages of Community Development Programme (Package-1, 2, 3, 5 & 6), quotation-based procurement has been adopted.
- Evaluation of RFQs for package-1,2,5 & 6 is under process by the consultants.

Bottlenecks

- Issuance of NOC/Security Clearance for the Expatriates of GE/Sino Hydro JV.
- Expected Date of Completion= 2026.
- Overall Physical Progress=26.17%
- Overall Financial Progress=21.4%

Warsak Hydel Power Station

CAPACITY ENHANCEMENT OF CHITRAL HYDEL POWER STATION FROM 1 MW TO 5 MW

Chitral Hydel Power Station having a capacity of 1 MW 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 Power 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. 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 up to 5 MW.

WAPDA had carried out Preliminary Studies, Topographic Survey, Geological Mapping for Weir Intake / Power Channel / Powerhouse Areas etc. and a Feasibility Design Report has been completed by Hydro Planning WAPDA in May, 2012.

Present Status

- The PC-I for Capacity Enhancement of Chitral Hydel Power Station has been approved by CDWP on November 10, 2016.
- AFD's financing for the project (€ 14.964 Million) has been finalized. Credit Facility Agreement has been signed on July 19, 2019 and SLA has been signed on October 14, 2019.
- Contract Agreement for consultancy services signed on October 20, 2021.
- The consultants have commenced their services w.e.f November 04, 2021.
- Pre-qualification proposals submitted by contractors opened on March 01, 2023. Out of sixteen (16) only four (04) participants submitted pre-qualification documents.
- Contract Agreement for Grid Interconnection studies has been signed on January 19, 2023 with M/s Power Planners International, Lahore. M/s Power Planners International has submitted the Draft Report of GIS on April 05, 2023.
- Activity 1A (E & S Studies) has been completed by consultant. Payment against activity I - (a) (E & S Studies) has been made directly to Project Consultants by AFD to the tune of 4.6 million PKR and 2.6 million PKR on May 12, 2023.
- AFD has desired additional works / studies under E & S Studies. Accordingly, M/s Integration submitted technical and financial proposal towards Fauna and E-flow Surveys as an additional study.
- Under Activity 1B, Preparation of Detailed Engineering Design and Tender Documents is in progress.

REHABILITATION OF DARGAI HYDRO ELECTRIC POWER STATION – DISTRICT MALAKAND

Dargai Hydroelectric Power Station having installed capacity of 20 MW is located in Dargai Malakand District about 202 km from Islamabad. The Power Station commissioned in 1952 belongs to the technologies of old era and installed equipment has now become obsolete as well as more vulnerable to the defects/break downs. Up-gradation and modernization with state-of-the-art technology is dire need of the day.

Major E & M equipment have outlived their useful lives and deteriorated due to excessive wear & tear causing reduction in turbine efficiency and capacity of the plant (reduced to 18 MW against 20 MW). WAPDA has completed a feasibility study for rehabilitation of Dargai Power Station to ensure efficient & reliable operation of the generating Units with enhanced capacity of at least 22 MW for another life cycle of 35 ~ 40 years.

Status as on June 30, 2023

- PC-I Proforma of the project has been approved by ECNEC in meeting November 14, 2018, with a total cost of PKR 4,050.364 million.
- AFD's financing for the project has been finalized and approved by their board. Credit Facility Agreement has been signed on July 19, 2019 and Subsidiary Loan Agreements has been signed on October 14, 2019.
- WAPDA has entered into a Consultancy Services Agreement with M/s PES Pvt. Ltd. in association with M/s Knight Piesold Consulting USA on December 16, 2020 for a total period of 67 months.
- Pre-qualification of bidders for Civil + E & M Works has been completed and four (04) out of fourteen (14) applicants have been notified as pre-qualified in September, 2022.
- Design Optimization of the Water Ways Scheme has been finalized and communicated to the consultants for incorporation in the bidding documents.
- Issues pertaining to the Water Ways have been discussed in Ministry of Water Resources and actions as finalized shall be taken jointly by Irrigation KPK and WAPDA.
- Upon NTDCL desire WAPDA is getting Grid Interconnection Studies conducted through Independent Consultant i.e., M/s Power Planners International for which contract has been awarded in January, 2023.

After issuance of AFD's NOL to the Bidding Documents, four (04) pre-qualified bidders have been intimated to collect their copy of bidding documents

HYDRO POWER TRAINING INSTITUTE (HPTI) MANGLA

Mangla Training Centre is the only source of providing O&M Training for hydro power Engineers and Technical Staff. It was established in 1977 and was functioning in very old building, relying upon limited resources.

WAPDA has planned to upgrade the existing Training Centre and proposed establishment of Hydropower Training Institute (HPTI) at Mangla to be equipped with state-of-the-art equipment which will meet the following objectives for training of Engineers & Technical Staff.

- To enhance technical capability of the Engineers regarding Modern Maintenance Techniques, covering all aspects of Hydropower Plant equipment with due emphasis on the Latest Technology
- To impart necessary training for introducing the latest computerized Maintenance Management Systems at WAPDA Hydel Stations
- Practical Orientation of Engineers and other Technical Staff through Test Laboratories, Workshops etc.
- Comprehensive knowledge relating to different stages of new Hydropower Projects

Present Status

PC-I for Establishment of Hydro Power Training Institute approved in principle by CDWP on November 29, 2013 amounting to PKR 486.151 million. Planning Division issued Authorization letter on December 02, 2015. Accordingly, Ministry of Water & Power issued administrative approval on April 21, 2016.

European Union- Asian Investment Facility (EU-AIF) provided Euro 2.5 million grant through AFD for construction of building, procurement of technical equipment and training of trainers/ consultancy services charges. A component of Euro 1.5 million was also provided by AFD for HPTI as a part of loan from Warsak Rehabilitation Project.

M/s NESPAK Pakistan is the main consultant of the civil works. Contract was signed with M/s NESPAK on February 26, 2016.

Contract for construction of building of Hydropower Training Institute (HPTI) Mangla at a cost of Rs. 241.457 million was signed with M/s A.S Khan Construction Ltd Islamabad on December 02,

2016. Upon substantially completion Take Over Certificate (TOC) was issued to the contractor on August 19, 2020. The contractor is presently working on clearing the punch list items.

Contract for Consultant's Services to Support WAPDA in Modernization, Review & Remodeling of Training Courses & Procurement of Training Equipment for Hydropower Training Institute (HPTI) Mangla amounting to equivalent Rs. 126.259 million was signed with M/s Integration- Electra-JV on February 10, 2018. 6th Amendment in Consultancy Services Agreement (CSA) for extension of time up to December 31, 2023 has been granted. The consultants have delivered/ carried out all the tasks assigned to them as per CSA.

Procurement of Lab Equipment was divided into following four lots:

Lot I: Training Workstations
Lot II: Teachware (Scale and Cutaway Models including 3D-PDF Models)
Lot III: Instruments/Devices
Lot IV: Hydropower Simulation Software

The equipment has been delivered by the respective supplier to site, installed and commissioned in the Lab of HPTI Mangla.

Purchase Order for supply of additional equipment i.e. scale models, projector, and handheld thermal imaging camera was signed with M/s Mushtaq Ali, Govt. Contractor, Rawalpindi, on December 26, 2022 at total cost of Rs. 7.78 million. The material has been supplied to the site on March 07, 2023.

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WAPDA Administrative Staff College - Islamabad

ADMINISTRATION

Administrative Support

WAPDA Sports

Faisalabad Engineering Academy

ADMINISTRATION SUPPORT

TRAINING

Training & Development is essential for progression, while goal of education is learning and the goal of Training is performance. WAPDA has always been paying more & more attention to the training and producing skillful and disciplined work-force. To meet with the goal successfully, manpower needs to be continuously trained at all levels to remain efficient and provide round the clock services. Training needs to be made effective & comprehensive in order to select, promote and post the right man for the right job who should be able to handle the existing & higher responsibilities.

Due importance is being given to this element in WAPDA. Engineers, Officers & Staff of WAPDA/PPMC/NTDC & GENCOs are systematically trained at following Training Institutions to meet with the present and future managerial and technical needs of officers & staff functioning on various assignments.

Training & Development Programme at a Glance

WAPDA has complete set ups vide following Training Centers equipped with adequate infrastructure & material resources, offering better learning atmosphere & opportunities to go ahead in all fields of WAPDA's mandatory & obligatory services:

i. WAPDA Administrative Staff College, Islamabad
ii. WAPDA Engineering Academy, Faisalabad
iii. Accounts & Finance Training Institute, WAPDA, Faisalabad
iv. Hydro-Power Training Institute, WAPDA, Mangla
v. WAPDA Ministerial Staff Training Institute, Sunny View, Lahore

Wapda Administrative Staff College, Islamabad

No. of Course	JMC	MMC	SMC	EMC / MIC	MTC / ABO	SSC for JE Telecom	MIC for PEPCO	PMC	Engr. Management Course	SLC	AIT	Total No. of Participant
31	215	202	32	130	---	---	12	---	---	31	159	781

Wapda Engineering Academy, Faisalabad

No. of Course	BPS-11 to 16	BPS-17	BPS-18	BPS-19	Private	UET	Total No. of Participant
34	571	127	106	23	---	25	852

Hydropower Training Institute, WAPDA, Mangla

No. of Course	BPS-11 to 16	BPS-17	BPS-18	BPS-19	Private	No. of Participants
12	164	66	---	---	---	230

Wapda Ministerial Staff Training Institute, Sunny View, Lahore

No. of Course	IT Asstt. to IT Officer 02.01.23 to 20.01.23	Research Officer to Asstt. RO 02.01.23 to 20.01.23	Jr. Clerk to Steno. 06.02.23 to 24.02.23	Jr. to Sr. Clerk 06.02.23 to 24.02.23	Jr. to Sr. Clerk 20.03.23 to 07.04.23	Jr. to Sr. Store Keeper 02.05.23 to 19.05.23	Asstt. to Sr. Superintendent 29.05.23 to 16.06.23
12	03	04	09	16	20	05	852

As socio corporate responsibility towards a better educated & learned society, WAPDA Training Institutions also provides free Internship.

WAPDA ADMINISTRATIVE STAFF COLLEGE, ISLAMABAD

WAPDA Administrative Staff College (WASC), Islamabad is an in house management Training Institution. WASC provides mandatory Management Training to the officers of WAPDA / PEPCO/NTDC /AJK PDO and AJK ED at four tiers i.e. BPS 16 to 19. WASC has highly qualified and dedicated faculty consisting of 12 officers. Moreover, scholarly and experienced guest speakers from relevant fields in academia and industry, are invited to deliver lectures in their specific fields of expertise.

The beautiful red brick building of WASC located at Pitrus Bukhari Road H-8/1, Islamabad. It has a well-furnished Hostel and Messing facilities for lodging and boarding of course participants. The hostel consists of 79 No. Rooms. WASC building also includes a beautiful Mosque and Sports Center.

Following mainstream courses are conducted at WASC:

1. Senior Management Course
2. Middle Management Course
3. Junior Management Course
4. Management Induction Course
5. Elementary Management Course

Other than main stream courses, the short courses on Project Management and Engineering Management are held at WASC. The college also offers following short courses “on demand” short courses as per requirement of stakeholders’ formation:

a. Project Management along with its Software Tools (Two week)
b. Financial Management (One week)
c. Procurement / Contract Management (Two weeks)
d. Land Acquisition and Resettlement (One week)
e. ERP / Smart Computer (One week)
f. Project Planning Documents (PC-I / Feasibility Study) (Two weeks)
g. Senior Leadership Course (Two weeks)
h. Asian Institute of Technology (AIT) Courses

WASC Team, in its effort to improve the modules of training courses, the presentation activities as well as course curricula of all the mainstream courses by making them mutually exclusive. A comprehensive course outline booklet of all the mainstream courses has already been published. The new format of courses has successfully implemented and response of participants regarding new and innovative format of courses is very positively encouraging.

In order to make sports activities as a compulsory part of management courses, the sports club building at WASC has been revived. Participation in sports activities has been made mandatory for participants of all courses. Inter classes tournaments are regularly conducted at sports club.

Courses Conducted by WAPDA Administrative Staff College, Islamabad

Courses Conducted	Target Group (BPS)	Duration (Weeks)	No. of Courses	No. of Participants
Senior Management Course	19	11	01	32
Middle Management Course	18	09	06	170
Junior Management Course	17	09	07	215
Elementary Management Course	16	04	05	130
Management Induction Course (WAPDA/PEPCO)	17	06	01	12
Senior Management Course	20	02	02	31
AIT Course	17,18,19	---	08	159
Total Courses / Participants			**30**	**749**

The participants are taken for educational instructional visits of various public and private sector organizations within the country. The participants of management courses visit in land important public and private organizations for their exposure to the best management practices.

WAPDA ACCOUNTS & FINANCE TRAINING INSTITUTE FAISALABAD

WAPDA AFTI Faisalabad is an in-house Accounts & Finance Training Institute. AFTI provides Mandatory Management Training to the officials/ officers of WAPDA at four tiers i.e. 01 to 17. AFTI has highly qualified and dedicated faculty consisting of 10 employees. Moreover, scholarly and experienced guest speakers from relevant fields in academia and industry, are invited to deliver lectures in their specific fields of expertise.

Objectives

The objective of establishing independent AFTI is meant for conducting refresher courses on Accounts & Finance in WAPDA for Accounts and Finance personals. The courses mainly cover the professional needs of Assistant Managers A&F, Accounts Officers, and Accounts Assistant, Junior Clerk etc. apart from conducting mandatory training for promotion of Accounts / Audit Assistant and Junior Clerks.

It's also arranges orientation/ induction courses for newly inducted Accounts personal.

History

In past, there was a WAPDA Accounts Training Institute (ATI) situated at Lahore that had been catering for the training needs of Accounts & Finance Wing. This institute was amalgamated with WAPDA Administrative Staff College, Islamabad during the year 1999 for the staff in BPS-16 and above.

The training offering mandatory courses for promotion of Accounts Staff up to BPS-15 and below was being imparted to Accounts Training Cell in sunny view Lahore.

As the requirement of DPE has been waived off, the main focus shifted to purposeful professional training of employees. This warrants revival of Accounts & Finance Training Institute to operate under Finance Wing under General Manager Finance (Coordination).

Later, the supervision of AFTI placed under GM (TI&E) during restructuring in December 2022.

Infrastructure

The beautiful building of AFTI is located at Steam Power Station Colony, Shiekhupura Road Faisalabad. It has a well-furnished Hostel and Messing Facilities for lodging boarding of course participants. The hostel consists of 26 No. Rooms.

Courses offered at AFTI

AFTI Faisalabad is offering all professional/Mandatory Promotional Training Courses to the Accounts and Finance staff up to BPS-16. Besides conducting orientation courses for new entrants and imparting requisite skills to be promoted officials and officers. The following mainstream courses are conducted at WAPDA AFTI:

1. Mandatory Promotion Training Course for Accounts Officers (BPS-16) to Assistant Manager A&F (BPS-17)
2. Mandatory Promotion Training Course for Accounts Assistant (BPS-16/15) to Accounts Officer (BPS-16)
3. Mandatory Promotion Training Course for Junior Clerk (BPS-11) to Accounts Assistant (BPS-15)
4. Mandatory Promotion Training Course for Naib Qasid (BPS-01) to Junior Clerks A&F (BPS-11)

The institute also offers following short courses "on demand" short courses as per requirement of stakeholder's formation:

a) Induction Courses for Assistant Manager (A&F) BPS-17, Accounts /Audit Assistant (BPS-15), Junior Clerk Cum Computer Typist (BPS-09)
b) Refresher Courses for Accounts Officer (BPS-16) Accounts /Audit Assistant (BPS-15), Junior Clerk Cum Computer Typist (BPS-09)

Courses Conducted by WAPDA Accounts & Finance Training Institute Faisalabad

Courses Conducted	Target Group (BPS)	Duration (Weeks)	No. of Courses	No. of Participants
Assistant Manager (A&F) Induction Training Course	17	04	01	08
Accounts/Audit Assistant Mandatory Training Course	15	08	03	58
Accounts / Audit Assistant Refresher Course	15	05	01	09
Junior Clerk Cum Computer Typist Refresher Course	11	05	01	11
Junior Clerk Cum Computer Typist Mandatory Course Naib Qasid to Junior Clerk	01	09	01	25
Total Course / Participants			**07**	**111**

AFTI Team is working to enhance course modules and curricula for all mainstream courses to ensure they are manually exclusive and well structured. The new format of course has been successfully implemented and response of participants regarding new and innovative format of course is very encouraging.

The participants are taken for educational instruction visits of various Public and Private Sector Organization within the country. The participants of management course visit in land important public and private organization for their exposure to the best management practices.

Courses Conducted at WEA, Faisalabad

Following courses have been conducted for FY-2022-23 at WAPDA Engineering Academy in various technical and management disciplines.

Common Mandatory Courses

Name of Courses	Target Group (BPS)	Duration (Weeks)	Planned Courses	Actually Held Courses	Proposed Capacity	Actual Participations (Nos.)
Refresher Course (Pre-promotion) for S.Es/Directors/R.Es/Common Services	19	05	01	01	25	23
Middle Management for Senior Executive Officers/Engineers	18	09	---	01	25	32
Junior Management Course (JMC)	17	09	---	02	25	56
Elementary Management Course (EMC)	16	04	---	02	25	69
Management Orientation Course (MOC)	17	02	01	01	20	08
Office Automation Course for FESCO Employees	11-16	01	---	11	20	280
Total						**468**

Transmission & Distribution

Name of Courses	Target Group (BPS)	Duration (Weeks)	Planned Courses	Actually Held Courses	Proposed Capacity	Actual Participations (Nos.)
Mandatory						
Refresher Course (Pre-promotion) for Sr. Engineers (Dist./ T&G)	18	06	02	02	25	55
Sector Specific Course (Pre-Promotion) for JEs (Dist./T&G)	17	06	02	02	30	37
Upper Technical Subordinate Staff Course (Pre-promotion) LS/SSO to JEs.	14-16	06	04	03	35	101
Non- Mandatory						
Practical for Line Superintendent	11-14	01	---	05	20	105
Internship of Engineering University Students	---	04	01	01	25	25
Total						**323**

Civil Engineering

Name of Courses	Target Group (BPS)	Duration (Weeks)	Planned Courses	Actually Held Courses	Proposed Capacity	Actual Participations (Nos.)
Mandatory						
Refresher Course (Pre-promotion) for Sr. Engineers	18	06	01	02	20	51
Sector Specific Course (Pre-promotion) for Jr. Engineers	17	06	01	02	20	34
Technical Refresher Course for Sub. Engineers	14	06	01	01	20	08
Total						**93**

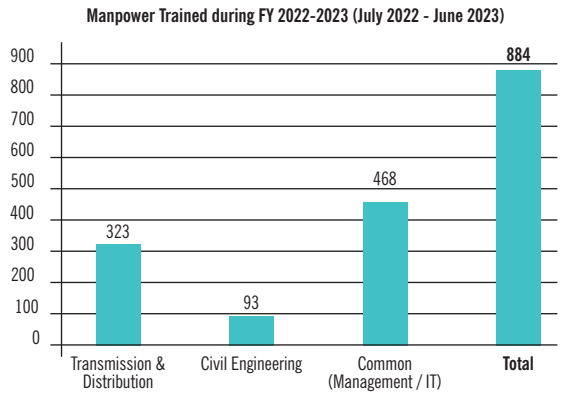
WEA Training Programs at a Glance

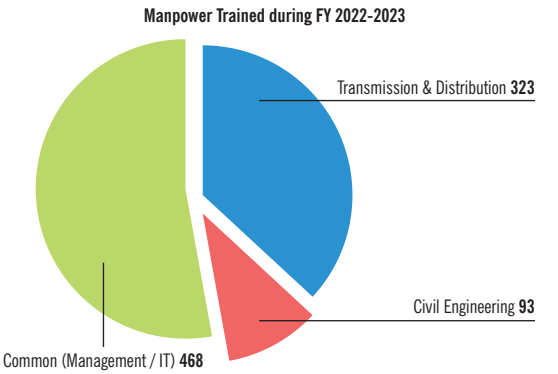
No. of Courses	Trainees		Internship	Total
	Officers	Staff		
35	296	563	25	**884**

Manpower Trained during July-2022 to June-2023

Following table and charts show the number of participants trained at WEA during Financial Year 2022-2023.

Years	Transmission & Distribution	Civil Engineering	Common (Management/IT)	Total
July 2022 to June 2023	323	93	468	884





CPD Workshop/Seminar Conducted

WAPDA Engineering Academy is registered as professional engineering body vide Registration No. PEB-F-WAPDA F-0085. In this regard WEA, Faisalabad is conducting CPD Workshop/Seminars through out the year. Paramount objective of organizing continuing professional development Workshop/Training is to share the technical and management knowledge with the engineers. Detail of CPD workshop conducted by WEA during July 2022 - June 2023 till now is here under.

Year	No. of CPD Workship	No. of Participants
2022 - 23	03	145

HYDROPOWER TRAINING INSTITUTE (HPTI) MANGLA

The information in respect of Hydropower Training Institute (HPTI) WAPDA Mangla for the period under report is as under please:

Following courses are offered for the officers of Power Wing

a). For Engineers of Hydel Generation:

i. Refresher Course (Pre-promotion) from XEN to SE
ii. Sector Specific Course (Pre-promotion) for AXENs
iii. Induction Course (for Newly Inducted AXENs)
iv. Workshop on Procurement Management for Engineers (Hydel Generation)
v. Workshop on Post-earthquake / Disaster Management
vi. Workshop on Project Management

b). For Technical Staff of Hydel Generation:

i. Upper Technical Subordinate Staff Course for (Foreman / Turbine Operator)
ii. Advance Operator Course for Attendants
iii. Advance Craftsman Course for Assistant Foremen
iv. Craftsman Course for Junior Technicians
v. Basic Craftsman Course for ASA (Elect./Mech./Protection, Pump Operator, Lift Attendant etc.)
vi. Basic Operator Course for ASA (Operation)
vii. Store Staff Course for (Sr. Store Keeper / Jr. Store Keeper / Store Assistant.)
viii. Telephone Staff Course (Telephone Supervisor, Operator, Lineman)

Following is the Tally of Courses Conducted at HPTI Mangla during the Fiscal Year

Name of Course Held	No. of Courses	No. of Participants		Total
		Officers BPS 17 - 18	Officers BPS 5 - 16	
Refresher Course for Senior Engineers	01	15	-	15
Sector Specific Course (SSC)	02	40	-	40
1st & 2nd Induction Course for AXENs (IC)	02	30	-	30
3rd Workshop on Procurement Management	01	19	-	19
Workshop on Post-earthquake Management	-	-	-	-
CNC Machine Training LOT-II	01	15	-	15
Upper Technical Subordinate Staff Course (UTSSC)	01	-	14	14
Advance Operator Course (AOC)	02	-	55	55
Advance Craftsman Course (ACC)	01	-	27	27
Craftsman Course (CC)	02	-	70	70
Basic Craftsman Course (BCC)	01	-	26	26
Basic Operator Course (BOC)	01	-	26	26
Store Staff Course (SSC)	02	-	14	14
Telephone Staff Course (TSC)	02	-	10	10
TOTAL	**19**	**119**	**242**	**361**

WAPDA MEDICAL SERVICES

Pakistan WAPDA along with its sister corporate entities constitute a huge establishment in term of number of employees. The fact that it has various formations and activities spread throughout the breadth and width of the country puts on it even more onerous 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 back bone and vital asset of any vibrant organization.

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 corporatized 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 Services, to Departmental Employees and their Dependents, as well as Client Companies.

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.

WPADA Health Units (Province-Wise)

Province	Hospitals	Fortified Dispensaries	Basic Dispensaries	Total
Punjab	6	9	8	23
Sindh	3	2	6	11
Khyber Pakhtunkhwa	2	2	2	6
Balochistan	1	-	-	1
Total	**12**	**13**	**16**	**41**

WAPDA Hospitals

Central Hospital of 250 Bed at Lahore, 50 bed at Peshawar, Tarbela, Rawalpindi, Gujranwala, Faisalabad, Multan, Hyderabad, Guddu & Quetta and 20 bed at Mangla & Sukkur are fully functional and providing in-house services in all major clinical disciplines.

WAPDA Fortified Dispensaries

13 Fortified Dispensaries are located at Warsak, Barotha, RBC Tarbela, Gujrat, Chashma, Jhang, Sargodha, Kasur, Muzaffargarh, Rahim Yar Khan, Sahiwal, Dadu and Jamshoro.

Two Male and One Female Doctors are posted in each WAPDA Fortified Dispensary along with Nursing and Paramedical Staff.

Laboratory and X-Ray facilities are also available in Fortified Dispensaries.

WAPDA Basic Dispensaries

16 Basic Dispensaries are located at D.I. Khan, Dargai, Islamabad, Sialkot, SPS Faisalabad, Okara, Shalamar Lahore, Sheikhupura, Bahawalnagar, Bahawalpur, Larkana, Karachi, Kotri, Lakhra, Mirpur Khas and Nawabshah.

One male and one female doctors are posted in each WAPDA basic dispensary along with paramedical staff.

Sr. No.	Name of Hospital	Name of Fortified Dispensaries	Name of Basic Dispensaries
1	Peshawar	Warsak	D.I.Khan
2	Tarbela	Barotha	Dargai
3	Rawalpindi	RBC, Tarbela	Islamabad
4	Mangla	Gujrat	Sialkot
5	Gujranwala	Chashma	SPS, Faisalabad
6	Faisalabad	Jhang	Okara
7	Lahore	Sargodha	Shalamar, Lahore
8	Multan	Kasur	Sheikhupura
9	Guddu	Muzaffargarh	Bahawalnagar
10	Sukkur	Rahim Yar Khan	Bahawalpur
11	Hyderabad	Sahiwal	Larkana
12	Quetta	Dadu	Karachi
13		Jamshoro	Kotri
14			Lakhra
15			Mirpur Khas
16			Nawabshah

WAPDA Dental Units

In order to have a healthy population, it is imperative to improve the levels of oral hygiene of the community. 08 Dental Units at Warsak, RBC Tarbela, Barotha, Chashma, Shalamar, Sahiwal, Muzaffargarh, and Jamshoro with dental chair / accessories are functional.

Beneficiaries
The facilities provided at these 41 health units are availed by more than 60,532 registered employees which include serving, retired and widows. The dependents of the employee are also entitled and with average family consisting of six persons, there are nearly 363,192 patients who are benefiting from this system.

There is a large No. of employees (70,000 Approx) who, though drawing Cash Medical Allowance, are 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 1.547 million patients visited the WAPDA Health Care delivery system, which means an average daily attendance of more than 5,158 patients.

Category of Employees	Registered Employees
Serving	42676
Retired	11549
Widows	6307
Total	**60532**

Human Resource

Category	Sanctioned	Holding	Vacant
Specialists	151	124	27
General Doctors	296	291	5
Dental Surgeons	23	22	1
Allied Professionals	16	16	0
Nurses	377	337	40
Paramedics	1444	1094	350

New Induction
WAPDA Medical Services has always strived to engage professionally sound and skilled human resources for efficient and smooth functioning of the Medical Units. Sufficient No. of doctors are always required to cater for the patients spread all across the country by providing comprehensive medical cover. Due to shortage of specialists, doctors and staff nurses the incumbent appointed on locum basis during the year 2022-23 in WAPDA Medical Services.

Communication System Installation of Land Line Telephones & Fax Machines in Fortified / Basic Dispensaries
Ever since 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 efforts to make arrangement of the essential facility has turned out fruitful and now almost all the health units are equipped with Landline Telephone, Internet and Fax Machines resulting in close and timely contact within and outside their Region.

Establishment of Cardiac Centre, Gynae / Obs and Neonatology Units
Authority in its meeting held on October 03, 2017 and February 16, 2018 accorded approval for establishment of Cardiac Center, Gynae / Obs and Neonatology Units at WAPDA Hospital Complex, Lahore. These units have been made functional w.e.f March 01, 2020 and deliveries are being successfully conducted.

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.

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 and Tubal Ligation Operation Facilities are available. The Gujranwala, Faisalabad, Multan and Muzaffargarh intended RHS-B Centre, are in process of registration. These are serving not only the WAPDA employees but also common people from general public are availing relevant benefits. In other WAPDA Medical Units the establishment of Family Welfare Centers is also under way.

COVID -19
COVID -19 pandemics hit hard and had very lethal and damaging impact on the entire world. Government of Pakistan declared national emergency to save the nation from this menace. WAPDA Medical Services had also instituted preventive and curative measures for containing the spread of the deadly virus. All the available resources like infrastructure, manpower, space and equipment have been optimally utilized for the protection and treatment of the COVID patients.

Services	Total
OPD Patients Attended	1,547,582
Emergency/Casualty Attendance	246,536
Investigations	
i) X-Ray	51,947
ii) E.C.G	33,299
iii) Lab. Tests	2,358,640
iv) Ultra Sounds	26,437
Total Investigations	**2,470,323**

Services	Total
Total Admissions	24,089
No. of Surgeries (Minor/Major)	8,663
No. of Cases referred out Hospitals and Specialists	103,929
Cardiac Cases referred for Interventional Treatment to Panel Hospitals	1,572
Antiviral Treatment provided for Hepatitis B&C Patients (SMB)	315
Cases referred for Liver Transplantation	7
Renal Disease Treatment	551
Cases referred for Renal Transplantation	8
Thalassemia	43
Chemotherapy	327
Service Items provided by Family Welfare Centers	86,332

ESTABLISHMENT DIRECTORATE (HR & ADMN)

Management experts after extensive research now sternly believe in human capital potential. It is not the money or physical assets rather soft skills possessed by employees of any company/ organization that helps in giving it a leading position. The employees gradually add up to an organization and have potential of converting a small company/ organization into a gigantic one within short span of time. HR & Admn Directorate take full cognizance of the same and its role becomes crucial as it performs the task of recruitment (BPS-1-20) besides giving guidelines to all field formations thereupon. Other allied tasks include advices to the Authority on different matters, deputation cases, clarifications (other than Rules) and coordination between WAPDA and Ministry of Water Resources.

The Human Resource activities handled by this Directorate during the year 2022-23 are as under:

a. Training of Officials/Staff (51 Nos.)
b. Promotion of Employees (57 Nos.)
c. Time Scale Up-gradation of Employees (28 Nos.)
d. Processing of Welfare, Pension, GLI, Long Term Advance Cases etc. (63 Nos.).
e. Induction BPS-1 to 16 (46 Nos.)
f. Induction in BPS-17 (8 Nos.)
g Induction in BPS-18 (9 Nos.)
h. Induction in BPS-19 (2 Nos.)

WAPDA SECURITY DIRECTORATE

General

WAPDA raised its own security comprising of retired personnel for security and protection of its under construction as well as O&M Project. The raised force performs its security duties under respective PD's / GM's, however technical control is maintained under WAPDA Security Directorate, headed by GM (Admn & Security), a retired Brigadier from Pak Army.

While exercising its technical control, the Security Directorate is responsible for planning and adoption of proactive security measures at an equal pace with ongoing security challenges faced at WAPDA Projects/ Installations. Under technical control of WAPDA Security Directorate, WSF is an ever increase outfit and its multi directional duties compel it to guard avenues which occur as per existing security matrix. In order to withstand such compulsions, not only flexible and sharp approach is needed but implementation becomes round the year responsibility, through carrying out rehearsals and mock exercises.

To act upon such a mandate, WAPDA Security Directorate focused its attention on the following more pronounced avenues which are summarized as:

Training

Once a physical security system is deployed and has been deemed at substantial use, some form of end-user training is required as part of duty. For the orientation of newly recruited troops with the duties and SOPs of WAPDA and organizing refreshers courses for the already inducted troops, establishment of WSF Training School is underway. As a pilot project, 3 x courses have been conducted at Tarbela w.e.f. December 05, 2022 to January 20, 2023, February 06, 2023 to March 22, 2023 & April 30, 2023 to June 21, 2023 whereby 539 x newly inducted WSF Staff has been trained.

Escort Duties

Interfering with foreigners' activities, working for WAPDA, are one of the major activity of miscreants. WAPDA Security Force (WSF) as ever alert and responsive outfit, manages to maintain conducive environments for foreigners while their movements inside/outside project. WSF efforts in this regard added confidence amongst foreigners in believing workable environments at WAPDA premises.

Coordinating LEAs Support for WAPDA Projects

While performing its role as security coordinator, the Security Directorate has extended its full support in engaging Civil/ Armed Forces/ LEAs in security and protection of following projects:

(1). Tarbela Dam Project
(2). Kachhi Canal Project
(3). Mangla Dam Organization
(4). Neelum Jhelum Hydropower Company
(5). Gomal Zam Dam
(6). Dasu Hydel Power Project
(7). Mohmand Dam Project
(8). Diamer Basha Dam Project

(9). Kurram Tangi Dam
(10). Kurram Garhi Hydel Station

Recruitment of Security Staff
To strengthen the WAPDA Security Force, 12 x Inspectors, 95 x Security Sergeants and 436 x Guards were inducted. The case for the recruitment of Security Staff was initiated for different projects.

Fire Fighting Cell
Fire Fighting Staff is performing important role in the various WAPDA Organization. They have adopted precautionary measures against fire incidents which occurred at their projects and their timely response helped in reducing major loss of WAPDA assets. In the year of 2022-23 Fire Fighting Cell conducted mock exercises and evacuation drill in WAPDA House, Lahore to give awareness to the employees as to how to evacuate the building in case of any emergency. Addressable smoke Detection System is installed at WAPDA House building for early detection of fire and quick response to the exact incident place.

Necessary instructions received from time to time from Government of Pakistan and other law enforcement agencies are being strictly implemented besides updating the SOPs.

DIRECTORATE RULES

The core function of Rules Directorate is to promulgate Service Rules, issue 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 Director presently maintains following rules:

a. Updated Manual of General Rules (Containing 14 Different Rules) (2020)
b. Service Rules Officers (21 Cadres)
c. Service Rules Staff (25 Cadres)
d. Guidelines for PERs (Book)
e. Compendium of Important Instructions up to 2116

Rules Directorate also contributes through being Member I Convener of different committees on various issues and some standing committees e.g. Date of Birth, Promotion etc.

During the year 2022-23 progress of this Directorate has been as under:

Amendments / Clarifications

Clarification	44
Amendments	05
Comments I Opinion	185

EDUCATION DIRECTORATE

WAPDA is running 16 educational institutions along with one Postgraduate College at various projects throughout the country. These institutions are being managed by 400 teaching/non-teaching staff approximately. More than six thousands students are getting quality education in these schools and colleges.

- WAPDA has established a Primary School at Golen Gol Hydel Power Station Koghuzi Chitral which will start its function w.e.f April 2025.
- 3-tier service structure has been adopted by WAPDA in 2022. Eligible teaching staff have been given new nomenclature after their promotion.
- Syllabus for Departmental Promotion Examinations has been revised for teaching/non-teaching staff.
- School/Inter Collegiate speech /debate contests are being annually organized at School level and between four Higher Secondary Schools/Inter-Colleges and in Postgraduate College Tarbela for BS-Level students.

LABOUR AND WELFARE DIRECTORATE

Labour and Welfare Directorate is mainly responsible to assist the Authority for preservation of industrial peace in WAPDA. To achieve these objectives, this Labour & Welfare Directorate plans, coordinates, evaluates labour management relations through amicable settlement of disputes, maintaining good human relations and motivation to the workers.

Labour and Welfare Directorate further maintains liaison with the employees, Collective Bargaining Agent and other agencies operating in WAPDA to resolve labour issue.

This Labour and Welfare Directorate is responsible to maintain and preserve the peaceful labour management relations in WAPDA 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.

Major activities of this Labour & Welfare Directorate during financial year 2022-23 are appended below:

a. The Nominees of Unions were forwarded by this Labour & Welfare Directorate to NIRC for notification so that the Shop Stewards in various offices could perform their duties to strengthen the relations of Labour Management at grass root level.
b. Varrious requests forwarded by the labour Unions and individual WAPDA employees were

processed, to the concerned formations to redress their grievances.

c. Different cases of Labour Unions pending in NIRC and Civil Court were followed to defend the departmental interest various formations sought advice regarding labour laws.
d. The request was examined and advice rendered, accordingly.

Efforts were made for quick and expeditious processing of WAPDA employees' pension cases, grants out of WW Fund, marriage grant, educational scholarship of retired employees and grants to handicapped children of WAPDA employees as well as Group Life Insurance (GU) cases of widows of deceased employees.

TRANSPORT DIRECTORATE

Transport Directorate was established in 1976 with a view to ensure proper control, repair, maintenance vis-a vis economical use of WAPDA Transport. Over a period of time, its scope has increased manifold which included formation and implementation of Transport Policy, Provision of Transport to Authority, VIPs Foreign Delegation, Common Services Wing Officers / Offices, Touring Officers and Community Transport to employees and their school / college going children etc.

Moreover, welfare service e.g. provision of transport on payment for personal use, marriage ceremonies, and funeral attendance is also provided on concessional rates.

Transport Directorate ensures gigantic task of un-interrupted pick and drop services to the employees and their school going children on daily basis, spread around Lahore up to Kamoke, Kasur and Sharqpur. This facilitates punctuality, attendance and presence for optimum benefit of the organization.

Despite old vintage fleet of 122 x vehicles which include buses, coasters, vans and small vehicles, Transport Directorate managed to keep the wheel moving with hectic and continuous repair throughout the year whereby 620 vehicles were repaired at Unit Repair Organization(at Transport Directorate) within economical and quality based assurance.

This Directorate has set its priority to train the drivers for safety. For the purpose supervisory staff arranged briefings and lectures to highlight the importance of safety and security on the road. Therefore, no significant accident reported during the year. Subsequently, City Traffic Police delivered a number of lectures / presentations, by audio / video means for training of the drivers. To boast up the moral of the drivers, a two weeks training session was also held for time scale up-gradation of them.

77 x old vintage vehicles of different formations of WAPDA were surveyed off throughout the country for disposal through Office of DG (P&D) WAPDA, Sunny View, Lahore.

The Authority in its Meeting on May 10, 2022 has been pleased to accord approval for withdrawal of Transport Directorate as "Self Financing Unit".

O&M DIRECTORATE

O&M Studies

The tasks entrusted to O&M Directorate is to analyze the emerging demands pertaining to creation, abolition, re-designation and up-gradation of posts in respect of all the offices of WAPDA and collection of statistical data of all WAPDA Manpower besides dealing with routine matters.

After collecting the information/data from concerned offices on prescribed proformas, O&M Directorate analyzes the real justification/purpose of posts for creation, re-designation and up-gradation, existing set-up/arrangement, job description, existing staff strength and total financial implication involved.

O&M Directorate received 07 cases for creation/Re-designation/Up-gradation of posts during Financial Year 2022-2023, however, in pursuance of Austerity Measures and due to ban on creation of new posts except those required for development projects and approved by the competent authority", 02 cases were finalized while remaining 05 cases are in the pipeline.

Important news/events from the formations under GM (HRD) were collected for its publication in WAPDA Khabarnama on monthly basis through ADG (PR) WAPDA by O&M Directorate.

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 Recknor annually. The booklet of Manpower Statistics contains all necessary data of all categories of WAPDA employees.

The booklet also provides opportunity to the Authority and other Directorates of WAPDA which deal with personnel management policies of employees regarding appointments, transfers, postings and

training etc. Keeping in view the utilization of Ready Reckoner, O&M Directorate always facilitates WAPDA formations in compilation of data.

PROPERTY MANAGEMENT CELL

Information relating to this Directorate is as under:

a. Implementation on SOPs for Management of Land Assets – WAPDA in order to secure, upkeep and maintain these in coordination with Heads of Formations is being ensured.
b. WAPDA formations were asked to formulate SOPs for management of land assets keeping in view the situation prevailing in that particular area.
c. The formations have also been asked to establish an Anti-Encroachment Squad to react promptly against any attempt of encroachment.
d. WAPDA formations have been emphasized to ensure safety & security of their WAPDA land assets and coordinate with local administration for ejection of encroachers from WAPDA land.
e. Chairman WAPDA desired to identify land that can be utilized for strategic afforestation in line with WAPDA's commitment to environmental conservation and Green Pakistan in order to claim carbon credit. Accordingly, after hectic efforts the requisite land data collected from WAPDA formations was provided to convener of the committee constituted to deliberate and prepare draft Request for Proposal (RFP) for strategic afforestation on WAPDA owned land.
f. M/s. Green Tourism (Pvt) Limited (GTPL) has approached WAPDA for leasing out WAPDA properties at Tarbela Dam, Mangla Dam & Chashma Barrage identified by GTPL for developing them into tourist resorts activities with investment. In this regard, MoU is being finalized to be signed between WAPDA & GTPL.

CAREER MANAGEMENT CELL

During the period of 2022-23 CE (Civil) to GM (Civil) No. 05, SE (Civil) to CE (Civil) No.07, SE (Agriculture) to CE (Agriculture) No.01, XEN (Civil) to XEN (Civil) No.44, AXEN (Civil) to XEN (Civil) No. 81, Junior Geologist to Senior Geologist No. 03, Junior Seismology /Geophysicist to Senior Seismologist 04 and Research Officer (GWH) to Senior Research Officer (GWH) No. 01 have been promoted.

SERVICES & ESTATES DIRECTORATE

Services & Estate Directorate WAPDA is one of the pivotal directorates in WAPDA who is responsible to provide wide range of services to Authority offices and other directorates working under GM (Admn) & GM (HRD) WAPDA. The directorate is not only closely linked with the Authority offices but also serves as a focal office for clarification on certain important issues throughout WAPDA. It is custodian of important policies which include House Acquisition Policy, Free Electricity Policy, Medical Facility, Accommodation Policy, Telephone Policy, Allotment of Space, Provision of Liveries and other SOPs regarding Hostels and Rest Houses. This office is also responsible for management and operations of 07 x WAPDA Rest Houses, 02 x Hostels and 01 x Female Hostel.

During the year 2022-23, S&E Directorate has exclusively worked on the assigned responsibilities and has taken care of the affairs of Official/Residential Accommodation and Single Officers Hostel, WAPDA Rest Houses, Authority Officers' Mess, WAPDA Employees Canteen, WAPDA House & Sunny View, Lahore.

The salient contributions of the Directorate in FY 2022-23 are as under:

a. It generated/collected an annual income of Rs. 38.45 million approx. from commercial tenants.
b. The income collected from WAPDA Office Building (G-7) of RS.55.81 million.
c. The following Rest Houses & Hostels were well managed and the facilities were improved:
   i. WAPDA Rest House Upper Mall, Lahore
   ii. WAPDA Rest House Shadman, Lahore
   iii. Rawal Rest House, Islamabad
   iv. WAPDA Rest House, Muree
   v. WAPDA Rest House, Nathia Gali
   vi. WAPDA Rest House, Naran
   vii. Single Officers Hostels
   viii. Female Officers Hostel
d. Total revenue of Rest Houses & Hostels for FY 2022-23 has been RS. 35.23 million.
e. The revenue of Mega Hydel Complex for FY 2022-23 has been Rs. 20.08 million.
f. This office is contributing its maximum to upgrade and improve services in WAPDA Rest Houses for the facilitation of WAPDA Officers and sponsored guests.
g. Provision of quality food at subsidized rates to WAPDA / NTDCL / PPMC employees at WAPDA Employees Canteen, WAPDA House & Sunny View, Lahore.
h. All Rent Assessment applications of houses to be acquired for WAPDA Employees were processed/finalized during the year. Approximately 2513 house acquisition cases OI renewals were processed OI finalized during the year.

CAREER MANAGEMENT (P&F)

Career Management (P&F) Cell deals with Career Planning and HR Management of Grade 17, 18 & 19 of Hydel Generation, Finance Divn: & IT

Officers WAPDA. Besides, maintaining ACRs of the Hydel, IT and Finance Divn: Officers, it deals with transfers/postings as per criteria of "Right man for the right Job".

a. Promotion to next higher scales, training (Local/ Foreign), Inspection of Material Abroad and Deputation (Local) of Hydel, IT & Finance Divn: Officers are also taken care by Career Management (P&F) Cell.
b. Apart from routine Transfer / Postings of the Officers of above cadres and grades, the salient achievements of Career Management (P&F) Directorate during the year 2022-23 are as under:

(1) Promotion Board for AXENs (Power) to XENs (Power) in BPS-18 was held on October 14, 2022. Therein, thirty One (31) officers were recommended / approved for promotion as XENs (Power).
(2) One (01) Promotion Board for Assistant Directors (P/SA) BPS-17 to the rank of Dy. Directors (P/SA) in BPS-18 was held on August 26, 2022. One (01) officer was recommended / approved for promotion as Dy. Director (P/SA).
(3) Twenty (20) Power Engrs (BPS-17) were sent to attend 21st Sector Specific Course (SSC) conducted at HTC, Mangla from February 06, 2023 to March 17, 2023 (05 Weeks).
(4) Nine (09) SEs (BPS-19) were sent to attend 55th & 56th Senior Management Course (SMC) conducted at WASC, Islamabad from February 01, 2021 to April 02, 2021 & May 17, 2021 to July 16, 2021, respectively.
(5) Three (03) Dy. Directors (P/SA) and six (06) XENs (Power), (BPS-18) were sent to attend 137th, 138th & 139th Middle Management Course (MMC) conducted at WASC, Islamabad from January 09, 2023 to March 10, 2023 & May 02, 2023 to June 30, 2023 respectively.
(6) Twenty-five (25), two (02), twenty (20) AXENs (Power) and five (05) & two (02) Assistant Manager (A&F) (BPS-17) were sent to attend 171st, 172nd, 174th, and 175th & 176th Junior Management Course (JMC) conducted at WASC, Islamabad from December 05, 2022 to February 03, 2023, December 19, 2022 to February 17, 2023, March 27,2023 to May 26, 2023 and May 02, 2023 to June 30, 2023 & June 05, 2023 respectively.
(8) Twelve (12) AXENs Power (BPS-17) was sent to attend Induction Course conducted at HTC, Mangla from November 21, 2022 to January 13, 2023.
(9) Two (02) Power Engrs (BPS-18/19) were nominated to visit China for Factory Acceptance Test (FAT) for Runner & Wicket Gates for 2nd Rehab Project, Warsak from June 05, 2023 to June 17, 2023.
(10) Two (02) Power Engrs (BPS-18/19) were nominated to visit China for Factory Acceptance Test (FAT) for Staying Unit No. 4 Dasu HPP, from May 22, 2023 to May 24, 2023
(11) Three (03) Power Engrs (BPS-18/19) were nominated to visit China for Factory Acceptance Test (FAT) for Transformers Package 3B Unit 1~2 MRP, Mangla from May 08, 2023 to May 23, 2023
(12) Two (02) Power Engrs (BPS-18) were nominated to visit Germany for Factory Acceptance Test (FAT) of Runner Blades with set of Oil Seals for Chashma from October 31, 2022 to November 11, 2022
(13) Two (02) Power Engrs (BPS-18) were nominated to visit Switzerland for Factory Acceptance Test (FAT) of Generator for 2nd Rehab Project, Warsak from May 30, 2023 to June 12, 2023.
(14) One (01) Power Engr. (BPS-18) was nominated to visit Austria for Factory Acceptance Test (FAT) of Training of New Excitation System Units 11~14 for HPS, Tarbela from October 01, 2022 to October 14, 2022.
(15) One (01) Power Engr. (BPS-18) was nominated to visit Germany for Factory Acceptance Test (FAT) of 3 days training for O&M of NJHPC from June 10, 2023 to July 09, 2023.
(16) Out of six (06) court cases, three (03) were decided in favour of WAPDA during 2022-2023. other four (03) cases are under trial.
(17) 529 ACRs of Power, IT & Finance Division Officers (BPS-17,18 & 19) were got cleared during 2022-23.

WAPDA RECRUITMENT CELL

WAPDA Recruitment Cell has been established by the Authority with the purpose to facilitate & coordinate the recruitment process in order to have transparent & merit based appointments. Recruitment in WAPDA is made in accordance with WAPDA Recruitment Policy / SOP in line with the Federal Govt. Policy / Guidelines.

The functions of WAPDA Recruitment Cell are as follows:

- To Coordinate and facilitate different WAPDA Formations in carrying out Recruitment Process as per WAPDA Recruitment Policy / SOP.
- Scrutiny / Vetting of advertisements received from all WAPDA Formations and its publication through WAPDA PR Division
- Coordination with Testing Agency with reference to conducting Written Tests against the Advertised Posts (BPS-06 to 18)
- Collection of job applications against the advertised posts of BPS-19 & above, initial Scrutiny and Further Processing
- Process cases for Recruitment of Advisors / Individual Consultants / Experts from Open Market as per SOP
- Arrangements & Conduct of Interviews against the Posts of BPS-17 & above by the Authority
- Handling of complaints with reference to Recruitment in WAPDA received through Pakistan Citizen's Portal.
- Conduct Departmental Promotional Exams of WAPDA Officers and Officers of Distributions Companies.
- Nomination of WAPDA Officers for Mandatory & Optional Trainings
- WAPDA Recruitment Cell carried out recruitment process against 341 posts of Officers and Staff during the financial year 2022-23.
- Departmental Promotion / Up-Gradation Exams of 2488 Officers of different categories from BPS-16 to 17, BPS-17 to 18 & BPS-18 to 19 of WAPDA, PPMC, DISCOs, GENCOs, NTDCI, and PITC employees have been conducted during the financial year 2022-23.

MONITORING & SURVEILLANCE DIVISION

WAPDA Monitoring and Surveillance Division under General Manager, is entrusted to serve as WAPDA Regulator/Watch-Dog and to ensure the transparency in different formations by regular monitoring & surveillance of projects/works under execution. M&S WAPDA Division also carries inspection and monitoring of all on-going and O&M Projects of WAPDA.

This division keeps on checking the irregularities & deviations from specified design / criteria / contractual obligations / contract administration during execution of projects / works. General Manager (M&S) redresses the public complaints as focal person of WAPDA for Prime Minister Secretariat and also Convener of the Grievances Redressal Committee for settlement of disputes of bidders under Rule No.48 of PPRA-2004.

M&S WAPDA Division also conducts enquiries, investigations of corruption, irregularities, mis-conduct, monitoring of disciplinary actions and high powered enquires of fraud / embezzlements. It also carries annual inspection of WAPDA Administrative Staff College, WAPDA Engineering Academy Faisalabad and WAPDA Hospitals & Allied Dispensaries. M&S Division also takes up any other duties assigned by the Authority from time to time. Progress achieved by the Monitoring & Surveillance Formation during the year 2022-23 is as under:

Monitoring (Civil) Directorate

Total Inspections of Site	=	08 No.
Total Inquiries Concluded	=	19 No.

Monitoring (Power) Directorate

Inspection of E&M Works of Projects and WAPDA Hospitals along with Allied Dispensaries	=	05 Nos.

Investigation Directorate

Post of Director (Investigation) M&S WAPDA was created on Revamping of GM (M&S) Office in August 2020.

Total Number of Fact-finding Inquiries/Investigations Concluded	=	05 Nos.

Inquiries Directorate

Post of Director (Inquiries) M&S WAPDA was created on revamping of GM (M&S) Office in August 2020.

Total Inquiries Concluded	=	05 Nos.

Diamer Basha Dam Monitoring Directorate

Total Inspections of Site	=	02 No.
Total Inquiries Concluded	=	02 No.

Grievance Redressed Cases

GM (M&S) redresses the public complaints as Focal Person of WAPDA from Prime Minister Secretariat and also Convener of the Grievances Redressed Committee for settlement of disputes of Bidders under Rule No.48 of Public Procurement Regulatory Authority (PPRA)-2004.

Complaints Attended/ Concluded received from Contractors/Consultants/Others	=	02 Nos.

Summary

Total No. of Inspections	=	15 Nos.
Total No. of Inquiries Conducted	=	31 Nos.
Total No. of Complainants of Bidder Redressed	=	02 Nos.

WAPDA CENTRAL LIBRARY

WAPDA Central Library is situated at WAPDA House, Lahore. The Library offers excellent reading environment and educational services to its readers. The facility was envisioned to help WAPDA's professionals to access and use organizational

collective knowledge of water and power sector infrastructure development, which has been playing a key role in national progress over the decades. In addition, various government agencies, libraries, scholars, researchers and general public also benefit from the facility for research and academic purposes.

More than three thousands reports and studies on different water and power sector projects since the creation of WAPDA are available in the WAPDA Central Library for consultation of WAPDA professionals; to name a few, Tarbela Dam Project, Mangla Dam Project, Ghazi Barotha Hydropower Project, Kalabagh Dam Project, Diamer Basha Dam Project. During the financial year 2022-23, total collection of the Library stood at 17,066 Books, with addition of 30 books on different topics i.e. engineering, literatures, general knowledge, and their cataloguing and circulation systems have been automated to facilitate the readers. All regular WAPDA employees are eligible to get membership of the Library without any charges. At present, it has 1829 members.

Objectives and Goals
To provide material and services to WAPDA employees to meet their 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 2022-23, 30 Books on different topics i.e. Engineering, Islamic studies, have been added and entered in the Library Accession Register. Now the total collection of WAPDA Centeral Library is 17,066 Books.

Magazines / Journals
The following 02 technical and non-technical magazines / journals were also subscribed for the readers of WAPDA Central Library.

i) Sayyara Digest
ii) Urdu Digest

Reports
More than three thousands reports/studies of different Water & Power Projects since creation of WAPDA are also available for the consultation of WAPDA professionals. List of some very importants reports are as under:

Feasibility Reports
- Ghazi Barotha Hydropower Project
- Kalabagh Dam Project
- Diamer Basha Dam Project
- Akhori Dam Project
- Tarbela Dam Project
- Command Water Management Baluchistan
- Pre – Feasibility Reports of Bunji Hydropower Project

Completion Reports
- Mangla Dam Project
- Ghazi Barotha Hydropower Project
- Rawal Dam Project
- Simly Dam Project
- Link Canals
- Barrages
- Water and Soils Investigation Division (WASID Reports)
- P&I Reports
- IBP Reports
- ACOP Reports
- GTZ Reports
- International Water Logging And Salinity Research Institute (IWASRI Reports)
- Tipton & Kalmbach (T&K) Reports
- WAPDA Annual Reports (1959 – 2019)
- PC-I,II,III
- Mangla Raising Project Planning Reports

Newspapers
Newspapers banned instructions issued by Dy. Director (Coord.) on behalf of Secretary WAPDA.

Services Internet Facility
To keep our professionals up-dated, internet facility has been provided for latest information / knowledge. For this purpose two computer systems have been installed in separate kiosks.

Departmental Promotion Examination Papers
WAPDA Central Library is also the custodian of previous Departmental Promortion Examination. Papers of different categories of WAPDA Examination are available, employees from all over Pakistan visit the Library to get photocopies of papers relevant material for preparation of DPE is also made available for this purpose.

PUBLIC RELATIONS DIVISION

With establishment of Pakistan Water and Power Development Authority (WAPDA) through an act of Parliament in 1958, Public Relations Division came into being the same year with a mandate to act as a lead formation responsible for carrying out the activities relating to Public Relations, publicity of WAPDA development projects in particular and to serve as a liaison between media and WAPDA. Headed by Additional Director General Public Relations, the Division has three Sections namely Advertisement & Publications, Press and Protocol.

Advertisement and Publication Section, headed by

Additional Director (PR), continued ensuring the publication of WAPDA advertisements/ tender notices in media. It managed the printing of fortnightly WAPDA Khabarbama on regular basis, Annual Report and Telephone Directory while brochures, pamphlets and leaflets were also got printed on need basis. Besides, advertisement invoices were processed for payment to the newspapers.

Similarly, Press Section, headed by Deputy Director (Press), kept publicizing WAPDA development projects in Water and Hydropower Sectors. It maintained active liaison with print, electronic media and conducted visits of media persons to WAPDA projects etc.

Media coverage of meetings, delegations' visits, seminars and workshops were arranged in addition to facilitating interviews and briefings of Chairman WAPDA and the Members of the Authority and preparation of draft speeches and talking points for the Prime Minister, Federal Minister for Water Resources and Chairman WAPDA.

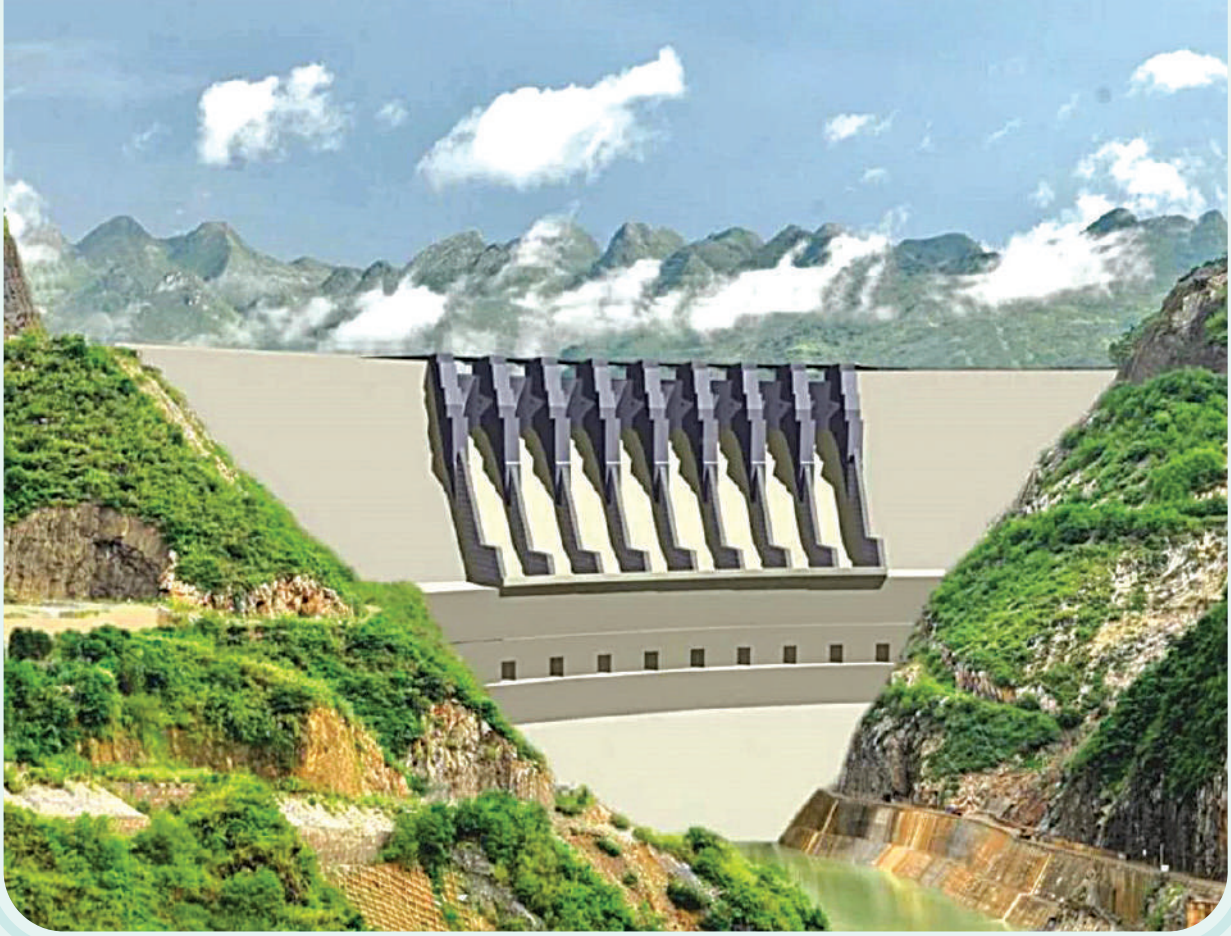
Likewise, Protocol Section, headed by Deputy Director (Protocol), carried out protocol assignments for visiting local and foreign dignitaries, delegations, Chairman WAPDA and Members of the Authority. It also arranged different functions such as inauguration of WAPDA projects, seminars and workshops besides designing and preparation of WAPDA souvenirs etc.

WAPDA SPORTS

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. Since the un-bundling of WAPDA entities, it has 15 Units namely PESCO, IESCO, GEPCO, LESCO, FESCO, MEPCO, HESCO, QESCO, TESCO, SEPCO, NTDC, GENCOs, Hydel Formations, Head Office and Water Wing, who are represented on its Board. These Unit Teams participate in Annual Inter Unit Sports Competitions of 22 Men, 4 Women and 4 Officers events. Presently WSB is managing 65 (Men & Women) Teams consisting more than 2400 sports persons. WAPDA is National Champion of 34 Teams (17 Men, 17 Women) and Runners up of 22 Teams (13 Men, 9 Women). WAPDA is Runners up of Quaid-e-Azam Trophy during 34th National Games 2023 held at Quetta by bagging 109 Gold, 101 Silver and 80 Bronze medals.

WAPDA Endowment Fund for Sports (WEFS)

WAPDA Endowment Fund was established in 2010 with the prime objective to arrange financial support and provide sports facilities to the youngsters to improve the medal position of Pakistan in International Competitions. Youngsters 12 to 16 years are enrolled in 8 sports disciplines (Athletics, Football, Hockey, Karate, Squash, Tennis, Weightlifting and Wrestling) and retained up to age of 18 years. They are being provided coaching / training facilities at door step and stipend of Rs.7,000/- per month. As many as 300 youngsters have so far been enrolled in 5 intakes. Currently 70 youngsters are getting monthly stipend of Rs.7,000/- each. So far, WEFS youngsters won 21 Gold, 13 Silver and 11 Bronze medals at International Level and 252 Gold, 99 Silver and 68 Bronze medals at National Level.



Model - Dasu HPP

FINANCE WING

Internal Audit
Central Contract Cell (CCC)
Public Sector Development Programme (PSDP)
Management Reports
Balance Sheets

INTERNAL AUDIT

Internal Audit Division headed by Chief Auditor WAPDA was established in December 1959 and is responsible for providing assurance and consultancy services to Authority in a wide array of internal control and related matters. Internal Audit reviews financial and operational accounts of formations of WAPDA. It also conducts physical verification of stocks held at various stores, audit inspection of payments made to consultancy services engaged in development projects and special audit as per directives of the Authority.

During the financial year 2022-23, Internal Audit conducted annual audit of 53 formations and physically verified stock of 05 formations. Project audit was also conducted and 11 reports were issued, besides 03 audit inspections were carried out of payments made to consultants. A sum of Rs. 10.359 million were recovered from payments made to consultants. 04 special assignments were also carried out as per directions of Member / Chairman.

One of the important functions of Internal Audit Division is to assist/coordinate the WAPDA formations, External Audit and Ministry/Secretary (PAO) to finalize the replies to the audit reports of the Department of Auditor General Pakistan and submit compliance of PAC/DAC directives to PAC, Special/Sub-committee of PAC/DAC. During the period 2022-23 updated compliance status on following audit reports were prepared and sent to the Ministry of Water Resources for submission to the National Assembly Secretariat & Auditor General of Pakistan.

During this year 2022-23, a series of PAC/DAC meetings were facilitated by this office pertaining to Audit Reports for the year.

Audit Report	DAC Meetings	PAC
2019-2020	02	02
2021-2022	01	-
2022-2023	04	-

Progress achieved during Financial Year July, 2022 to June,2023.

Financial Year 2022 - 23	Routine Audit	Consultant Audit	Project Audit	Special Assignment	Stock Varification
No. of Formation Audited	53	03	11	04	05
Recovery during the year (Rs. In Million)	---	Rs. 10.359	---	---	---

CENTRAL CONTRACTS CELL WAPDA

Central Contracts Cell (CCC) has been effectively functioning since May, 1974 when it was established to provide specialized assistance to the Authority in awarding contracts for purchase and construction of various categories of complex, large scale works, and for appointment of local and foreign consulting Engineering Firms.

The CCC is a common services department of the Authority, headed by General Manager assisted by Chief Engineer-I, Chief Engineer-II, Chief Engineer (PG) Hydel and Seven Directors belonging to Water, Power and Common Services Wings. The Cell has rendered valuable services to WAPDA over a period of about 48 years and justified its existence. The Cell has now grown into a self-sustaining institution, which is working as an independent advisory body to the Authority.

Central Contracts Cell assists Authority in arriving at decisions on the cases referred to it for scrutiny which mainly include evaluation of PQ documents, review of bidding documents for procurement of works, goods and services as well as matters relating to after award contract management as Variations, Extension of Time, Claims and Disputes etc. It also reviews Request for Proposal (RFP) in the light of applicable standards/procedures of PEC, PPRA, Guidelines of Planning Commission, World Bank or ADB, WAPDA procurement and Contracts Manual and WAPDA Book of Financial Powers. It holds technical and financial negotiations as per provisions of TOR and RFP with top ranked consulting firms/JVs approved by the Authority. It also assists project authorities in dealing with contractual matters of consultants.

It is added that during the financial year 2022-23, CCC has reviewed and processed 516 cases including 29 Nos. pertaining to Evaluation of Tender, 103 Nos. Review/Vetting of Tender Documents, 64 Nos. Processing of Extension of Time Cases, 30 Nos. Processing of Variation Orders and 26 Nos. processing of Claims & Invoices & 117 Nos. cases of Advice on Miscellaneous Contract Cases. Moreover, it also rendered advice on 134 Miscellaneous Cases, participated 11 times in Tender openings and negotiation with consultants in 02 Nos. procurements.

PUBLIC SECTOR DEVELOPMENT PROGRAMME 2022 - 23

The final allocation for WAPDA's Water Sector Projects/Schemes financed by the Government of Pakistan through its Public Sector Development Program 2022 - 23 stands at Rs. 75,139.357 million as tabulated below:

Expenditure 2022 - 23

The expenditure on WAPDA Water Sector Projects/Schemes has provisionally been booked at Rs. 76,033.031 million inclusive of disbursement of USAID amounting to Rs. 1,393.674 million for Kurram Tangi Dam Project (Stage - I).

(Rs. In Million)

Description	Final Allocation 2022-23		Expenditure/ Utilization during the FY 2022-23	
	Total	Foreign Assistance	Total	Foreign Assistance
Water Storage/ Irrigation Dams	45,048.447	500	45,942.121	1,393.674
Conveyance Canals	29,006.911	---	29,006.911	--
Research / Investigation & Monitoring	126,000	---	126.000	---
Engineering Studies	957.999	---	957.999	---
Grand Total	**75,139.357**	**500**	**76,033.031**	**1,393.674**

MANAGEMENT REPORT WATER WING

Background

The Government of Pakistan is investing sizable funds for harnessing available potential of land and water resources for socio-economic uplift of the country. Accordingly, planning, designing and execution of Water Resources Development Projects in sub-sector of Irrigation, Drainage and Storages have been assigned to WAPDA in line with WAPDA Act. Therefore, funds as Grants under Development Expenditure Budget of Water Resources Division are being provided through Public Sector Development Programme. The Cash Development Loan utilized for Drainage Projects, is re-payable by the Provincial Governments on transfer of the infrastructure built, whereas the Foreign Loans to Water Sector Projects are also re-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, (Suspended since December, 2012) while for O&M of CRBC, the Government of Punjab and Khyber Pakhtunkhwa are to provide funds as per agreed formula of May, 2002.

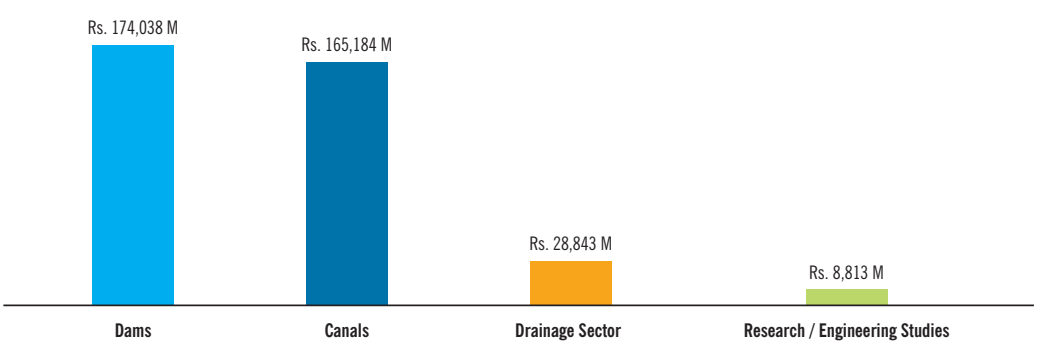
On-Going Programme

Water Wing is engaged on a programme which includes 7 Dams (Comprising 4 Water Storage and 3 Medium Irrigation Dams) and 5 Canals including Greater Karachi Water Supply Scheme (K-IV Project) of national importance aiming at bringing a green revolution in the country with progressive expenditure of Rs.174,038 million and Rs.165,184 million, respectively, as at June, 2023. Further, an investment of Rs.28,843 million had been made in Drainage Sector i.e. RBOD-I and RBOD-III during the period ranging from 1994-95 to-date. The expenditure relating to Investigation/Research and Engineering Studies etc. had been recorded at Rs.8,813 million being continued activities. The upkeep and maintenance of Khanpur Dam, Hub Dam, CRBC and Mirani Dam Projects have also been carried out costing Rs.6,681 million against designated sources besides interim funding, receivable from beneficiaries. WAPDA's interim financing for O&M of national assets stands at Rs.2,577 million as at June, 2023. (From Provincial Govt. of Punjab - Rs.197 Million - CRBC), Govt. of KPK (Rs.547 Million - CRBC), Govt. of Sindh (Rs.1,149 Million - Hub Dam) and, Govt. of Baluchistan (Rs.487 Million - Hub Dam - and Rs.197 Million – Mirani Dam).

The major work activities during 2022-23 have taken place at Kurram Tangi Dam, Nai Gaj Dam, Kachhi Canal (Phase-I), Kachhi Canal (Remaining Works) and Greater Karachi Water Supply Scheme (K-IV) Projects. Further, USAID released US$ 56.566 million (including US $ 5.932 Million during FY 2022-23) against commitment for US$ 81 million at Kurram Tangi Dam Project Stage-I. The objectives of Raising of Mangla Dam are being derived through impounding to raised level through Power generation. Contractual obligations at Darawat Dam have been cleared during FY 2022-23. Pre-feasibility / Feasibility and Engineering Studies of different schemes alongwith General Investigation in all provinces were also carried out by Water Sector Study Cell (now merged with o/o GM Hydro Planning) as well as by IWASRI, MONA and LIM Research Organizations.

Completed Works

WAPDA has so far completed 7 Water Storage Dams costing Rs.12,534 million and 9 Canal Projects including Chashma Right Bank Canal, Pat Feeder Canal, Mardan Canal and Pehur High Level Canal with an expenditure of Rs. 42,787 million.



All the projects have been transferred to the provinces except Khanpur Dam, Hub Dam and CRBC Projects. Moreover, 75 Drainage and Reclamation Projects had consumed Rs.65,850 million, while an amount of Rs.10,120 million has also been incurred on Investigation/ Research, Monitoring and Planning Schemes. The expenditure of Rs.19,735 million relates to Indus Basin Projects executed during the period from 1960 to 1974, through Water Sector Development Budget.

Expenditure on Completed Projects as at on June 30, 2023

Description	Rs. In Million	% age
Water Storage (Dams)	12,534	8%
Conveyance Canals	42,787	28%
Drainage & Reclamation Projects	65,850	44%
Research / Investigation & Monitoring/ Engineering Schemes	10,120	7%
IBP Consequential Works	19,735	13%
Total	**151,026**	**100%**

MANAGEMENT REPORT POWER WING

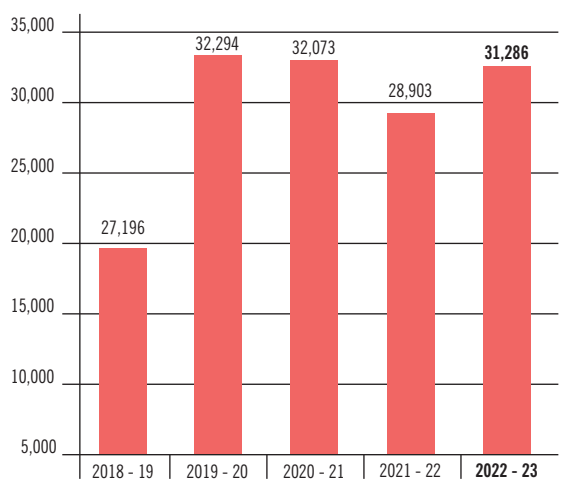
WAPDA (Regulated Business) covers operation, maintenance and development of hydel power resources in Pakistan under generation license granted by the Power Regulator 'NEPRA'.

Operational Performance

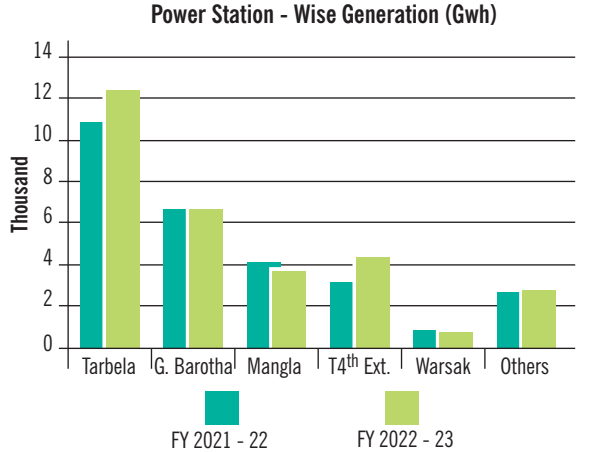
WAPDA presently owns and operates 21 hydel power stations with aggregated installed generation capacity of 8,420 MW. Major hydel power stations include Tarbela (3,478 MW), Ghazi Barotha (1,450 MW), Tarbela 4th Ext. (1410 MW), Mangla (1,000 MW) Warsak (243 MW), Chashma (184 MW) and Golen Gol (108 MW).

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. During FY 2022-23 the Net Electrical Output (NEO) for the year stood at 31,286 GWh as compared to last year 28,903 GWh.

Generation Trend (Gwh)



Power Station - Wise Generation (Gwh)



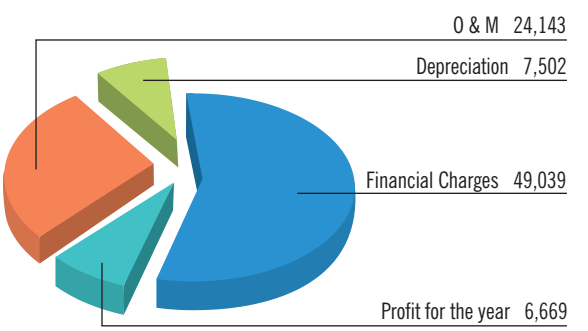
Profitability Position

Recovery of Regulatory Revenue Gap allowed by NEPRA was completed on May 17, 2022. Therefore, tariff without Revenue Gap for FY 2020-21 remained applicable during whole FY 2022-23 pending decision of WAPDA Tariff Modification Petition for FY 2022-23 by NEPRA. Resultantly Power Sales billing (excluding Hydel Levies and GST) during FY 2022-23 stood at Rs.74,794 million (2022: Rs. 98,711 Million including Revenue Gap recovery of Rs. 24,116 Million). The cost of electricity stood at Rs. 28,910 million (2022: 26,660 Million) resulting in net profit of Rs. 6,669 million (2022: Rs. 30,637 Million). The value of property, plant & equipment (at net carrying cost) and Capital Work in Progress (CWIP) has reached to Rs. 891,727 million (2022: Rs. 717,886 Million).

Profit & Loss Comparison

Particulars	FY 2022 - 23 (Mln. Rs.)	FY 2021 - 22 (Mln. Rs.)
Sales (Exclusive GST)	74,794	98,711
Other Income	12,559	11,059
Total Revenue	**87,353**	**109,770**
Cost of Sales		
O&M	24,143	21,147
Depreciation/Ijara Rental	7,502	7,747
Total Cost of Sales	31,645	28,894
Surplus/ (Deficit)	55,708	80,876
Less: Financial Charges	49,039	50,239
Profit for the Year	**6,669**	**30,637**
Add: Net Movement in Regulatory Deferral Debit Account	848	-11,198
Profit for the Year and Net Movement in Regulatory Deferral	**7,517**	**19,439**

Cost & Profitability FY 2022 - 23



Liquidity Position

In line with NEPRA Tariff notification Rs. 119,522 million has been billed to CPPA-G during FY 2022-23 inclusive of Hydel Levies and GST (FY 2021-22: Rs. 126,360 Million) against which CPPA-G made payment of Rs. 103,846 million (FY 2021-22: Rs. 95,086 Million). Resultantly, Trade Receivable from CPPA-G has increased to Rs. 290,435 million (inclusive of Hydel Levies) as on 30th June, 2023 from Rs. 274,760 million as on 30th June, 2022.

During the year Rs. 7,411 million have been paid on account of Salaries, Wages and Benefits, Rs. 1,010 million for Repair and Maintenance expenses, Rs. 1,088 million have been disbursed for Dam Inspection & Monitoring Cost, Rs. 2,734 million for operating expenses and Rs. 5,140 million on account of Post-Retirement Benefits to the pensioners of WAPDA. Moreover, Rs. 16,745 million has been invested in planned asset against Pension Liability which has been reached to Rs. 26,745 million.

Repair & Maintenance

WAPDA during FY 2022-23 managed to generate 31,286 Gwh Net (31,510 GWh gross) through effective preventive maintenance. It is worth mentioning that Tarbela & Tarbela 4th Ext. collectively generated 302 MkWh more than last year. Repair & Maintenance works of all 21 Hydel Power Stations were carried out as per schedule.

Major repair and maintenance works that were carried out as per schedule.

Major repair and maintenance works that were carried out successfully during the financial year include.

- The replacement of the runner for unit No. 05 of the Tarbela Hydel Power Station.
- The overhauling of Unit No. 02 of the Warsak Hydel Power Station,
- The upgradation of the governing system for Unit No. 08 of the Chashma HPS and the replacement of the turbine nozzles for the Unit No. 02 of the Allai Khwar HPS.

Rehabilitation and Up-gradation

- In second phase of Mangla Power House rehabilitation of Units 3 & 4 is underway which is expected to be completed in June 2024.
- E&M Contract of Warsak 2nd Rehabilitation Project has signed with M/s Hydro France and M/s Sino Hydro China JV.
- After signing of the Consultancy Agreements for Rehabilitation/ Up-gradation of Chitral and Dargai Hydel Power Stations, Pre-Qualification/ Initial Selection of Contractor for Rehabilitation of Dargai has been completed and contract will be awarded shortly.

Power Expansion

After many decades WAPDA has commenced the development of monolithic projects in the history of Pakistan with carbon free aggregate generation capacity of 11,278 MW besides other enormous benefits for the national economy. These projects include multipurpose Diamer Basha Dam and Mohmand Dam, Tarbela 5th Ext. and Run of the River Dasu Hydropower.

Project wise capital expenditure is as follows:

Capital Work in Progress (CWIP) (Rs. in Million)

Balance as at 30th June	2022	Additions	Transferred	2023
Basha Dam Project	188,765	49,766		238,531
Dasu HPP	131,338	51,457		182,795
Kheyal Khwar HPP	3,765	192		3,957
Mohmand Dam	86,651	46,618		133,269
Tarbela 5th Ext.	16,435	15,393		31,828
Tarbela 4th Ext.	10,268	7,778	(1,033)	17,013
Golan GoI Project	714	152		866
Mangla Rehab	18,886	3,633		22,519
Warsak 2nd Rehabilitation	2,571	1,260		3,831
GB Projects	-	785		785
Others	7,879	3,130	(3,044)	7,965
Total	**467,272**	**180,164**	**(4,077)**	**643,359**

Hydel Levies

During the period Rs. 8,500 million have been paid to the provinces on account of NHP, Rs. 266 million as Water Usage Charges (WUC) to Govt. of AJ&K whereas Rs. 97 million has been paid as IRSA Charges.

Payable against Hydel Levies stood at Rs. 127,852 million as on June 30, 2023 (Rs. 91,990 Million as on June 30, 2022).

MANAGEMENT REPORT COORDINATION WING

Charter of WAPDA as enunciated in the WAPDA Act, 1958 with regard to exploration and utilization of water resources and development of Hydel Power Generation is executed under Water and Power Wings of the Authority. The former include construction of dams, canals and drainage projects whereas the generation of Hydel Power falls under the ambit of Power Wing. The two Wings are headed by respective Members of the Authority. Funding of the two types of projects come from PSDP, Foreign Donors and partially from self-financing of the Power Wing.

Operational Performance

The common services including general administration, Accounts & Finance, Health, Education, Security, Sports, Pension & Insurance, General Provident Fund (GPF), WAPDA Welfare Fund (WWF) and Transportation etc. are provided by the Coordination Wing headed by Member Finance. Most of these services are not restricted to WAPDA only, but the corporate entities as before unbundling of WAPDA are also continuously availing of the same. Financing of the Coordination Wing comprising of the common services offices and the Authority's offices is majorly dependent upon contribution at certain rates from the overall budget of Water and Power Wings. Currently the Coordination Wing contains the following centrally managed Authority offices.

- Authority / D.G. (HR & Admn)
- G.M Finance (Coord)
- General Manger (CCC)
- Director (Security)
- General Manager (M&S)
- Director (Vigilance)
- Director (Labour & Welfare)
- Law Division
- Director Transport

The operational costs of all centrally managed Authority offices during the FY 2022-23 were Rs.2,910.880 (M) and breakup is given below:

Funding Position

The source of income for Coordination Wing is according to Government approved rates, inter alia, to meet the Authority's overheads is as follows:

Water Wing Budget	0.8%
Power Wing Budget	1.0% of Hydel Development 5.0% of Hydel Operation

Authority offices (HOC) income share at above rates received from concerned wings and other income for FY 2022-23 were Rs.1,747.084 (M) whereas the establishment expenses for the same year were Rs.2,910.88 (M). The net deficit was decreased by Rs.6.035 (M) as compared to previous year. A quick glance of financial position is as under:

Income Statement Comparison (Rs. In Million)

Particular	FY 2022-23	FY 2021-22
Service Income	1,418.445	1,159.999
Operating Expenses	(2,910.880)	(2,448.299)
Other Expenses (Subsidies)	---	(3.777)
Operating Profit / (Loss)	(1,470.533)	(1292.077)
Other Income	328.639	122.245
Net Surplus/(Deficit) for the year	**(1,163.797)**	**(1,169.832)**

Funds Flow Highlights

The key features of cash change are due to:

- Out of Total Service Income of Rs.1,747.084 (M), receipts from Authority Overhead for FY 2022-23 from Power and Water Wings were Rs.1,363.195(M).

Rs. Million

Name of Formation Under D.G. Finance (B&C)	Approved Budget for FY 2022-23	Establishment Expenses FY 2022-23	Variance Analysis
Authority / DG (HR&A)	1293.99	1255.548	38.442
G.M.F (Coord)	1034.009	891.132	142.877
G.M (CCC)	256.290	201.487	54.803
Director (Security)	159.522	92.447	67.075
G.M (M&S)	256.394	195.880	60.514
Director Vigilance	135.009	72.786	62.223
Director Labour & Welfare	39.575	24.434	15.141
Law Division	80.286	50.381	29.905
Director Transport	345.456	126.785	218.671
Total	**3,600.531**	**2,910.880**	**689.651**

- The Building Rent of Rs.280.02(M) and mark up of Rs.43.769(M) were received on working capital reserves.
- Payment of Rs.557.502 (M) was made to Director (Pension), WAPDA for pensionary charges.
- Payment made Rs.1,237.703(M) as Salaries, Wages & Other Employees benefit and Rs.145.046 (M) as Rent, Rates, Taxes & Other Charges.
- The closing cash in hand balance has increased from Rs.136.245(M) to Rs.550.945 (M) as at June 30, 2023.

WAPDA Funding Units

WAPDA Sports Board (WSB), WAPDA Chief Auditor (CAR) and Director Public Relations (DPR) offices were previously managed financially by Coordination Wing for establishment expenditures.

To reduce the burden on Authority over head, it was decided in FY 2014-15 with approval of the Authority that the expenses of the three offices i.e. WAPDA Sports Board (WSB), WAPDA Chief Auditor (CAR) and Director Public Relations (DPR) be proportionately divided amongst the three Wings henceforth.

Coordination Wing	30%
Power Wing	45%
Water Wing	25%

The detail of 30% Share of Coordination Wing for the FY 2022-23 as under:

Director Public Relations	45.544 (M)
Chief Auditor WAPDA	120.884 (M)
WAPDA Sport Board	55.417 (M)
Total	**221.845 (M)**

CASH FLOW STATEMENT WATER WING (Water Sector Projects / Formations)

for the year ended June 30, 2023

	2023	2022
	----- PKR '000' -----	
Cash Flow for Development Projects		
Government of Pakistan Development Grant / Loan	**33,779,047**	35,427,274
Development Partner's Funding (USAID)	**1,417,093**	3,210,757
Loan from Power Wing for Development Projects & Salaries	**893,880**	390,851
Repayment of Loan to Power Wing	**-**	(659,300)
Infrastructure Development - On Going	**(38,239,161)**	(38,141,610)
Infrastructure Development - Completed	**(34,258)**	(47,706)
Total	**(2,183,399)**	180,266
Cash Flow for Supervisory Offices		
Supervision Charges @ 1.45 %	**1,082,270**	907,370
Management Cost of Supervisory Offices	**(1,139,771)**	(1,003,414)
Total	**(57,501)**	(96,044)
Cash Flow for Recurrent, O&M Formations and Service Providers		
Non-Development/Revenue Grants by GOP	**58,400**	103,000
Miscellaneous Receipt	**461,232**	330,139
Decrease in Advances	**9,986**	(11,423)
Recovery from Debtors	**13,031**	31,732
Expenditure on Behalf of Beneficiaries	**(1,616,036)**	(1,170,191)
Decrease in Other Receivable	**1,573,694**	22,435
Pension Fund for Retirees	**3,960,000**	6,013,130
Increase in Pension Fund Contribution	**(3,960,000)**	(6,013,130)
Expenditure on Revenue Budget, Service Providers and O&M Formations	**(443,844)**	(230,599)
Expenditure on Other Formations	**(88)**	(94,133)
Other Misc. Receipts	**1,761,626**	964,168
Acquisition of Assets	**(6,292)**	(11,770)
Depreciation Charged	**9,736**	3,628
Total	**1,821,445**	(63,014)
Net Increase/ (Decrease) in Cash & Cash Equivalents	**(419,455)**	21,208
Cash & Cash Equivalents at beginning of the year	**3,616,132**	3,594,924
Cash & Cash Equivalents at end of the year	**3,196,677**	3,616,132

BALANCE SHEET WATER WING (Water Sector Projects / Formations)

As at June 30, 2023

	2023	2022
	----- PKR '000' -----	
Assets		
Net Operating Assets	**26,572**	30,016
Infrastructure Development - Completed	**151,026,280**	150,992,022
Infrastructure Development - On Going	**378,171,146**	339,488,141
Long Term Loans/Advances	**442,279**	452,265
Sundry Debtors	**5,581,137**	4,013,153
Other Receivables	**3,928,245**	5,501,939
Pension Fund Contribution	**13,031,800**	9,071,800
Cash, Bank & Imprest Balances	**3,196,677**	3,616,132
Total Assets	**555,404,136**	513,165,468
Capital & Liabilities		
Capital Employed - Completed	**151,696,695**	151,696,695
Capital Employed - On-Going	**378,199,617**	342,813,396
Pension Fund for Retirees	**13,031,800**	9,071,800
Deposit Accounts	**325,853**	347,372
Pension Claim Payable	**6,995,541**	5,594,883
Other Payables & Accruals	**4,963,782**	3,694,193
Excess of Receipts over Expenditure	**190,848**	(52,871)
Total Capital & Liabilites	**555,404,136**	513,165,468

STATEMENT OF FINANCIAL POSITION (HYDROELECTRIC - NEPRA REGULATED BUSINESS)

As at June 30, 2023

	2023	2022
	----- PKR '000' -----	
Assets		
Non - Current Assets		
Property, Plant & Equipment	**891,726,679**	717,886,286
Long Term Investments	**20,906,500**	-
Long Term Loans, Advances & Deposits	**800,565**	754,686
	913,433,744	718,640,972
Current Assets		
Stores, Spares & Loose Tools	**8,738,695**	6,969,599
Receivable from the Customer	**290,435,130**	274,760,431
Short Term Investments	**31,744,901**	25,000,000
Other Receivables	**5,566,756**	2,364,014
Loan & Advances	**4,731,936**	6,458,900
Prepayments	**5,101**	5,068
Bank Balances	**158,726,506**	151,139,321
	499,949,025	466,697,333
Total Assets	**1,413,382,769**	1,185,338,305
Regulatory Deferral Account Debit Balances	**16,344,789**	15,496,426
Total Assets & Regulatory Deferral Account Debit Balances	**1,429,727,558**	1,200,834,731
Equity & Liabilities		
Equity		
Investment of Government of Pakistan	**63,000,716**	63,000,716
Unappropriated Profits	**186,947,055**	185,633,322
	249,947,771	248,634,038
Non - Current Liabilities		
Long Term Financing	**224,911,452**	209,043,487
Deferred Grants	**210,764,691**	167,108,420
Employees Post Employment & Other Benefits	**69,558,024**	72,690,632
Retention Money Payable	**22,005,403**	12,522,049
	527,239,570	461,364,588
Current Liabilities		
Trade & Other Payables	**24,662,292**	26,480,285
Short Term Borrowings	**182,469,842**	145,687,690
Payable Against Hydel Levies	**127,852,637**	91,990,154
Current Portion of Long Term Financing	**311,029,838**	222,054,095
Current Portion of Deferred Grants	**244,678**	244,678
Current Portion of Retention Money Payable	**1,829,616**	1,140,992
Accrued Interest	**4,451,314**	3,238,211
	652,540,217	490,836,105
Total Liabilities	**1,179,779,787**	952,200,693
Total Equity & Liabilities	**1,429,727,558**	1,200,834,731
Contingencies & Commitments	**---**	---

STATEMENT OF PROFIT OR LOSS (HYDROELECTRIC - NEPRA REGULATED BUSINESS)

for the year ended June 30, 2023

	2023	2022
	----- PKR '000' -----	
Revenue from Contract with Customer - Net	**74,793,564**	98,711,153
Cost of Revenue	**(28,910,734)**	(26,659,817)
Gross Profit	**45,882,830**	72,051,336
Operating Expenses	**(2,734,081)**	(2,234,332)
Operating Profit	**43,148,749**	69,817,004
Finance and Other Costs	**(49,038,697)**	(50,238,904)
Other Income	**12,558,619**	11,058,809
Profit for the Year Before Net Movement in Regulatory Deferral Account	**6,668,671**	30,636,909
Net Movement in Regulatory Deferral Account	**848,363**	(11,197,788)
Net Profit for the Year	**7,517,034**	19,439,121

STATEMENT OF COMPREHENSIVE INCOME (HYDROELECTRIC - NEPRA REGULATED BUSINESS)

for the year ended June 30, 2023

	2023	2022
	----- PKR '000' -----	
Net Profit for the Year	**7,517,034**	19,439,121
Other Comprehensive Loss:		
Items that will not be Subsequently Reclassified to Profit or Loss:		
- Actuarial Loss on Employees Retirement Benefits	**(6,203,301)**	(5,030,247)
Items that will be Subsequently Reclassified to Profit or Loss	**---**	---
	(6,203,301)	(5,030,247)
Total Comprehensive Income for the Year	**1,313,733**	14,408,874

STATEMENT OF CHANGES IN EQUITY (HYDROELECTRIC - NEPRA REGULATED BUSINESS)

for the year ended June 30, 2023

	Government of Pakistan's Investment	Unappropriated Profits	Total
	---------- Rupees in Thousands ----------		
Balance as at June 30, 2021	**63,000,716**	**171,224,448**	**234,225,164**
Profit for the Year and Net Movements in Regulatory Deferral Account Debit Balances	---	19,439,121	19,439,121
Other Comprehensive Loss	---	(5,030,247)	(5,030,247)
Total Comprehensive Income for the Year	---	14,408,874	14,408,874
Balance as At June 30, 2022	**63,000,716**	**185,633,322**	**248,634,038**
Profit for the Year and Net Movements in Regulatory Deferral Account Debit Balances	---	7,517,034	7,517,034
Other Comprehensive Loss	---	(6,203,301)	(6,203,301)
Total Comprehensive Income for the Year	---	1,313,733	1,313,733
Balance as at June 30, 2023	**63,000,716**	**186,947,055**	**249,947,771**

STATEMENT OF CASH FLOWS (HYDROELECTRIC - NEPRA REGULATED BUSINESS)

for the year ended June 30, 2023

	2023	2022
	----- PKR '000' -----	
Cash Flows from Operating Activities		
Profit for the Year Before Net Movements in Regulatory Deferral Account Debit Balances	**6,668,671**	30,636,909
Adjustments to Reconcile Profit for the Year Before Net Movements In Regulatory Deferral Account Debit Balances to Net Cash Flows:		
Depreciation of Operating Fixed Assets	**7,501,978**	7,372,725
Finance and other Costs	**34,602,190**	40,574,538
Sukuk III Ijarah Rentals	**---**	374,297
Effects of Exchange Rate Changes on Bank Balances	**14,436,507**	9,664,366
Provision of Employees Retirement Benefits and other Benefits	**13,253,980**	9,211,449
Income from Financial Assets	**(12,023,967)**	(10,523,216)
Gain on Disposal of Operating Fixed Assets	**(5,022)**	(4,161)
Amortization of Deferred Grants	**(244,678)**	(244,678)
	57,520,988	56,425,320
Operating Profit before Working Capital Changes	**64,189,659**	87,062,229
(Increase) / Decrease in Current Assets:		
Stores, Spare and Loose Tools	**(1,769,096)**	(408,698)
Receivable from the Customer Against Sale of Electricity	**(8,497,641)**	(49,453,809)
Receivable from the Customer Against Hydel Levies	**(7,177,058)**	17,764,603
Loans and Advances	**1,732,257**	968,535
Prepayments	**(33)**	268
Other Receivables	**(3,202,742)**	(302,568)
(Decrease) / Increase in Current Liabilities:		
Trade and Other Payables	**(381,103)**	319,345
Payable against Hydel Levies	**35,862,483**	4,583,126
	16,567,067	(26,529,198)
Cash Generated from Operations	**80,756,726**	60,533,031
Payment of Sukuk III Ijarah Rentals	**---**	(374,297)
Long Term Loans, Advances and Deposits (Given)	**(49,892)**	(78,239)
Payment of Finance and other Costs	**(22,274,348)**	(14,107,676)
Retention Money Deducted	**6,344,120**	4,244,160
Payment of Employee Retirement and other Benefits	**(49,334,790)**	(4,354,411)
	(65,314,910)	(14,670,463)
Net Cash Generated from Operating Activities	**15,441,816**	45,862,568
Cash Flows from Investing Activities		
Purchase of Operating Fixed Assets and Capital Stores	**(1,247,154)**	(825,519)
Capital Expenditure Incurred on Capital Work in Progress	**(110,395,746)**	(80,593,038)
Proceeds from Sale of Operating Fixed Assets	**13,030**	19,349
Long Term Investments made During the Year	**(20,906,500)**	---
Short Term Investments made During the Year	**18,000,000**	(35,000,000)
Short Term Investments Realized During the Year	**2,000,000**	2,000,000
Interest and other Income Received	**12,022,687**	10,522,566
Grants Received	**43,900,949**	28,975,643
Net Cash Used in Investing Activities	**(56,612,734)**	(74,900,999)

	2023	2022
	----- PKR '000' -----	
Cash Flows From Financing Activities		
Proceeds from Long Term Financing	**53,730,047**	39,874,690
Repayment of Long Term Financing	**(5,552,688)**	
Proceeds from Short Term Borrowings	**580,744**	1,349,288
Net Cash Generated from Financing Activities	**48,758,103**	41,223,978
Net Increase in Cash & Cash Equivalents	**7,587,185**	12,185,547
Cash and Cash Equivalents at the Beginning of the Year	**151,139,321**	138,953,774
Cash and Cash Equivalents at the End of the Year	**158,726,506**	151,139,321

CONSOLIDATED BALANCE SHEET WAPDA

As at June 30, 2023

PKR '000'

	Power Wing	Water Wing	Coordination Wing	Total
ASSETS				
Non Current Assets				
Operating Fixed Assets	248,368,201	26,572	20,588,454	268,983,227
Capital Works				
In Progress	643,358,478	378,171,146	670,931	1,022,200,555
Completed Works	-	151,026,280	-	151,026,280
Long Term Investments	20,906,500	-	-	20,906,500
Long Term Advances	778,869	442,279	1,070,974	2,292,122
Long Term Security Desposits	21,696	-	9,303	30,999
	913,433,744	**529,666,277**	**22,339,664**	**1,465,439,683**
Current Assets				
Stock, Spare Parts and Loose Tools	8,738,695	-	354,972	9,093,667
Trade Debts	290,435,130	-	-	290,435,130
Pension Fund Contribution	-	13,031,800	-	13,031,800
Sundry Debtors	-	5,581,137	10,469,089	16,050,226
Loan & Advances	4,731,936	-	-	4,731,936
Prepayments / Other Receivables	5,571,857	3,928,245	1,554,191	11,054,293
Consignment Account	-	-	15,390,052	15,390,052
Short Term Investments	31,744,901	-	-	31,744,901
Cash & Bank Balances	158,726,506	3,196,677	3,131,755	165,054,938
	499,949,025	**25,737,859**	**30,900,059**	**556,586,943**
Regulatory Deferral Account Debit Balances	16,344,789	-	-	16,344,789
Total Assets	**1,429,727,558**	**555,404,136**	**53,239,723**	**2,038,371,415**
EQUITY & LIABILITIES				
Equity				
Accumulated Profits	186,947,055	-	-	186,947,055
Excess of Receipts over Expenditures	-	190,848	-	190,848
Government of Pakistan's Investment	63,000,716	-	-	63,000,716
Reserves	-	-	1,338,783	1,338,783
Capital Employed	-	529,896,312	-	529,896,312
Deposit Accounts	-	325,853	73,914	399,767
	249,947,771	**530,413,013**	**1,412,697**	**781,773,481**
Revaluation Surplus	-	-	19,737,822	19,737,822
	249,947,771	**530,413,013**	**21,150,521**	**801,511,303**
Non Current Liabilities				
Long Term Financing - Interest Bearing	224,911,452	-	-	224,911,452
Long Term Advances	-	-	361,731	361,731
Employees Post Employment & Other Benefits	69,558,024	-	-	69,558,024
Deferred Grants	210,764,691	-	-	210,764,691
Retention Money Payable	22,005,403	-	-	22,005,403
	527,239,570	**-**	**361,731**	**527,601,301**
Current Liabilities				
Trade Creditors & Other Payables	24,662,292	17,995,582	9,516,888	52,174,762
Pending Bills of Suppliers/Contractors	-	-	91,625	91,625.00
Pension Claims Payable	-	6,995,541	4,732,817	11,728,358
Payable against Hydel Levies	127,852,637	-	-	127,852,637
Current Portion of Long Term Financing	311,029,838	-	-	311,029,838
Current Portion of Deferred Grants	244,678	-	-	244,678
Current Portion of Retention Money Payable	1,829,616	-	-	1,829,616
Accrued Interest	4,451,314	-	-	4,451,314
Consignment Account	-	-	17,386,140	17,386,140
Short Term Borrowings	182,469,842	-	-	182,469,842
	652,540,217	**24,991,123**	**31,727,470**	**709,258,810**
CONTINGENCIES AND COMMITMENTS				
Total Equity & Liabilities	**1,429,727,558**	**555,404,136**	**53,239,723**	**2,038,371,415**

INCOME AND EXPENDITURE STATEMENT

for the year ended June 30, 2023

	2023	2022
	----- PKR '000' -----	
Sources to Finance Supervisory Offices	**1,082,270**	907,370
Share of Supervisory Overheads (@1.45%)	**1,082,270**	907,370
Expenditure		
General Manager Finance (Water)	**329,207**	296,128
General Manager (Technical Services)	**24,509**	24,773
General Manager Water (Central)	**171,113**	154,309
General Manager (Project) South	**420,400**	368,087
General Manager (Project) North	**194,542**	160,117
	1,139,771	1,003,414
Deficit of Supervisory Offices for the Year	**(57,501)**	(96,044)
Left Over Reciepts/(Excess Of Exp.) of Previous Year	**(381,682)**	(285,638)
Net Surplus/(Deficit)	**(439,183)**	(381,682)
Add: Other Receipts		
Water Charges of Khanpur Dam	**-**	504
Interest Income	**475,181**	229,323
Misc. Receipts	**154,850**	98,984
	630,031	328,811
Excess of Receipts Over Expenditure	**190,848**	(52,871)

Ministry of Water Resources
Government of Pakistan Islamabad
(As on June 30, 2023)

Minister of Water Resources — **Syed Khursheed Ahmed Shah**

Secretary, Water Resources — **Hasan Nasir Jamy**

Senior WAPDA Managers
(As on June 30, 2023)

Chairman WAPDA
Lt. Gen. (R) Sajjad Ghani

WATER WING

Member (Water)
Jawaid Akhtar Latif

GM (C&M) Water
Muhammad Azam Joya

GM (CDO)
Dr. Khizar Hayat

GM (TS)
Nasir Ali

GM (HRM)
Masroor Naqvi

GM (HP)
Altaf Qadir
(Current charge)

GM (DBDO)
Nazakat Hussain

GM (MDHP)
Javed Afridi

GM/PD (Dasu)
Anwar Ul Haq

GM/PD (KCP/Central)
Syed Ali Akhtar Shah

GM/PD (TDP)
Zakir Atiq

GM/PD (NA)
Abdul Razzaq

GM (Projects)
Shahzad Ajmal

GM (Projects) South
Masood Ahmed Soomro

GM (M&S)
Syed Talib Hussain Naqvi

POWER WING

Member (Power)
Jamil Akhtar

GM (Hydel) Operation
Nadeem Iqbal

GM (Hydel) Dev.
Ihsan Ullah
(Acting charge)

GM (Coord.) Power
Sh. Azmat Hayat

CEO NJHPC
Muhammad Arfan

FINANCE WING

Member (Finance)
Naveed Asghar Ch.

GMF (Coord.)
Shakeel Ahmed
(Current Charge)

GMF (Power)
Syed Irfan Hussain Rizvi

GMF (Water)
Syed Irfan Hussain Rizvi
(Additional Charge)

Chief Auditor
Asia Shehriyar

HR WING

GM (HRD)
Brig. (R) M. Hamid Raza
(Current Charge)

GM (Training)
Ali Anwar Buriro

DG (HR)
Sana Ullah

DG (CM) Water
Muhammad Saeed

DG (CM) P&C
Pervaiz Hussain Khan

DG (Recruitment)
Azam Malik

ADMN WING

GM (Admn)
Brig. (R) M. Tufail
(Currentl Charge)

DG (MS) Lahore
Dr. Aamir Yaqub

DG (Sports) WSB
M. Musharraf Khan

Dir. (Legal)
Shahzad Asaf Sheikh

WAPDA SECRETARIAT

Secretary WAPDA
Fakharruzaman Ali Cheema

CHAIRMAN OFFICE

PSO to Chairman
Brig. (R) Mateen Ahmed Mirza

WAPDA
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Public Relations Division, WAPDA
WAPDA House, Lahore - Pakistan
Tel: +92 42 9920 2633
Email: wapdapr@gmail.com

SMS Consultants
0300 431 9305