



# **ANNUAL REPORT 2023**

**Office of the Chief Engineering Advisor & Chairman,  
Federal Flood Commission**

**6-Atturk Avenue, G-5/1, Islamabad**

**[www.ffc.gov.pk](http://www.ffc.gov.pk)**

**June 2023**



**Government of Pakistan  
Ministry of Water Resources  
O/o Chief Engineering Advisor/ Chairman  
Federal Flood Commission**



# ANNUAL REPORT 2023



**6-ATATURK AVENUE, SECTOR G-5/1,  
ISLAMABAD, PAKISTAN**

[www.ffc.gov.pk](http://www.ffc.gov.pk)

## **FORWARD**

It is with great pride and pleasure to present the Annual Report of office of Chief Engineering Advisor/ Chairman FFC for the calendar year 2023. This report encapsulates important activities performed by various wings of O/o CEA/CFFC, achievements, and the progress made towards fulfilling the mission of the department. In spite of numerous challenges, dedication of Professional Engineers of O/o CEA/CFFC enabled to overcome issues and achieve significant success. Key highlights include Technical Appraisal of (i) 23 water sector development projects by the Civil Engineering Wing; (ii) 28 dam projects by Dams Safety Council and likewise, (iii) 39 No. Hydropower and Transmission/Distribution projects by the Power Wing.

2023's achievements for the Flood Management Wing of O/o CEA/CFFC (FFC) are marked with accomplishment of its two key initiatives i.e. Updation of 4<sup>th</sup> National Flood Protection Plan (Updated NFPP-IV) including approval granted by the ECNEC for its Phase-I i.e. Umbrella PC-I of 3<sup>rd</sup> Flood Protection Sector Project-III/ FPSP-III, and launch of National Master Plan on Flood Telemetry Network. Flooding has become a recurring issue in Pakistan, with disastrous flood events occurring more than once every four years over the past 76 years. Climate change is predicted to exacerbate this problem in the future, posing a significant threat to the country's rapidly expanding urban and rural populations.

In July 2023, Pakistan experienced unusually heavy rainfall during the monsoon season, resulting in the loss of 226 human lives and damage to public infrastructure, private properties, and livestock. High to Exceptionally High Flood Situation was observed in River Sutlej. Due to cumulative outflows from India's Pong Dam (which controls River Beas) and Bhakra Dam (which controls River Sutlej), River Sutlej attained Exceptionally High Flood at Ganda Singh Wala in Pakistan with peak discharge of 278,297 cusecs on 19<sup>th</sup> August 2023 and Very High Flood at Sulemanki with peak discharge of 191,053 cusecs on 22<sup>nd</sup> August 2023, causing inundation of nearby villages. High flood reportedly damaged standing crops and houses on both sides of River Sutlej in Kasur district besides washing away of embankments, settlements, etc.

For comprehensive and Integrated Flood Risk Management on a country-wide basis, Government of Pakistan through Federal Flood Commission (FFC) has implemented three 10-yearly National Flood Protection Plans (NFPPs) from 1978 to 2008 with additional interventions from 2009 to 2022 through Normal/ Emergent Flood Protection Program. The latest National Flood Protection Plan (NFPP-IV) was approved in May 2017 by the Council of Common Interests. However, it could not be implemented for want of funds. In line with directions of the then Prime Minister dated August 29, 2023, original NFPP-IV (2017 version) has been reformulated based on consultative process led through FFC with active participation of all relevant stakeholders at the Federal and Provincial level in view of lessons learnt from 2022 flood event. FFC managed this task as per PD&SI Division's requirements and as per its mandate.

The final draft NFPP-IV Updated is in its final approval process enroute Ministry of Water Resources and PD&SI Division. Implementation of NFPP-IV Updated has been recommended under 4RF (Resilience, Recovery, Rehabilitation and Reconstruction Framework) prepared by PD&SI Division to build back better from 2022 floods. Detail of various structural and non-structural interventions, recommended hitherto under NFPP-IV Updated' are provided in this annual report of the department. Besides, the activities carried out by the various wings of the CEA/CFFC office have also been comprehensively described together with the organization's present and future prospects and information regarding the flood scenario encountered during the 2023 Monsoon Season.

The dedicated support of all Professional Engineers of O/o CEA/CFFC, towards formulation of Annual Report 2023, is greatly acknowledged.

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## EXECUTIVE SUMMARY

After the country's independence, a Central Engineering Authority was established by the Government of Pakistan as a lead development authority under the Chief Engineering Adviser. It was re-designated as '*Chief Engineering Advisor's Office*' after establishment of '*Water and Power Development Authority (WAPDA)*' in 1959. The then Office of Chief Engineering Adviser (O/o CEA) was mandated to mainly deal with the issues related to water, irrigation & power sector. Subsequently, two wings i.e. Civil Engineering Wing and Power Engineering Wing were established in O/o CEA. Later in 1977, Federal Flood Commission (FFC) was established for the purpose of Integrated Flood Management (IFM) at National level and it was decided that O/o CEA will be the Secretariat of FFC. Hence, the organization was renamed as the office of Chief Engineering Adviser/ Chairman Federal Flood Commission (O/o CEA/CFFC).

In 1981, Dam Safety Council (DSC) was also added to the O/o CEA/CFFC to review plans for new dams & barrages and to carry out inspections of existing dams with Dam Safety Organization (DSO) WAPDA. Administration and Accounts Wing of O/o CEA/CFFC provides logistic support to aforementioned four technical wings. By means of being an ex-officio member of IRSA, and having pride to represent Pakistan in International Commission on Large Dams (ICOLD) and in International Commission on Irrigation & Drainage (ICID), the CEA/CFFC has a very strong coordinating role with Pakistan Commissioner for Indus Waters. O/o CEA & CFFC conducted three seminal studies on 'Environmental Flows and Sea-Water Intrusion', known as 'Kotri Barrage Studies'.

**Civil Engineering Wing** mainly deals with the matters pertaining to water sector and allied engineering issues at national level. The Wing has played a pivotal role in the formulation and approval of country's first ever National Water Policy (NWP) approved from the Council of Common Interests (CCI) in 2018 besides signing of a landmark Pakistan Water Charter. DSC also acts as Secretariat of Pakistan National Committee on Irrigation and Drainage (PANCID).

**Dams Safety Council (DSC)** deals with annual and periodic inspection/monitoring of dam projects to ensure safety of dams. The Council reviews new projects (PC-Is, PC-IIs, Feasibility Studies and related documents) and renders technical input pertaining to various dam projects and allied engineering issues at national level. DSC also acts as Secretariat of Pakistan National Committee on Large Dams (PANCOLD).

**Federal Flood Commission (FFC)** is a multi-stakeholder platform. It brings together all relevant organizations from federal and provincial levels to one forum. It provides a coordination mechanism that would otherwise be absent in water sector policymaking and project implementation. Its members include CEA; D.G. Pakistan Meteorological Department (PMD); Provincial Irrigation Secretaries; and Representatives from NDMA, IRSA, NHA, Pakistan Railway, Infrastructure Division of Planning Commission, and member from Pakistan Commission for Indus Waters.

Since its creation, FFC has successfully served at national level in execution of various flood protection sector projects on-ground, based on river-reach wise feasibility studies, flood-related infrastructure damage restoration activities, improving the flood forecasting & warning system and ensured implementation of Standard Operating Procedures (SOPs) for regulation of Tarbela & Mangla reservoirs. FFC has also played a pivotal role in improving the National Flood Forecasting & Warning System,

and River Telemetry. The automated weather data collection equipment and high frequency radio communication systems were procured for PMD& WAPDA under the umbrella of National Flood Protection Plans (NFPPs) of FFC. Similarly, complete mapping of floodplains of all major rivers was conducted by FFC, which gives a dynamic forecasting of various flood-levels in the form of the Flood Warning Manual.

FFC undertook NFPP-IV formulation in the aftermath of devastating floods of 2010. The NFPP-IV was formally approved by the CCI in May 2017 at an estimated cost of Rs 332.246 billion after a rigorous consultative process. NFPP-IV then envisages reclamation of land 154,176 hectares, erosion protection of 779,250 hectares of land and protection of 2,479,555 hectares of land from inundation. For the total Plan's cost of Pak. Rs 332.246 billion, an Umbrella PC-I was also prepared and processed for approval, however, it could not be approved/ implemented for want of funds. In view of devastating floods faced by the country during 2022, the Prime Minister of Pakistan on 29<sup>th</sup> August 2022 directed PD&SI Division that "Flood Protection Plan 2017" to be updated and protection measures against flash floods and hill torrents to be included in the Plan". In compliance to the Prime Minister's directive, original NFPP-IV (2017 version) has been updated based on consultative process led through FFC with active participation of all relevant stakeholders at the Federal and Provincial level. FFC managed this task as per the PD&SI Division's requirements and as per its mandate. The final draft NFPP-IV Updated is in its final approval process enroute Ministry of Water Resources and PD&SI Division.

The priority requirements of the Provinces and respective FLAs under NFPP-IV Updated, have been included in the Umbrella PC-I of FPSP-III, updated in the light of CDWP's directions issued in its meeting held on 14<sup>th</sup> September 2022. Accordingly, ECNEC in its meeting held on 27<sup>th</sup> June 2023 approved Umbrella PC-I of FPSP-III Updated at the estimated cost of Rs. 194,625 million. The financing plan approved by the ECNEC is (i) GOP Equity = 20% federal components & 10% provincial components (ii) Donor Financing = 80% & (iii) Provinces to share 10% cost for their interventions. Given the preceding, Annual Work Plan (2023-24) was prepared, finalized and submitted to MoWR in September 2023; it included 38 No. priority sub-projects of FPSP-III for implementation. Out of 14 Individual PC-Is/ PC-IIs received so far in FFC, 05 sub-projects have been cleared by FFC's Scrutinizing Committee and submitted to MoWR for further processing for final approval. PC-I for Establishment of PCMU for FPSP-III has also been submitted to MoWR. Nevertheless, donor funding required to kick start FPSP-III is yet to be materialized by EAD as 80% funds are to be arranged through foreign donors as per ECNEC's decision.

**Power Wing** of Office of CEA/CFFC was established in fifties and is discharging the functions related to evaluation of power sector project/schemes prepared by WAPDA, NTDC, GENCOs, DISCOs, PPB & AEDB and render expert technical advice to Ministry of Energy on Hydel, Thermal & non-conventional sources of energy (like; solar, wind, biomass etc.) besides on projects of transmission lines & grid stations, power distribution, rural electrification. Power Wing also deals with relevant assignment including investigation/ inquiries related to WAPDA's hydro-power project as well as transmission and distribution schemes and other technical matters as and when referred.

**Administration & Accounts Wing** deals with the matters like general services management, annual budgeting of office and development projects, utilization, control and audit. It coordinates matters related to trainings (in-country & abroad) of officers/officials, maintenance of project accounts, internal inspection of accounts,



financial monitoring of development projects, and similarly matters relating to Departmental Accounts Committee / Public Accounts Committee w.r.t appropriation accounts and audit reports.

### Monsoon Season 2023

PMD predicted '**Normal Monsoon Rainfall**' from July to September 2023 in Pakistan. Upper Punjab, Khyber Pakhtunkhwa and Azad Jammu & Kashmir were expected to receive 'Slightly Above-Normal' rainfall but within 5% departure from the 'Normal'. Sindh and south-western parts of Balochistan were expected to receive 'Normal' to 'Slightly Below Normal' rainfall during the season. Nevertheless, in July 2023, '**70% Above Normal**' rains were observed in the country, whereas in August & September, rainfall recorded was "**below Normal**".

Monsoon 2023 had penetrated more towards Southern parts of the country due to change in atmospheric conditions. As a result, Southern parts received more rains, contrary to the upper parts. PMD's Forecast regarding Exceptionally High Flood in Sutlej River was issued on **18<sup>th</sup> August 2023**. Subsequently, High to Exceptionally High Flood Situation was observed in River Sutlej during the Monsoon 2023.

Due to cumulative outflows from India's Pong Dam (which controls River Beas) and Bhakra Dam (which controls River Sutlej), **River Sutlej** attained **Exceptionally High Flood** at Ganda Singh Wala with peak discharge of **278,297 cusecs** on **19<sup>th</sup> August 2023** and **Very High Flood at Sulemanki** with corresponding discharge of 191,053 cusecs on 22<sup>nd</sup> August 2023, causing inundation in nearby villages. High flood reportedly damaged standing crops and houses on both sides of River Sutlej in Kasur district besides damaging the flood protection structures/ embankments, settlements, etc. It also reached **High Flood at Islam** with **151,904 cusecs** flows on **25<sup>th</sup> August 2023**.

**River Chenab** also attained **High Flood** at **Khanki** on **20<sup>th</sup> July 2023** reaching a peak discharge of **204,041 cusecs**. The Flood situation in other main rivers (i.e. **Indus, Kabul & Ravi**) remained in **Low to Medium Range**. Normal Flows were observed in **River Jhelum** during the Monsoon Season 2023.

**Tarbela Dam** attained its Maximum Conservation Level (MCL) of 1550 feet on 11<sup>th</sup> August and 17<sup>th</sup> August 2023. After some respite, it again retained its MCL from 28<sup>th</sup> August to 8<sup>th</sup> September 2023 (i.e. Tarbela remained in its MCL stage for 14 days during Monsoon 2023). **Mangla Dam** remained at its full conservation level of 1242.00 feet for five (05) days i.e. from 17<sup>th</sup> August to 21<sup>st</sup> August 2023.

### Recommendations for better Flood Preparedness in Future

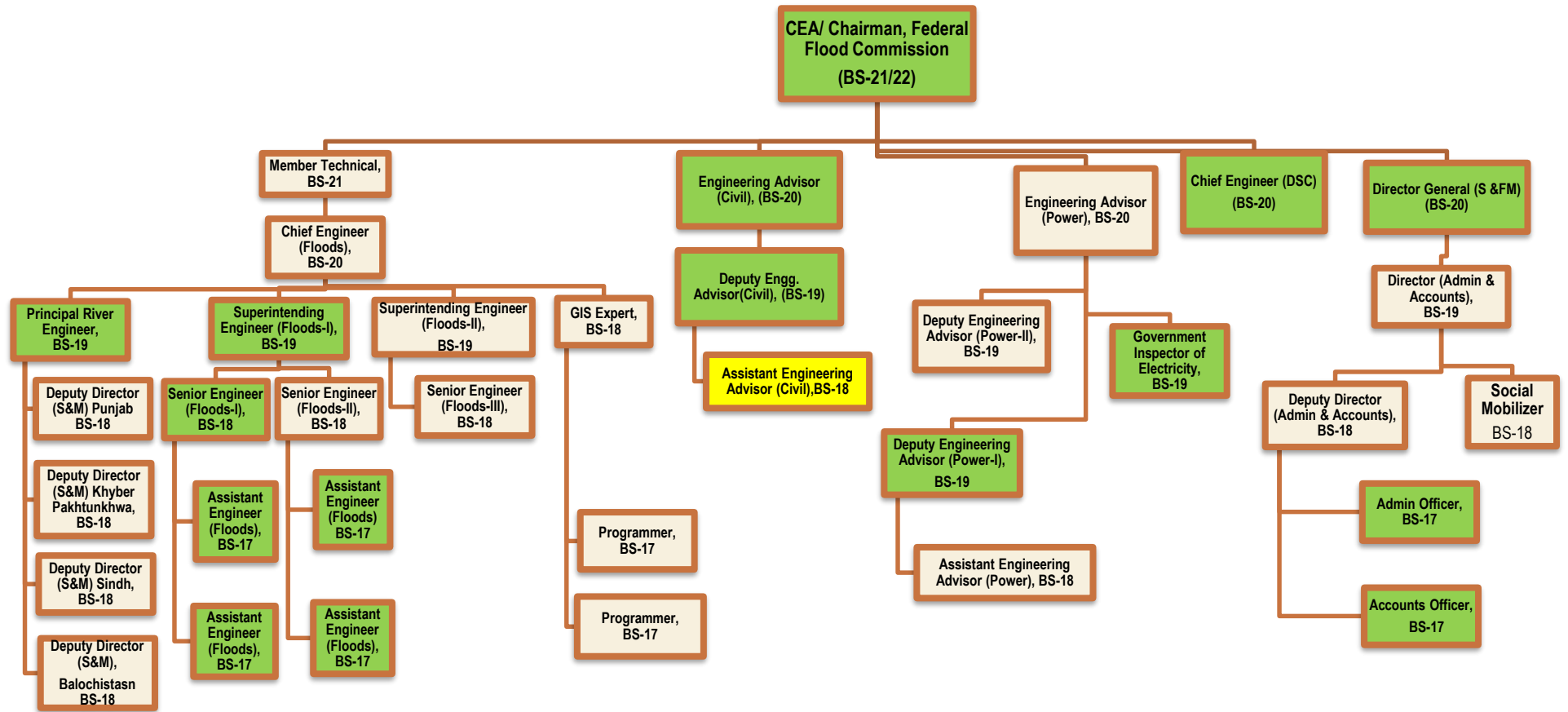
Provincial Irrigation Departments and Federal Line Agencies (PIDs & FLAs) need to promptly engage in crucial rehabilitation and maintenance tasks for flood protection infrastructure, including civil works. Clearing encroachments in flood plains and waterways is essential for PIDs & FLAs to reduce the risk of loss of life and property damage in future floods occurrences. In this respect, PIDs & FLAs are also required to ensure early approval of River Act from their respective Cabinets and subsequently promulgate the same on urgent basis.

Flood Forecasting & Warning System needs improvement by installing new Radars and upgrading Flood Telemetry Network. These endeavors need to be completed well before the onset of the 2024 Monsoon Season to ensure comprehensive flood

preparedness. The office of Pakistan Commissioner for Indus Waters (PCIW) should also endeavor to ensure establishing alternative arrangements for acquiring reservoir and river flow data for the Chenab and Eastern Rivers (Rivers Ravi, Beas & Sutlej) in case the Indian Commissioner for Indus Waters (ICIW) declines to provide the flood flow data of transboundary rivers during the Monsoon Season.

In addition to conducting regular mock exercises with an emphasis on raising awareness of the communities living in flood-prone areas, PDMAs/SDMA/GBDMA to make sure that the required provisions regarding flood relief items are made for the successful management of riverine and non-riverine/urban flooding (dewatering equipment, flood-reliant products etc.). Punjab Government and RUDA along with other stakeholders should chalk out a well thought-out contingency plan/ solution regarding the long outstanding issue of non-functionality of Shahdara Bridge Breaching Section. Likewise, concerning absence of Barakas Nullah role as Emergency Spillway of Mangla dam, WAPDA (Mangla Dam Organization) to prepare and implement in case of flood emergency, the Contingency Plan required for 'Most Critical' nature of flood management at Mangla Dam.

## ORGANOGRAM -OFFICE OF THE CEA/CFFC



Filled

Vacant

On deputation in MoWR

## ABBREVIATIONS

ADB	Asian Development Bank
AJ&K	Azad Jammu & Kashmir
Cusec	Cubic Feet per Second
DEM	Digital Elevation Model
DMPs	Drought Management Plans
FFC	Federal Flood Commission
FLAs	Federal Line Agencies
GFAS	Global Flood Analysis System
GIS	Geographic Information System
GPS	Geographical Positioning System
GB	Gilgit Baltistan
HEC-RAS	Hydrological Engineering Center-River Analysis System
IRSA	Indus River System Authority
IT	Information Technology
IFAS	Integrated Flood Analysis System
JICA	Japan International Cooperation Agency
KP	Khyber Pakhtunkhwa
Km	Kilometer
Km <sup>2</sup>	Square Kilometer
MoWR	Ministry of Water Resources
mm	Millimeter
NESPAK	National Engineering Services of Pakistan
NDMA	National Disaster Management Authority
NWC	National Water Council
NWP	National Water Policy
O/o CEA/CFFC	Office of Chief Engineering Adviser/ Chairman Federal Flood Commission
O&M	Operation and Maintenance
PCC	Plain Cement Concrete
PDMA	Provincial Disaster Management Authorities
PIDs	Provincial Irrigation Departments
PMD	Pakistan Meteorological Department
PMU	Project Management Unit
PARC	Pakistan Agricultural Research Council
PCIW	Pakistan Commissioner for Indus Waters
PWD	Public Works Department
RDA	Rawalpindi Development Authority
SCARP	Salinity Control and Reclamation Programme
WAPDA	Water and Power Development Authority
WASA	Water and Sanitation Agency
US\$	United States Dollar

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# CIVIL ENGINEERING WING

# 1. CIVIL ENGINEERING WING

## 1. History, Organogram & Functions of Civil Engineering Wing

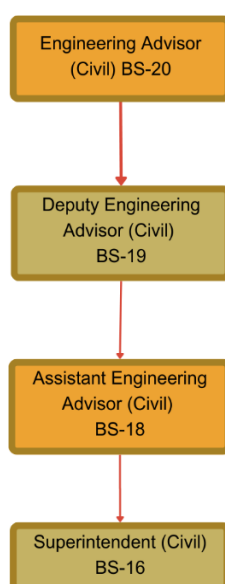
### Historic Perspective

With the objective of performing advisory role in various sectors of development at Federal Level, a Central Engineering Authority was established after creation of Pakistan in August 1947. After the establishment of WAPDA in 1959, Government of Pakistan decided to substitute the existing authority with a compact engineering organization to be known as “Office of Chief Engineering Advisor”. The then Professional Engineers and technical staff of office of the Chief Engineering Advisor laid the foundation of Civil Engineering Wing. It is now one of the oldest and most important technical organs of office of the CEA/CFEC.

### Organogram

**Figure 1.1** shows the organogram of the Civil Engineering Wing. The Wing is headed by Engineering Advisor (Civil). Engineering Advisor (Civil) is assisted by a Deputy Engineering Advisor (Civil) and Assistant Engineering Advisor (Civil). The professional team is assisted by Civil Engineering Branch with a Superintendent in-charge.

**Figure 1.1: Organogram of the Civil Engineering Wing**



### Main Functions

The Civil Engineering Wing mainly deals with the matters pertaining to water, hydropower and allied engineering issues at national level. The prime function of the Civil Engineering Wing is to assist CEA/CFEC in performing his lead role as Head of the Organization. The main functions of the Civil Engineering Wing are enlisted below:

- i. Technical scrutiny & evaluation of Water Sector Projects relating to Canals, Irrigation System Rehabilitation, Irrigation Efficiency, new Irrigation

Technologies, Salinity Control and Reclamation Project (SCARP), Drainage etc., all related PC-Is, PC-IIs, Feasibility Studies, and other studies/reports prepared by WAPDA, Provincial Irrigation Departments and other agencies/Consultants/ Stakeholders;

- ii. Render expert comments at the advice of Ministry of Water Resources and Office of Pakistan Commissioner for Indus Water (PCIW) on International Water Issues, Project/ Programme etc. being planned/ built in the neighboring country/countries and having impacts on Pakistan's river system/flows;
- iii. Render expert comments on national & international water sharing disputes when referred to by the respective agencies like IRSA, WAPDA and Ministry of Water Resources etc.;
- iv. Deal with all matters relating to IRSA including Advisory Committee meetings, Telemetry System etc.
- v. Inter-departmental and inter provincial coordination for implementation of NWP guidelines;
- vi. Any additional duty including National Assembly and Senate Business.
- vii. Pakistan is a member of the International Commission on Irrigation & Drainage (ICID) since 1953. The Civil Engineering Wing of O/o CEA/CFFC acts as the Secretariat of Pakistan National Committee on Irrigation & Drainage (PANCID). The PANCID represents Pakistan at the ICID. PANCID shares technical data relating to irrigation, drainage advancement projects etc. including general liaison with all concerned national and international organizations in particular with ICID.

## 2. Activities Performed During 2023

During the calendar Year 2023, Civil Engineering Wing of O/o the CEA/CFFC performed following functions related to its charter of duties given in the preceding segment;

### Technical Scrutiny of PC-Is/PC-IIs of Water Sector Projects

The following project proposals (PC-Is/PC-IIs) were examined and technical views/comments were forwarded to Ministry of Water Resources (MoWR):

**Table 1.1: PC-Is & PC-IIs of Water Sector Projects**

Sr. #	Name of Project	Date of submission of Technical Inputs
i.	1 <sup>st</sup> Revised PC-I for Remedial Measures to Control Water Logging due to Muzaffargarh & T.P Link Canals Project	January 03, 2023 February 03, 2023 (Further comments)
ii.	Turning Wastewater into a Green Opportunity through Wastewater Treatment Strategies	January 05, 2023
iii.	Kachhi Canal Project (Phase-II) RD 1322+000 to RD 1512+000 amounting to Rs. 70,811 Million	January 16, 2023
iv.	Preparation of Feasibility Study, Detailed Engineering Design, Tender Documents and PC-I of K-V Project Estimated Cost Rs. 261.934 Million	January 16, 2023

Sr. #	Name of Project	Date of submission of Technical Inputs
v.	Project Readiness Financing (PRF) from ADB for Patan Hydropower Project	March 02, 2023
vi.	Construction of 06 Nos Tarries Shah Ji Tarrie, Mithro Charan, Tajia Bha, Rohar Charan, Rani Jo Dani, Karangari, Tarries in Taluka Chacharo of District Tharparkar	March 03, 2023
vii.	PC-I for Kachhi Canal Project (Phase-II) RD 1322+000 to 1512+000, Costing Rs. 70,811 Million	March 03, 2023
viii.	Construction of 05 Nos Tarries Borli, Bhavi Jo Tar, Lunia, Wadam, Katan, Tarries in Taluka Islamkot of District Tharparkar	March 03, 2023
ix.	Construction of 05 Nos Tarries Gojihar, Pabuhar, Beevato, Khurbi, Pughar Tarries in Taluka Mithi of District Tharparkar	March 03, 2023
x.	Construction of 06 Nos Tarries Bupraro, Vehar, Kural, Sobharo, Churial, and Haji Uris Rahimoo Tarries in Taluka Diplo/ Dhali of District Tharparkar	March 03, 2023
xi.	Summary for Council of Common Interests regarding Construction of Jalapur Irrigation Canal	March 10, 2023
xii.	Research Studies on Quantification of Unaccounted Surface Water and Soil Salinity Survey of Indus Basin Irrigation System (July-2023 to June-2027)	March 15, 2023 March 27, 2023 (Further Comments)
xiii.	Sindh Coastal Resilience Project (Estimated Cost US\$ 263 Million)	March 15, 2023
xiv.	Revised PC-I of Sindh Barrage Improvement Project, Phase-II (Rehabilitation and Modernization of Sukkur Barrage and remaining works for Rehabilitation and modernization of Guddu Barrage	March 27, 2023 April 13, 2023 and May 08, 2023 (Further Comments)
xv.	Kachhi Canal Project: Planning Study Report (Draft) for Hill Torrents Management Works Consolidated for Phase-I & II RD 1005 to RD 1512	April 06, 2023
xvi.	PC-I of Kachhi Canal Project (Remaining Works of Phase-I)	May 15, 2023, June 20, 2023, August 07, 2023 & October 23, 2023 (Further Comments)
xvii.	Pakistan Inland Water Ways Transport Study on Implementable Vision for Revival and Development	May 24, 2023
xviii.	Inception Report (Final) in respect of Preparation of Feasibility Study, Detailed Engineering Design, Tender Documents and PC-I of Jacobabad, Shikarpur and Kashmore Drainage Project	June 08, 2023
xix.	Inception Report (Final) in respect of Preparation of Feasibility Study for construction of drainage network	June 09, 2023

Sr. #	Name of Project	Date of submission of Technical Inputs
	in Taluka Ubauro, Daharki, Khangarh, Mirpur Mathelo of District Ghotki Sindh	
xx.	PC-I for Restoration of Flood-2022 Damages of RBOD-I & RBOD-III Project	June 21, 2023
xxi.	Conduction of water from Indus River System at Tarbela Dam to the cities of Islamabad and Rawalpindi including R.C.B & C.C.B (Phase-I) Rs. 91,914.43 Million	August 01, 2023
xxii.	Final inception report by M/s NESPAK- Indus basin irrigation system: Automation of 07 Key Sites for Discharge Monitoring Project	October 27, 2023
xxiii.	Tender Documents and PC-I of K-V Project	November 02, 2023

### **National Water sharing issues dealt/Expert Advices Rendered & Issues of NWP**

Ministry of Water Resources sought the professional support of O/o CEA/CFFC on different issues. Accordingly feedback was provided by the Civil Engineering Wing to M/o Water Resources on the following matters;

- i. Annotated response was shared with Ministry of Water Resources on January 02, 2023 regarding *“National Security Policy Implementation Process”*.
- ii. On the request of Ministry of Water Resources requisite briefs were submitted on January 09, 2023 regarding *“Parliamentary Hearing at the United Nations on Water for People and Planet: Stop the Waste, Change the Game, Invest in the Future 13<sup>th</sup> & 14<sup>th</sup> February 2023, New York”*.
- iii. Follow up letter was issued to Provincial Irrigation Departments of Punjab, Khyber Pakhtunkhwa, Balochistan and Govt. of Gilgit-Baltistan on January 13, 2023 to furnish requisite brief on *“Implementation of National Water Policy: Follow up on Development of Regulatory Framework”*.
- iv. U.O note was sent to Secretary, Ministry of Water Resources on January 17, 2023 regarding *“Minutes of the 8<sup>th</sup> Project Steering Committee (PSC) Meeting of Scaling up of Glacial Lake Outburst Flood GLOF-II Risk Reduction Project”*.
- v. U.O note was shared with Secretary, Ministry of Water Resources on January 31, 2023 containing views/comments on the Annual Work Plan 2023-2024 of GLOF-II Project.
- vi. After obtaining approval of Secretary, Ministry of Water Resources views/comments on Annual Work Plan 2023-2024 of GLOF-II Project were shared with Additional Secretary, Ministry of Climate Change on February 01, 2023.
- vii. Follow up letter was issued to Provincial Irrigation Departments of Khyber Pakhtunkhwa, Balochistan, Govt. of Gilgit-Baltistan and Small Dams Organization, Rawal Dam Colony on March 01, 2023 to furnish requisite brief on *“Implementation of National Water Policy: Follow up on Development of Regulatory Framework”*.

- viii. Views/comments on “*Interim Report on Stocktaking Assignment for NWP 2018 Implementation*” were shared with PCRWR on March 02, 2023.
- ix. Comments on “*Revised Draft National Water Conservation Strategy*” were shared with PCRWR on March 02, 2023.
- x. Post meeting report of “*Pre-CDEP-CCC Meeting on Sindh Costal Resilience Project (Estimated Cost US\$ 263 Million)*” was shared with Ministry of Water Resources through U.O Note on April 06, 2023.
- xi. Information on “*Minimum Operating Level (MOL) of Tarbela Dam Reservoir*” was shared with Ministry of Water Resources on April 07, 2023.
- xii. Chief Commissioner, ICT & Provincial Irrigation Departments of Sindh, Khyber Pakhtunkhwa, Balochistan and Govt. of Gilgit-Baltistan were asked on April 19, 2023 to furnish updated details on “*Projects of Rainwater Harvesting*” initiated/completed by the province in pursuance of National Water Policy-2018.
- xiii. Views on “*Proposed Membership of Pakistan to Asia Water Council*” were shared with Ministry of Water Resources on May 29, 2023.
- xiv. U.O note was sent to Ministry of Water Resources on June 08, 2023 regarding “*Committee constituted by the Honourable Federal Minister for Water Resources on Joint Discharge Measurement by PCRWR, Downstream Taunsa, Chachran, Upstream Guddu and RD: 109 of Pat Feeder Canal*”.
- xv. Recommendations on “*Implementation of Recommendations of the Committee Constituted by the Honourable Federal Minister for Water Resources for Joint Discharge Measurement of River Indus Flow at Downstream Taunsa, Chachran, Upstream Guddu and RD: 109 of Pat Feeder Canal*” were shared with IRSA on July 06, 2023.
- xvi. Notice of “*Presentation on NWP-IF and NWC Strategy*” was issued to PCRWR and other concerned on July 14, 2023.
- xvii. Comments on “*Pakistan’s National Drought Plan*” prepared by MoCC were shared with Ministry of Water Resources on August 02, 2023.
- xviii. Views/comments on Grand National Dialogue (GND) report on “*Water Situation in Pakistan*” were shared with Ministry of Water Resources on September 06, 2023.
- xix. Updated status of “*Implementation of National Water Policy*” was obtained from all concerned on September 25, 2023.
- xx. Details regarding “*Implementation of National Water Policy*” were shared with Ministry of Water Resources on September 28, 2023.
- xxi. Matter was taken up with all concerned organizations on October 03, 2023 to share updated status of “*Implementation of National Water Policy 2018*”.
- xxii. Matter was taken up with PID Punjab on October 03, 2023 for the details of projects being carried out regarding “*Implementation of National Water Policy 2018*”.
- xxiii. Information regarding “*World Historic and Cultural Canal Cities Cooperation Organization (WCCO)*” was shared with Ministry of Water Resources on October 25, 2023.
- xxiv. Notice of 3<sup>rd</sup> Meeting of National Water Policy Steering Committee (NWP-SC) was issued on October 30, 2023.



- xxv. Agenda of “3<sup>rd</sup> Meeting of National Water Policy Steering Committee (NWP-SC)” was issued on November 02, 2023 to all members of NWP-SC.
- xxvi. Draft Working Paper for “3<sup>rd</sup> Meeting of National Water Policy Steering Committee (NWP-SC)” was shared with Ministry of Water Resources on November 02, 2023 for its approval.
- xxvii. Views/comment on “Draft Water Sector Investment Plan for EAD” were shared with Ministry of Water Resources on November 07, 2023.
- xxviii. U.O Note was issued to Ministry of Water Resources on November 15, 2023 to share “Draft Minutes of 3<sup>rd</sup> Meeting of National Water Policy Steering Committee (NWP-SC) on November 06, 2023” for approval of Honourable Federal Minister for Water Resources.
- xxix. Minutes of “3<sup>rd</sup> Meeting of National Water Policy Steering Committee (NWP-SC) held on November 06, 2023” were shared with all concerned organizations on December 13, 2023.
- xxx. Comments were offered to Ministry of Economic Affairs on December 18, 2023 regarding “Consultations on UK’s White Paper on International Development”.
- xxxi. In response to decision at Agenda Item# 04 of 3<sup>rd</sup> meeting of NWP-SC (Selection of Five (05) Private Members for NWC), CVs of individuals were shared with MoWR on December 20, 2023.

### Research, Development and Policy Implementation (RDPI) Cell of MoWR

Ministry of Water Resources issued Notification of RDPI Cell of MoWR under supervision of Chief RDPI Cell. The Heads of attached departments under administrative control of MoWR on rotational basis for period of three (03) years or as may be appointed by Secretary MoWR were to be appointed as Chief RDPI Cell. CEA/CFFC was appointed as first Chief RDPI Cell for period of two (02) years. Civil Engineering Wing supports CEA/CFFC in issues of RDPI Cell. Accordingly feedback was provided by the Civil Engineering Wing to M/o Water Resources on the following matters;

- i. Proposals of following projects for Implementation under Plan 2022-23 were shared with Ministry of Water Resources on April 13, 2023:
  - a. Hydrographic Survey of Simly Dam Project
  - b. Hydrographic Survey of Rawal Dam Project
  - c. Hydrographic Survey of Hub Dam Project
- ii. Revised Concept Proposals of following projects for Implementation under Plan 2022-23 were shared with Ministry of Water Resources on April 28, 2023:
  - a. Real Time Groundwater Monitoring and Advisory System for Chaj Doab
  - b. Environmental Flow Assessment of Critical Sites at River Ravi in Pakistan
  - c. Impact Assessment of Indus Water Treaty on Command Areas of Eastern Rivers
  - d. Surface and Groundwater Resources Assessment-Implementation of Water-Conservation for Shah Allah Ditta UC-49 Islamabad

- iii. Comments on Revised Proposal "*Installation of new and rehabilitation of Clogged Piezometers in Indus Basin Irrigation System (IBIS) by SMO for Implementation under plan 2022-23 of Research, Development and Policy Implementation Cell (RDPI)*" were shared on May 08, 2023.
- iv. Comments on Concept Proposal titled "*Pakistan National Water Internship Program for Graduate and Post Graduate students*" were shared with PCRWR on May 28, 2023.
- v. Office order was issued to all concerned regarding "*Advertisement for the Consultancy Assignment of the Research, Development Policy Initiative (RDPI) Cell, Ministry of Water Resources*" on May 31, 2023.
- vi. Office order was issued to all concerned regarding "*Selection Committee for recommendation/approval of appointment of the Consultants for the Research, Development Policy Initiative (RDPI) Cell, Ministry of Water Resources*" on May 31, 2023.
- vii. Notification for Scrutinizing Committee and Selection Committee were issued on June 01, 2023.
- viii. Office order was issued to all concerned on June 02, 2023 regarding "*Procurement Evaluation Committee (Technical/Financial Evaluation) for opening and Technical-cum-Financial Evaluation of the bids received against the Tender Notices published in connection with Research, Development & Policy Initiative (RDPI) Programmes*".
- ix. "*1<sup>st</sup> Progress Report of Programs/Projects being carried out under RDPI Cell of MoWR*" was prepared and shared with Ministry of Water Resources on June 06, 2023.
- x. Pre-bid meeting for "*Civil Works/ Upgradation Works of Flood Communication Cell (FFC)*" was held on June 12, 2023.
- xi. Minutes of Pre-bid meeting for "*Civil Works/ Upgradation Works of Flood Communication Cell (FFC)*" were published on FFC website on June 13, 2023.
- xii. Notice of "*Bid Opening-civil Works/ Upgradation Works of Flood Communication Cell (FFC)*" was issued to all concerned on June 14, 2023.
- xiii. Bid opening for Civil/ Upgradation works was held on June 15, 2023 in the presence of Procurement Evaluation Committee members and representatives of bidders.
- xiv. Pre-Bid meeting for reviewing the Financial Bids was held on June 15, 2023.
- xv. Minutes of the Pre-Bid meeting uploaded on FFC Website and also shared through E-mail with all the bidders of June 16, 2023.
- xvi. Technical Bid opened on June 20, 2023 and approval of PAO was also obtained on June 20, 2023.
- xvii. Notice of "*Financial Bid Opening-Procurement of Consultancy Services for Provision/Supply & Installation of necessary IT Equipment and Training on Flood Modeling*" was issued to all concerned on June 27, 2023.
- xviii. Financial Bid was opened on June 27, 2023.
- xix. Office order was issued to all concerned on July 04, 2023 regarding Constitution of Committee for "*Technical and Financial Evaluation of the bids*" for Revamping of Flood Communication Cell of FFC.

- xx. PCRWR was requested on July 17, 2023 to share the progress on “*Details of PCRWR Research Studies for FY 2022-23 and Submission of new Proposal for FY 2023-24 under RDPI Cell*”.
- xxi. Notice of “*Presentation on the projects approved by RDPI Cell*” scheduled for July 19, 2023 was issued to PCRWR and other concerned on July 18, 2023.
- xxii. Notice of “*Presentation on the projects approved by RDPI Cell*” scheduled for July 27, 2023 was issued to all concerned on July 26, 2023.
- xxiii. Notice of “*4<sup>th</sup> Steering Committee Meeting of Research, Development and Policy Implementation Cell (RDPI) of MoWR scheduled for August 15, 2023*” was issued to all concerned on August 10, 2023.
- xxiv. Minutes of “*Progress Review Meeting of the projects approved by RDPI Cell*” were shared with all concerned on August 15, 2023.
- xxv. Minutes of “*4<sup>th</sup> Steering Committee Meeting of Research, Development and Policy Implementation Cell (RDPI) of MoWR held on August 15, 2023*” were shared with all concerned on August 18, 2023.
- xxvi. Notification of Dr. Naheed Rajper, UNICEF was issued to all concerned on August 18, 2023 through Ministry of Water Resources.

### **Bilateral International Collaborations Dealt during 2023**

Following cases relating to bilateral international collaboration and MoU's were dealt during 2023:

#### **a. Sino Pakistan Smart Water Management Project (SPSWMP)**

Concept Clearance Paper of SINO Pakistan Smart Water Management Project was shared with EAD who forwarded the same to Chinese Consultants for their views. Chinese Consultants shared a questionnaire regarding the project. After obtaining necessary input from WAPDA, PCRWR and PMD, filled in questionnaire was shared with EAD. Meetings regarding the project were held on August 18, 2023, August 21, 2023, October 19, 2023, October 26, 2023. Letter was issued to EAD on 24<sup>th</sup> November to share minutes of last meeting.

#### **b. MoU between Ministry of Water Resources and IHE Delft Institute for Water Education Delft the Netherlands**

- i. IHE, Delft was requested on February 03, 2023 for “*Meeting with Pakistani Delegation from the Ministry of Water Resources and IHE Delft Institute for Water Education Delft the Netherlands*”.
- ii. IHE, Delft was requested on April 13, 2023 for sharing final version of “*MoU between IHE Delft, Netherlands and Ministry of Water Resources, Government of Pakistan*”.
- iii. Ministry of Water Resources was asked on May 22, 2023 to share “*Memorandum of understanding between IHE Delft Institute for Water Education Delft, the Netherlands and Ministry of Water Resources, Government of Pakistan*”.
- iv. Updated “*Memorandum of Understanding (MoU) between IHE Delft Institute for Water Education Delft, The Netherlands and Ministry of Water Resources, Government of Pakistan*” was shared with IHE, Delft on July 20, 2023 for obtaining consent of IHE Delft.

- v. Final version of MoU, after correction/additions suggested by M/o Law & Justice and M/o Foreign Affairs regarding "*Memorandum of Understanding (MoU) between IHE Delft Institute for Water Education Delft, The Netherlands and Ministry of Water Resources, Government of Pakistan*" was shared with the, Delft on August 09, 2023 for obtaining consent of IHE Delft.
- vi. Ministry of Water Resources was asked on August 24, 2023 for taking further necessary action regarding "*MoU between Ministry of Water Resources and IHE Delft Institute for Water Education Delft, The Netherlands*".

#### **c. Memorandum of Understanding (MoU) between MoWR and IUCN**

- i. U.O note was sent to Ministry of Water Resources on February 14, 2023 to share date and time convenient to the Secretary for signing of "*Revised Memorandum of Understanding (MoU) between MoWR and IUCN*".
- ii. Country Representative, IUCN, Pakistan was asked on February 17, 2023 to incorporate changes in "*Revised Memorandum of Understanding (MoU) between MoWR and IUCN*".
- iii. On April 07, 2023 Country Representative, IUCN, Pakistan was requested to furnish views/comments before signing of "*Memorandum of Understanding (MoU) between MoWR and IUCN*".
- iv. Ministry of Water Resources was asked on April 20, 2023 to share "*Final MoU between Ministry of Water Resources and IUCN Pakistan*".
- v. Ministry of Water Resources was asked on June 19, 2023 to share status of "*MoU between Ministry of Water Resources and IUCN Pakistan*".
- vi. Modified "*Memorandum of Understanding (MoU) between Ministry of Water Resources and International Union of Conservation of Nature and Natural Resources*" after incorporating comments of MoFA was shared with Ministry of Water Resources on September 14, 2023.

#### **d. Memorandum of Understanding (MoU) between MoWR and Water Aid Pakistan**

- i. Minutes of "*Meeting of Secretary Ministry of Water Resources with Country Director Water Aid Pakistan*" were shared with Country Director, Water Aid-Pakistan on February 27, 2023.
- ii. Country Director, Water Aid-Pakistan was requested on April 06, 2023 to provide draft MoU between MoWR and WAP for future collaboration.
- iii. Ministry of Water Resources was asked on May 15, 2023 to share "*MoU between Ministry of Water Resources and Water Aid Pakistan*".
- iv. Notice of meeting on "*MoU between Ministry of Water Resources and Water Aid Pakistan*" scheduled for June 13, 2023 was issued to all concerned on June 12, 2023.
- v. Country Director, Water Aid Pakistan was requested on June 15, 2023 to make the changes in draft "*MoU between Ministry of Water Resources & Water Aid Pakistan*".



- vi. *“Memorandum of Understanding between Ministry of Water Resources, Government of Pakistan and Water Aid Pakistan”* was shared with Ministry of Water Resources on July 13, 2023 for its signing.

#### e. Miscellaneous Cases

- i. Requisite information was shared with Ministry of Water Resources on February 01, 2023 regarding *“Bilateral Political Consultation with the European Countries”*.
- ii. Modification in the Joint Statement to be presented by Iraqi Government in *“UN 2023 Water Conference scheduled from 22-24 March 2023 in New York”* was issued to Ministry of Water Resources on February 23, 2023.
- iii. Information regarding *“The 5<sup>th</sup> Asia Assembly of Water Council (AAWC) Board Meeting form 23-24 May 2023”* was shared with Ministry of Water Resources on May 05, 2023.
- iv. UNICEF-Pakistan was asked on May 18, 2023 to share *“Government of Pakistan and UNICEF Programme of Cooperation (Wash, Climate Change, Environment and DRR Rolling Work Plan January 2023-December 2024)”*.
- v. Information regarding *“Bilateral Political Consultations between Pakistan and Bosnia & Herzegovina”* was shared with Ministry of Water Resources on May 30, 2023.
- vi. Information regarding *“High Profile Visit to Norway on June 04-05, 2023”* was shared with Ministry of Water Resources on June 01, 2023.
- vii. Comments on *“Memorandum of Understanding (MoU) between the Government of the Islamic Republic of Pakistan and the Government of Islamic Republic of Iran on Cooperation in the field of Disaster Management”* were shared with NDMA on July 03, 2023.
- viii. Information regarding *“High Profile Visit of Swiss Foreign Minister to Pakistan”* was shared with Ministry of Water Resources on July 04, 2023.
- ix. Requisite information regarding *“Country Development Cooperation Policy of JAPAN for the Islamic Republic of Pakistan”* was shared with MoWR on August 28, 2023.
- x. Information regarding *“12<sup>th</sup> Round of Bilateral Political Consultations with Norway”* was shared with Ministry of Water Resources on September 08, 2023.
- xi. Views/comments/suggestion on *“Memorandum of Understanding between the National Disaster Management Authority of Pakistan and the University of Hawaii (“UH”) Managing Partner of the Pacific Disaster Centre”* were shared with Ministry of Water Resources on September 08, 2023.
- xii. Views/comments/input on *“Pak-Swiss Action Plan on Collaboration in the Field of Disaster Management”* was shared with Ministry of Water Resources on September 14, 2023.
- xiii. Views/comments on *“Memorandum of Understanding (MoU) between the Government of the Islamic Republic of Pakistan and the Government of Australia on Cooperation in the field of Disaster Management”* were shared with Ministry of Water Resources on November 17, 2023.

- xiv. Views/comments on “*Memorandum of Understanding (MoU) between the Government of the Islamic Republic of Pakistan and the European Union on Cooperation in the field of Disaster Management*” were shared with Ministry of Water Resources on November 17, 2023.
- xv. Views/comments on “*Memorandum of Understanding (MoU) between the Government of the Islamic Republic of Pakistan and the Government of United States of America on Cooperation in the field of Disaster Management*” were shared with Ministry of Water Resources on November 17, 2023.

### **Key Events Attended (Meetings/Seminars/Workshops)**

The important/ high level meetings attended by the Senior Officers of Civil Engineering Wing are given below in **Table-1.2**:

**Table 1.2: Key Events Attended (Meetings/Seminars/Workshops)**

Sr. #	Description/ Meeting/ Workshop Title	Date of Meeting	Attended By
1.	Meeting between Economic Affairs Division and China International Development Corporation Agency	March 10, 2023	EA (Civil)
2.	Special IEC Meeting	March 27, 2023	CEA/CFFC and EA (Civil)
3.	1 <sup>st</sup> Virtual Meeting of Asian Regional Working Group (ASRWG)	April 12, 2023	EA (Civil)
4.	WWF-Pakistan 50 Year Celebrations	May 30, 2023	DEA (Civil)
5.	Flood Damages Restoration of RBODs (MNV) Project.	June 02, 2023	CEA/CFFC, EA(Civil) & CE (Floods)
6.	Inquiry Committee Meeting on Para No. 1.5.2 of Mohmand Dam	July 05, 2023	EA (Civil)
7.	Meeting for Selection of the Consultant (Legal) of Independent Reforms Unit of MoWR.	July 06, 2023	EA (Civil)
8.	Meeting for Selection of the Consultant HR/Policy of Independent Reforms Unit of MoWR	July 07, 2023	EA (Civil)
9.	2 <sup>nd</sup> Virtual Meeting of Asian Regional Working Group (ASRWG)	July 10, 2023	EA (Civil)
10.	Physical verification of documents at Lahore regarding Mohmand Dam Inquiry on Para No. 4.5.2	July 24-26, 2023	EA (Civil)
11.	Portfolio Review Meeting to Discuss Ongoing and Pipeline Projects of UK-FCDO held in EAD	August 02, 2023	DEA (Civil)
12.	Inquiry Committee Meeting on Para No. 1.5.2 of Mohmand Dam	August 01 & 08 2023	EA (Civil)
13.	Public Accounts Committee (PAC) meeting	August 03, 2023	EA (Civil)
14.	Meeting on Pending Grant Projects in EAD	August 09, 2023	EA (Civil)



Sr. #	Description/ Meeting/ Workshop Title	Date of Meeting	Attended By
15.	4 <sup>th</sup> Meeting of Steering Committee of RDPI Cell	August 15, 2023	CEA/CFFC, EA (Civil) & DEA (Civil)
16.	Meeting between Economic Affairs Division and China International Development Cooperation Agency	August 16 & 23 2023.	EA (Civil)
17.	5 <sup>th</sup> Workshop on Flood Management Planning (JICA)	August 28, 2023	EA (Civil)
18.	Presentation on Master Plan of Drainage	August 28, 2023	EA (Civil)
19.	Stakeholder Workshop regarding Launch of National Master Plan on Flood Telemetry and Final Consultation on updated NFPP-IV	August 29, 2023	EA (Civil)
20.	Meeting of Pakistan National Committee on Intergovernmental Hydrological Programme (PNC-IHP) of UNESCO	September 05, 2023	EA (Civil)
21.	Scrutinizing Committee Meeting of FFC	September 18, 2023	EA (Civil)
22.	Full Year Review of PSDP Meeting	September 21, 2023	EA (Civil)
23.	Progress Review Meeting of AIIB Project for USD 500 million	November 08 & 24 2023	EA (Civil)
24.	4 <sup>th</sup> meeting of Disaster Risk Financing Synergy Group (DRF-SG)	November 06, 2023	EA (Civil)
25.	Post Monsoon Meeting of FFC	November 27, 2023	EA (Civil)
26.	Meeting with CDM Smith's Team on ADB's Technical Assistance Project	November 28, 2023	EA (Civil)
27.	4 <sup>th</sup> Meeting of FFC on Drainage Master Plan	November 30, 2023	EA (Civil)
28.	Formulation of National Master Plan on Flood Drainage	5 <sup>th</sup> December 2023	EA (Civil)
29.	Draft Water Sector Investment Plan for EAD	December 07, 2023	EA (Civil)
30.	Scrutinizing Committee meeting of FFC	December 18, 2023	EA (Civil)
31.	3 <sup>rd</sup> Meeting of the Technical Committee on Ministry of Water Resources related SDG indicators	December 18, 2023	EA (Civil)

### Key Events Organized by Civil Engineering Wing

The meetings organized by Civil Engineering Wing during the reporting period are given below in **Table-1.3**:

**Table 1.3: Meetings Organized by Civil Engineering Wing**

Sr. #	Description/ Meeting Title	Date of Meeting
1.	Meeting with Iranian Official from TOOSSAB Company	March 01, 2023

2.	2 <sup>nd</sup> Steering Committee Meeting of Research, Development and Policy Implementation Cell (RPDI) of Ministry of Water Resources	March 14, 2023
3.	Meeting of Water Sector Development Partners	April 14, 2023
4.	Meeting with IWMI Pakistan	April 26, 2023
5.	Zoom Meeting to review IWASRI Proposals to be executed under RDPI Cell of Ministry of Water Resources	May 12, 2023
6.	3 <sup>rd</sup> Steering Committee Meeting of Research, Development and Policy Implementation Cell (RDPI) of Ministry of Water Resources	May 19, 2023
7.	Meeting regarding MoU between Ministry of Water Resources and Water Aid Pakistan	June 12, 2023
8.	Presentation on NWP-IF and NWC Strategy and Presentation on the projects approved by RDPI Cell	July 19, 2023
9.	Presentation on the projects approved by RDPI Cell	July 27, 2023
10.	4 <sup>th</sup> Steering Committee Meeting of Research, Development and Policy Implementation Cell (RDPI) of MoWR	August 15, 2023
11.	52 <sup>nd</sup> Annual Meeting of Pakistan National Committee on Irrigation & Drainage (PANCID)	September 07, 2023
12.	3 <sup>rd</sup> Meeting of National Water Policy Steering Committee (NWP-SC)	November 06, 2023

### **Role as PANCID Secretariat**

Civil Engineering Wing acts as Secretariat of Pakistan National Committee on Irrigation and Drainage (PANCID). The purpose of PANCID is to promote the aims and objectives of International Commission on Irrigation and Drainage (ICID) in Pakistan and act as the liaison body for ICID activities by exchanging technical information with ICID and its member countries on irrigation, drainage and flood control. The PANCID is mandated to organize specialized and regional ICID conferences on matters relating to irrigation, drainage and flood control, either independently or in association with other organizations. The Committee encourages the submission of papers for presentation at ICID congresses, conferences, symposia and workshops. Pakistan joined membership of International Commission on Irrigation and Drainage (ICID) in 1953. ICID Congress meeting is usually held after every three years for discussions on Technical matters and International Executive Council meeting is normally held each year for discussion on the Administrative issues of ICID. Presently, ICID has twenty-three (23) different work bodies (Committees/ Groups) and members from PANCID members represent in seventeen (17) Working Groups. Following actions were taken as PANCID Secretariat:

### **Circulation of ICID Irrigation and Drainage-Journals among PANCID members**

- Irrigation and Drainage-Journal (Volume-71, Number-5 December 2022).
- Irrigation and Drainage-Journals (Volume 72, Number 1, February 2023)
- Irrigation and Drainage-Journal (Volume-72 Number-2 April 2023)
- Irrigation and Drainage-Journals (Volume 72, Number 4, October 2023).

### PANCID Annual meeting

- Notice of “52<sup>nd</sup> Annual Meeting of Pakistan National Committee on Irrigation and Drainage (PANCID)” scheduled for September 07, 2023 was issued on August 30, 2023.
- Minutes of “52<sup>nd</sup> Annual Meeting of Pakistan National Committee on Irrigation and Drainage (PANCID) held on September 07, 2023” were shared on September 20, 2023 for taking action at their end.

### Call of ICID Webinars and meetings among all PANCID members

- 25th ICID Congress & 74th IEC Meeting, scheduled from 1-8 November 2023 in India.
- Webinar on “Tsunami/Tidal Wave Protection in Japanese Case” scheduled for April 19, 2023.
- Webinar on “Utilization of Agriculture Drainage benefits for facing the future challenges and achieving sustainability” scheduled for September 29, 2023.
- Webinar on “Adapting Agriculture to Climate Change: Strategies for Resilience and Sustainability” scheduled for November 22, 2023.

### Communications made with ICID Central Office

- Nomination of Dr. Muhammad Ashraf, Chairman, PCRWR was sent on February 03, 2023 to review the Abstracts of Papers for “*ICID’s International Review Committee of 25<sup>th</sup> ICID Congress, 1-8 November 2023 at Vishakhapatnam, Andhra Pradesh, India*”.
- Updated list of all PANCID members was shared on February 14, 2023 for getting access to ICID Irrigation & Drainage Journal.
- Filled in Review Consent Form in respect of Dr. M. Ashraf, Chairman PCRWR was shared on March 03, 2023 for “*International Review Committee of 25<sup>th</sup> ICID Congress, 1-8 November 2023 at Vishakhapatnam, Andhra Pradesh, India*”.
- After examining “*Draft Minutes of Special IEC Meeting*” views/comments/suggestion were shared on April 06, 2023.
- Details regarding Agriculture Statistics of Pakistan were shared on May 09, 2023.
- Nominations of three officers from PANCID for “*ICID’s Working Group on Land Drainage*” were shared on May 15, 2023.
- Nomination of Engr. Najam Waheed, President, PEC for “*Election of President & Vice Presidents 2023-2026, Vizag, India, 7<sup>th</sup> November 2023*” was shared on June 27, 2023.
- Abstract of Paper titled “*Sub-surface drainage installed under lining of OderoLal Branch (OLB) Canal in Sindh Province of Pakistan*” was shared with Dr. Willem Voltman, Chair of ICID Working Group on Land Drainage on July 10, 2023 regarding “*International workshop on the State of Drainage Worldwide, November 02, 2023, India*”.

- Nomination of Engr. Husnain Ahmed was shared on August 30, 2023 for “*New Nomination for Permanent Finance Committee (PFC) of ICID*”.

### Annual ICID Event

- ICID vide its email dated July 20, 2023 requested all National Committees to get themselves registered for “*25<sup>th</sup> International Congress on Irrigation & Drainage and the 74<sup>th</sup> International Executive Council from 1<sup>st</sup> – 8<sup>th</sup> November 2023 In Vishakhapatnam (Vizag) Andhra Pradesh, India*”.
- All PANCID members were requested on July 25, 2023 to get themselves registered for the said event.
- ICID was asked on August 03, 2023 to share “*Invoice for 25<sup>th</sup> ICID Congress & 74<sup>th</sup> IEC Meeting November 2023, Vizag, India*”, so that registration for the event can be carried out.
- Matter was taken up with Secretary General ICID on October 03, 2023 to share video link of “*25<sup>th</sup> International Congress on Irrigation & Drainage and the 74<sup>th</sup> International Executive Council from 1<sup>st</sup> – 8<sup>th</sup> November 2023 In Vishakhapatnam (Vizag) Andhra Pradesh, India*”, for attending the concerned sessions of the conference online.
- All PANCID members were requested on October 03, 2023 to review the agenda of “*74<sup>th</sup> IEC and Work Body Meetings 1-8 November 2023, (Vizag) Andhra Pradesh, India*” and share any new issue of common concern which needs to be included in the Agenda.
- ICID vide email dated October 05, 2023 intimated that there is no provision for attending the conference online.

### Participation in the activities of Asia Regional Working Group (ASRWG)

- CEA/CFFC represents PANCID in ASRWG of ICID.
- 1<sup>st</sup> Virtual Meeting of Asian Regional Working Group (ASRWG) held on April 12, 2023 was attended by EA (Civil) on behalf of CEA/CFFC.
- 2<sup>nd</sup> Virtual Meeting of Asian Regional Working Group (ASRWG) held on July 10, 2023 was attended by EA (Civil) on behalf of CEA/CFFC.
- “*Technical Report of Asia Regional Working Group (ASRWG) on Irrigation and Drainage for Asia Food Security-Pakistan*” was prepared by PANCID Secretariat and shared with all PANCID members on October 12, 2023 for their input.

### Communications made with PANCID members

- Dr. Usman Khalid Awan, Water Resources Specialist, International Water Management Institute (IWMI) was advised on January 18, 2023 to ensure presence in future meetings of WG-NCWRI.
- All PANCID members were requested on January 20, 2023 for registering themselves for “*International Review Committee of 25<sup>th</sup> ICID Congress, scheduled for 01-08 November, 2023 at Vishakhapatnam, Andhra Pradesh India*”, if interested.
- All PANCID members were requested on January 20, 2023 to share abstracts of papers for “*25<sup>th</sup> ICID Congress, scheduled for 01-08 November, 2023*”.

*Vishakhapatnam, India*". Theme of Congress is Tackling Water Scarcity in Agriculture.

- All PANCID members were requested on February 03, 2023 to share nomination of suitable officers for *"Election of President & Vice Presidents of ICID for term 2023-2026"*.
- Provincial Irrigation Departments of Punjab, Sindh Khyber Pakhtunkhwa, Balochistan and WAPDA were asked on March 08, 2023 to share details of Irrigation and Drainage Project for inclusion in ICID's *"Register for World Irrigation and Drainage Schemes"*.
- Provincial Irrigation Departments of Punjab, Sindh, Khyber Pakhtunkhwa, Balochistan and WAPDA were asked on March 08, 2023 to nominate suitable officers for *"ICID's Working Group on Land Drainage"*. Matter was followed up on March 24, 2023.
- Nomination of Mr. Ahmed Kamal, CEA/CFFC was shared on March 13, 2023 for attending *"Special IEC Virtual Meeting on 17<sup>th</sup> March 2023 on Redevelopment of ICID Central Office Building for Financial Sustainability"*.
- Ministry of Planning Development and Special Initiatives was asked on March 24, 2023 to nominate suitable officer for *"ICID's Working Group on Land Drainage"*.
- Follow up letter was issued to all PANCID members on March 28, 2023 to share nomination of suitable officers for *"Election of President & Vice Presidents of ICID for term 2023-2026, VIZAG, India, 7<sup>th</sup> November 2023"*.
- All PANCID members were requested on April 05, 2023 to share abstract of Papers for *"International Workshops of Working Group on Water Food Energy Nexus scheduled for November 2023"*.
- Nominations (if any) were invited from PANCID members on April 13, 2023 for the ICID's *"Watsave Awards & Recognition of World Heritage Irrigation Structures (WHIS) 2023"*.
- All PANCID members were requested on April 13, 2023 to share abstract of Papers for ICID's *"International Workshops in November 2023, Vizag, India"*.
- All PANCID members were requested on June 16, 2023 to share abstract of Papers for *"International Workshop on the State of Drainage Worldwide, November 02, 2023, India"*.
- Members of WG-Land Drainage were asked on June 16, 2023 to share abstract of Papers for *"International Workshop on the State of Drainage Worldwide, November 02, 2023, India"*. Follow up letter was issued on June 26, 2023.
- All PANCID members were requested on August 22, 2023 to share nomination of Senior Officers along with CV for *"Permanent Finance Committee (PFC) of ICID"*.
- Engr. Husnain Ahmed, Vice President, Pakistan Engineering Council was informed on September 07, 2023 regarding approval of his nomination for *"Permanent Finance Committee (PFC) of ICID"* by ICID.
- All PANCID members were requested on December 19, 2023 to share information regarding *"ICID E-Bulletin Weekly News Wrap 11<sup>th</sup> December 2023"*.







# DAM SAFETY COUNCIL

## 2. DAMS SAFETY COUNCIL

### 2.1 Creation of Dams Safety Council

Dams Safety Council (DSC) was established in 1987 within the office of CEA/ CFFC with the aim to review comprehensive plans of new dams and monitoring their implementation including annual and periodic inspections for effective repairs and efficient operation of existing dams etc. In the backdrop of 2004 repair issues with Sukkur Barrage, the issue of Barrage safety was further added to the functions of Council.

Recognizing the need for full-fledged monitoring and inspection of dams and reservoirs, a proposal for creation of a Dams Safety Council was agreed by Establishment Division in 1981 on the suggestion of international agencies for the purpose of ensuring safety of dams in Pakistan. In the absence of such regulatory organization, officials concerned even with the most important dams/barrages are often negligent towards their safe operation and maintenance. In order to have an independent system of dam safety monitoring by third party, Dams Safety Council is extremely important.

Large Dams are being operated & maintained by WAPDA which play a very critical role in Pakistan's economy. Other medium & small dams are owned, operated & maintained by respective Provincial Governments and these dams have also brought prominent change in the economic condition of villages and abadies at Divisional/District level. It will not be out of place to mention here that in Pakistan there exist 374 large dams (including reservoirs & barrages as per ICOLD definition) as well as hundreds of medium and small dams. Province/ Agency wise detail is given in **Table 2.1:**

**Table 2.1: Province/Agency Wise Summary of Dams in Pakistan\***

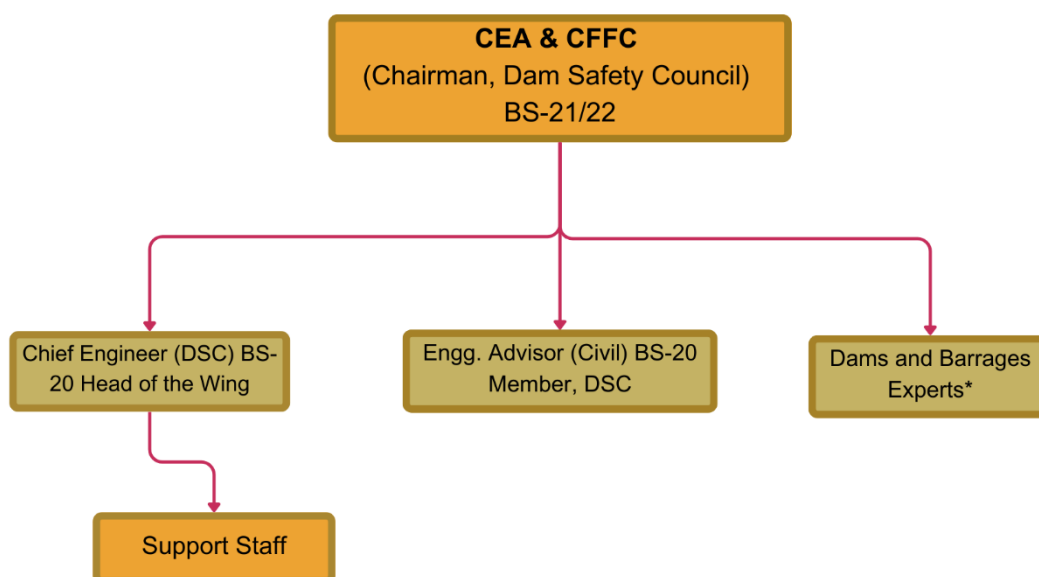
Territory	Completed						On-going (No.)	Proposed (No.)	Total (No.)
	Large Dams^		Small/ Medium Dams		Total				
	No.	Gross Capacity (MAF)	No.	Gross Capacity (MAF)	No.	Gross Capacity (MAF)			
Punjab	71	0.66288	3	0.00478	74	0.667658	05	02	07
Sindh	08	0.21625	80	0.18190	88	0.398190	39	07	46
Khyber Pakhtunkhwa	25	0.18280	02	0.00246	27	0.185264	15	20	35
Balochistan	159	0.73791	441	0.15745	600	0.882998	454	-	454
Merged Areas	19	0.11733	-		19	0.117333	-	-	00
AJ&K	-		-				-	34	34
<b>Sub-Total</b>	<b>282</b>	<b>1.91718</b>	<b>526</b>	<b>0.33422</b>	<b>808</b>	<b>2.251411</b>	<b>513</b>	<b>63</b>	<b>576</b>
WAPDA's Mega Dams	8	18.90295	-	-	8	18.902946	3	13	16
<b>Grand Total</b>	<b>290</b>	<b>20.82020</b>	<b>526</b>	<b>0.34659</b>	<b>816</b>	<b>21.15439</b>	<b>516</b>	<b>76</b>	<b>592</b>

\* It includes total number of completed, ongoing and proposed dams in Pakistan

<sup>^</sup> A dam with a height of 15 meters or greater from lowest foundation to crest or a dam between 5 meters and 15 meters impounding more than 3 million cubic meters, and defined in greater detail in the World Register of Dam.

## 2.2 Organogram

Dams Safety Council (DSC) is headed by a Grade 20 officer designated as Chief Engineer (DSC).



\*To be taken as Co-opted Members as and when needed

**Figure 2.1: Organogram of Dam Safety Council**

## 2.3 Issues Faced by Dam Safety Council

Dams Safety Council is the most under staffed wing of CEA /CFFC office. A study for strengthening the regulatory capacity of Dam and Barrage Safety Council of O/o CEA/ CFFC was conducted in 2010 by Indus Associated Consultants under ADB loan (TA 2178 Pak-SF) administered by the Project Management and Policy Implementation Unit (PMPIU) of Ministry of Water & Power (Now Ministry of Water Resources). Under this study, Pakistan's Dam Safety Act was developed to give legislative authority to the Council. Along with adequate and stable flow of government funds and arranging necessary logistics and support staff, the study also recommended to expand the composition of Dams Safety Council by adding ex-officio members from each of the four provinces and Chief Engineer (DSO) WAPDA as ex-officio member besides three members from private sector to work on full time basis. In line with the study recommendations, detailed proposal prepared for strengthening DSC enabling it an effective 3<sup>rd</sup> tier dams monitoring/ regulatory body has been submitted to M/o WR and being followed up as well.

## 2.4 Main Functions

Dams Safety Council mainly deals with the matters pertaining to Dams projects and allied engineering issues at national level. The key function of the Dams Safety Council is to assist the Chief Engineering Advisor / Chairman FFC (CEA/CFFC) in discharge of his duties relating to Dams & Barrages (review of design, repair issues, PC-I/PC-II, Inquiries) and their safety aspects (based on annual & periodic inspections). The other main activities performed by the Council are given as under:

- Participate in the annual and periodic inspection of dams & barrages organized by DSO-WAPDA and Provinces in accordance with SOPs of International Commission on Large Dams (ICOLD).
- Ensure implementation of follow-up actions, relating to O&M, dams/barrages safety measures required as a consequence of annual/periodic inspections.
- Advise WAPDA & concerned authorities regarding (i) repairs and maintenance of dams and reservoirs & (ii) regulation of reservoirs as per their SOPs
- Review PC-I, PC-II, Feasibility Studies and other studies/ reports/ plans of new dams & barrages, as and when received from the executing agencies (WAPDA and PIDs etc.)
- Monitor (including periodic field visit) the execution of ongoing dams & barrages projects/ programs funded by the federal government including donors and advise on necessary right coursing/ actions based on the outcome of the monitoring.
- Review plans and specifications for enlargement, modifications, major repairs, revival or otherwise of dams & barrages (as the need arises)
- Share technical data relating to dams in Pakistan including research under PANCOLD including general liaison with all related national and international organizations, in particular with International Commission on Large Dams (ICOLD)
- Liaison with WAPDA, IRSA, FFC, PCIW, NDMA, PDMAs, PMD and Provincial Irrigation Departments regarding dams safety toward: i) water distribution, ii) safety of structures in the event of any disaster iii) contingency plan to meet/respond to any disaster and (iv) observations brought out by the annual and periodic inspections.
- Pakistan is a member of the International Commission on Large Dams (ICOLD) since 1952. The Dams Safety Council acts as the Secretariat of Pakistan National Committee on Large Dams (PANCOLD). PANCOLD shares technical data relating to large dams including general liaison with all concerned national and international organizations in particular with ICOLD.

## 2.5 Activities performed during 2023

During the year 2023, Dams Safety Council of O/o the CEA & CFFC performed following functions related to its charter of duties given on preceding page as follows;

### General Technical Activities

Following salient technical/ coordination tasks were under taken during year 2023:

- Field visit of Nai Gaj Dam Project was conducted by Chief Engineer (DSC) along with Committee Members from January 12-14, 2023.
- Three meetings of the Inquiry Committee on "Audit Para No. 1.5.16 of Audit Report 2019-20 Undue Favor to the Contractor on Account of Amicable Settlement and Non-Encashment of Performance Guarantee Rs. 1454.48

- Million Keyal Khwar HPP was conveyed by Chief Engineer (DSC) and report was submitted to Ministry of Water Resources on 26<sup>th</sup> March 2023.
- iii. 3<sup>rd</sup> Annual Inspection-2023 of Gomul Zam Dam Project held from May 24 to 25, 2023 was attended by Chief Engineer (DSC).
  - iv. Meeting of “Inquiry Committee regarding Audit Para No. 1.5.6 of Audit Report 2019-20 undue favor to the contractor on account of Amicable Settlement and Non-Encashment of Performance Guarantee Rs. 1,454.48 Million Keyal Khwar Hydropower Project” was convened on 31<sup>st</sup> May 2023 at Project Liaison Office Lahore by Chief Engineer (DSC).
  - v. “Visit for confirming Physical Progress and record statement of Kachhi Canal Project” was carried out by Chief Engineer (DSC) from 6<sup>th</sup> July 2023 to 7<sup>th</sup> July 2023.
  - vi. Filed visit of Nai Gaj Dam conducted by Chief Engineer (DSC) from August 16-18 2023 connection with consultant’s performance.
  - vii. Site visit of “Kaitu Weir Irrigation & Power Project-KurramTangi Dam Project Stage-I” was carried out by Chief Engineer (DSC) on 18<sup>th</sup> – 19<sup>th</sup> September 2023.
  - viii. Report on “Committee to Evaluate Consultant’s Performance on Nai Gaj Dam Project” was shared with Ministry of Water Resources on 16<sup>th</sup> October 2023.
  - ix. Enquiry Committee meeting on Satpara Dam Project regarding “Para Nos. 21.7.3 & 21.7.4 Loss due to non-award of contract to the 1<sup>st</sup> Lowest Bidder, Amounting Rs. 361.41 Million and Irregular Award of Contract. Rs. 441.55 Million” was held on 10<sup>th</sup> November 2023 in GM (M&S) office WAPDA House Lahore and was also attended by Chief Engineer (DSC).
  - x. “31<sup>st</sup> Annual Inspection of Warsak Dam” was held from November 29-30, 2023 by DSO WAPDA and was also attended by Chief Engineer (DSC).
  - xi. International Conference on “Transformative Pathways for water and food systems in a climate Resilient Pakistan” held from 4<sup>th</sup> – 6<sup>th</sup> December 2023 in Islamabad during Pakistan Water Week 2023 was attended by CE (DSC) on behalf of CEA/CFFC and contributed as Chief Guest in fourth session.
  - xii. “8<sup>th</sup> Annual Inspection of Ghazi Barotha Hydropower Project” was held from December 18-19, 2023 and was also attended by Chief Engineer (DSC).
  - xiii. Represented office in Standing Committee of Ministry of Water Resources to examine Inquiry reports conducted in compliance of PAC/DAC directive and recommended disposal/actions by Principal Accounting Officer (PAO) of MoWR (meeting attended on 5<sup>th</sup> July 2023, 7<sup>th</sup> August 2023 and 21<sup>st</sup> to 25<sup>th</sup> September 2023).

### **Technical Review of PC-Is of Dam Projects**

Following PC-Is evaluated during year 2023 and technical views/comments were forwarded to Ministry of Water Resources, Provincial Governments & other stakeholder organizations. Detail is given in **Table 2.2**.

**Table 2.2: PC-Is reviewed by Dam Safety Council in Year 2023**

Sr. No.	Name of Project	Financing	Current Status of Project Reviews
<b>Punjab</b>			
1.	Construction of Papin Dam	Federal	Latest comments were communicated to M/o WR on 24 <sup>th</sup> October 2023
<b>Sindh</b>			
1.	Construction of 2 Nos. Small Dams Namely Doban & Hiser in District Thatta & Jamshoro in Sindh Province, Estimated Cost Rs. 975.130 Million	Federal	Comments communicated to M/o WR on 2 <sup>nd</sup> March 2023.
2.	Construction of Shah Mondhan Nai Dams in Qubba QadirBux and Dargah Ubhan Shah in District Khairpur Sindh Province, Estimated Cost Rs. 643.314 Million.	Federal	Comments communicated to M/o WR on 2 <sup>nd</sup> March 2023.
3.	Construction of Bharni Dam in District Jamshoro, Estimated Cost Rs. 979.252 Million	Federal	Comments communicated to M/o WR on 2 <sup>nd</sup> March 2023.
4.	Construction of Sohar Dam in District Thatta in Sindh Province, Estimated Cost Rs. 986.052 Million	Federal	Comments communicated to M/o WR on 2 <sup>nd</sup> March 2023.
5.	Construction of Khadeji Dam in District Jamshoro in Sindh Province, Estimated Cost Rs. 999.528 Million	Federal	Comments communicated to M/o WR on 3 <sup>rd</sup> March 2023.
6.	Construction of 06 Nos Tarries Shah Ji Tarrie, Mithro Charan, Tajia Bha, Rohar Charan, Rani Jo Dani, Karangari, Tarries in Taluka Chacharo of District Tharparkar	Federal	Comments communicated to M/o WR on 3 <sup>rd</sup> March 2023.
7.	Construction of 06 Nos Tarries Bupraro, Vehar, Kural, Sobharo, Churial, and Haji Uris Rahimoo Tarries in Taluka Diplo/ Dhali of District Tharparkar	Federal	Comments communicated to M/o WR on 3 <sup>rd</sup> March 2023.
8.	Construction of 05 Nos Tarries Gojihar, Pabuhar, Beevato, Khurbi, Pughar Tarries in Taluka Mithi of District Tharparkar	Federal	Comments communicated to M/o WR on 3 <sup>rd</sup> March 2023.
9.	Construction of 05 Nos Tarries Borli, Bhavi Jo Tar, Lunia, Wadam, Katan, Tarries in Taluka Islamkot of District Tharparkar	Federal	Comments communicated to M/o WR on 3 <sup>rd</sup> March 2023.
10.	Construction of Bijar Dam in Malir, Estimated Cost Rs. 904.763 Million	Federal	Comments communicated to M/o WR on 3 <sup>rd</sup> March 2023.
11.	Construction of Alko Jokhio Dam in District Thatta, Estimated Cost Rs. 999.824 Million	Federal	Comments communicated to M/o WR on 3 <sup>rd</sup> March 2023.
	Rehabilitation Restoration of Malir Weir, I, II, III and Thado Dam, Estimated Cost Rs. 13950.542 Million	Federal	Comments communicated to M/o WR on 3 <sup>rd</sup> March 2023.
12.	Construction of 2 Nos Small Dams namely Bhamhro & Shanger Khan Dam in Qubba QadirBux and Daragh Ubhan Shah, District Khairpur in Sindh Province under the project Estimated Cost Rs. 937.187 Million	Federal	Latest comments were communicated to M/o WR on 14 <sup>th</sup> March 2023.



13.	Construction of Mole-3 Dam in District Jamshoro	Federal	Latest comments were communicated to M/o WR on 14 <sup>th</sup> March 2023.
14.	Construction of Khadeji Dam in District Jamshoro in Sindh Province Estimated Cost Rs. 999.528 Million	Federal	Latest comments were communicated to M/o WR on 14 <sup>th</sup> March 2023.
15.	Construction of 2 Nos Small Dams namely Dargah Sultan Badshah and Mureed Wasan Dam in Qubba Qadir Bux and Daragh Ubhan Shah, District Khairpur in Sindh Province Estimated Cost Rs. 990.009 Million	Federal	Latest comments were communicated to M/o WR on 14 <sup>th</sup> March 2023.
16.	Construction of Darsano Dam in Malir in Sindh Province Estimated Cost Rs. 976.766 Million	Federal	Latest comments were communicated to M/o WR on 14 <sup>th</sup> March 2023.
17.	Construction of Sohar Dam in District Thatta in Sindh Province Estimated Cost Rs. 986.052 Million.	Federal	Latest comments were communicated to M/o WR on 14 <sup>th</sup> March 2023.
Balochistan			
1.	Garuk Storage Dam Project District Kharan Revised Estimated Cost Rs. 27753.763 Million	Federal	Latest comments were communicated to M/o WR on 13 <sup>th</sup> April 2023.
2.	Sunni Gar Dam (District Khuzdar) Balochistan Province Estimate Cost 5114.82 Million	Federal	Latest comments were communicated to M/o WR on 2 <sup>nd</sup> January 2023.
3.	Revised PC-I for Construction of Awaran Dam Estimated Cost Rs. 23,579.260 Million	Federal	Comments communicated to M/o WR on 12 <sup>th</sup> July 2023
4.	Revised PC-I for Construction of Panjgur Dam Estimated Cost Rs. 22,340.590 Million	Federal	Comments communicated to M/o WR on 21 <sup>st</sup> July 2023
5.	Revised PC-I of Winder Dam Project	Federal	Comments sent to MoWR on 4 <sup>th</sup> August 2023
6.	Construction of 100 Dams in Balochistan Package-III (20 Dams) Revised	Federal	Comments communicated to M/o WR on 10 <sup>th</sup> August 2023
7.	3 <sup>rd</sup> Revised PC-I Construction of Toiwari Batozai Storage Dam Project Estimated Cost Rs. 7,085.043 Million	Federal	Latest comments were communicated to M/o WR on 21 <sup>st</sup> September 2023.
8.	Construction of Mangi Dam and Water Conveyance System (2 <sup>nd</sup> Revised PC-I)	Federal	Latest comments were communicated to M/o WR on 17 <sup>th</sup> November 2023.
WAPDA			
1.	1 <sup>st</sup> Revised PC-I (updated) Satpara Dam Project (17.4 MW) Estimated Cost Rs 6,371.246 Million	Federal	Comments communicated to M/o

		WR on 11 <sup>th</sup> January 2023.
Total:		27

### Technical Review of PC-IIs of Dam Projects

One (01) PC-II evaluated during year 2023 and technical views/comments were forwarded to Ministry of Water Resources. Detail is given in **Table 2.3**.

**Table 2.3: PC-IIs Reviewed by Dams Safety Council in Year 2023**

Sr. No.	Name of Project	Financing	Current Status of Project Reviews
<b>WAPDA</b>			
1.	3 <sup>rd</sup> Revised (Rationalized-2023) PC-II Proforma for Detailed Engineering Design & Tender Documents of Mohmand (Munda) Dam Hydropower Project	WAPDA	Comments communicated to M/o WR on 15 <sup>th</sup> June 2023.

### Activities Performed as PANCOLD Secretariat

- Memorandum of Cooperation (MoC) between PEC and PANCOLD was signed by worthy CEA/CFFC and Registrar PEC on January 19, 2023 to enhance PANCOLD activities both at local and international level.
- In pursuance of ICOLD Circular regarding "Choice of Technical Questions for the 28<sup>th</sup> Congress (Chengdu, China 2025)", PANCOLD prepared Technical Questions by taking inputs from PCRWR and WAPDA and various other wings of this office and submitted to ICOLD on 8<sup>th</sup> February 2023.
- 49<sup>th</sup> Annual Meeting of Pakistan National Committee on Large Dams (PANCOLD) was held in Islamabad on 1<sup>st</sup> March 2023.
- Information was shared with all PANCOLD members on 8<sup>th</sup> February 2023 regarding "Invitation to register for 91<sup>st</sup> Annual Meeting of ICOLD to be held in Gothenburg, Sweden, 11-15 June 2023".
- Pakistan Engineering Council was requested by PANCOLD on 16<sup>th</sup> March 2023 regarding "Enhancement of ICOLD Membership".
- Notification regarding "Constitution of Core Committee of PANCOLD" was issued to all concerned on July 13, 2023.
- Notification regarding "Constitution of Joint Working Committee of PANCOLD" was issued to all concerned on July 13, 2023.
- First Meeting of Joint Working Group of PANCOLD was held at Islamabad on 16<sup>th</sup> August 2023.
- PANCOLD requested NESPAK on 22<sup>nd</sup> August 2023 regarding "Updation of National Register of Dams" in ICOLD records.
- As a special initiative of PANCOLD WAPDA was requested on 2<sup>nd</sup> October 2023 to furnish nominations along with CVs of suitable WAPDA officers for membership against relevant ICOLD Technical Committees regarding "Committees of PANCOLD/ICOLD".





# FEDERAL FLOOD COMMISSION

### 3. FEDERAL FLOOD COMMISSION

#### 3.1 FFC – History, Organogram and Functions

##### Historic Background

Prior to 1976, the Provincial Governments were responsible for the planning and execution of flood protection works. Disastrous floods of 1973& 1976 caused heavy loss of life and property and it was felt that the existing flood protection facilities and planning were inadequate to provide effective protective measures for the country. Heavy losses to the economy due to floods were discussed in the Inter-Provincial Conference held in January 1977 wherein it was decided to establish Federal Flood Commission (FFC) for integrated flood management on country wide-basis.

##### Organogram

CEA/CFFC heads the FFC as Chairperson. He is assisted by two senior officers i.e. Member Technical (BS-21) and Chief Engineer (Floods) BS-20.

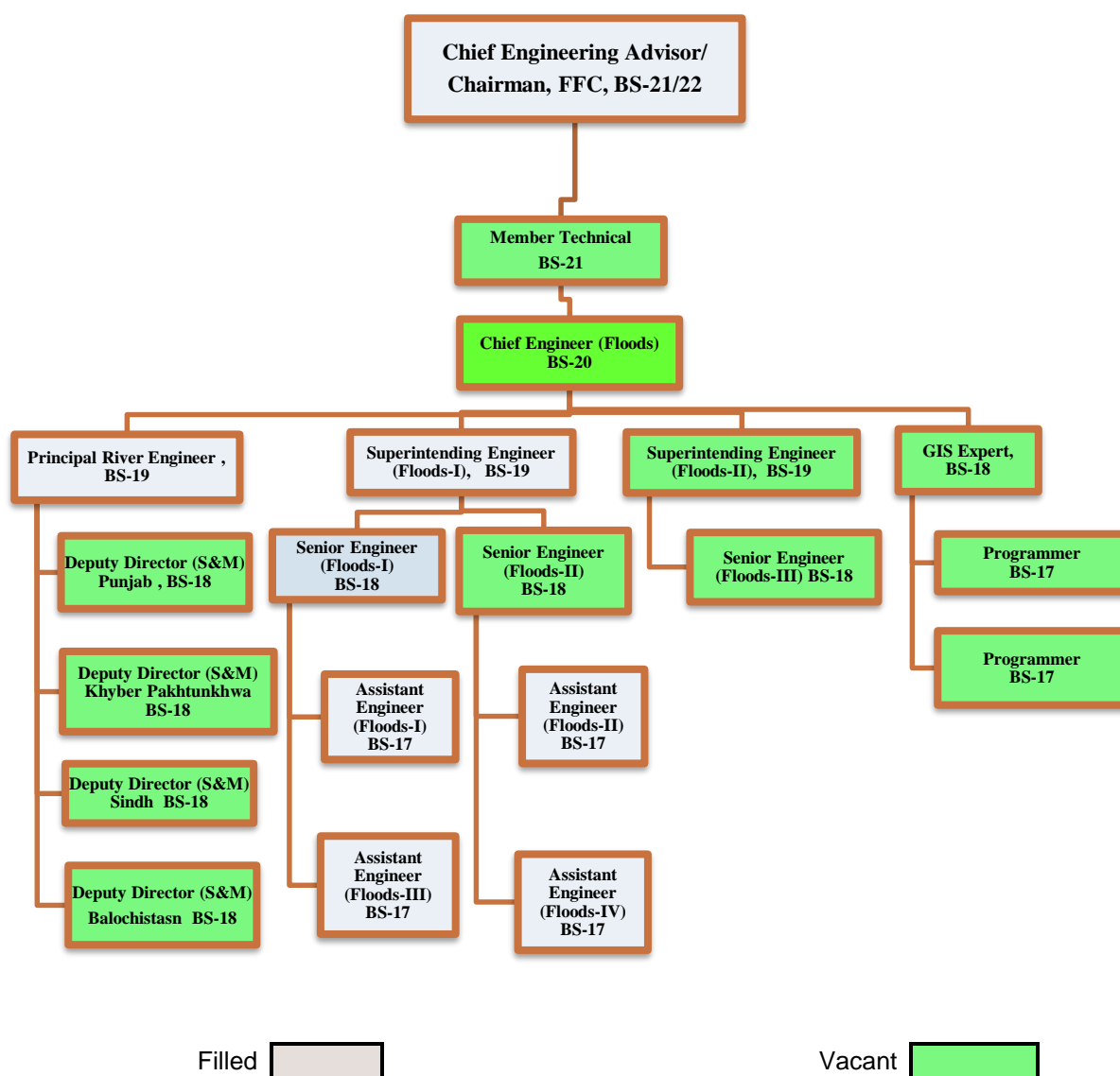


Figure 3.1: Organogram of FFC

### **Functions of Federal Flood Commission (FFC)**

The existing charter of duties of FFC is given as under;

- i. Preparation of Flood Protection Plan for the country including management of Plan;
- ii. Scrutiny of flood control/protection schemes funded by the federal government and prepared by Provincial Governments and Federal Agencies;
- iii. Review of damage of flood protection works and review of plans for restoration and reconstruction works;
- iv. Measures for improvement of Flood Forecasting & Warning System;
- v. Preparation of a Research Programme for flood control and protection;
- vi. Standardization of designs and specifications for flood protection works;
- vii. Recommendations regarding principles of regulation of reservoirs for flood control;
- viii. Evaluation and monitoring of progress of implementation of the National Flood Protection Plan; &
- ix. FFC may notify sub-committees as it deems appropriate.

Provincial Governments and Federal Line Agencies undertake flood protection schemes proposed under the National Flood Protection Plans (NFPPs). The Federal Government, however, provides the resources for meeting the capital costs of projects under NFPPs.

## **3.2 Floods in General Perspective**

### **Causes of Floods: Broad-spectrum**

The riverine floods take hours or even days to develop, giving ample reaction time to locals to prepare/evacuate. However, flash floods generate quickly in mountainous regions with little warning/reaction time for locals. Flash floods can be extremely dangerous, instantly turning a babbling brook into a thundering wall of water and sweeping everything on its way downstream. Floods occur in all types of rivers and their tributaries. Localized flooding may be caused or exacerbated by drainage obstructions such as landslides, ice, debris, or dam failure. The increase in flow may be the result of sustained rainfall, rapid snow melting, monsoon/depression (weather system) or tropical cyclones. Rapid flood events including flash floods, more often occur on smaller rivers, rivers with steep valleys or rivers that flow for much of their length over impermeable terrain. The cause may be localized convective precipitation (intense thunderstorms) or sudden release from an upstream impoundment created behind a dam, landslide or glacier.

Disaster experts classify floods according to their likelihood of occurring in a given time period. A hundred-year flood, for example, is an extremely large, destructive event that would theoretically be expected to happen only once every century. But this is a theoretical number. In reality, this classification means there is a one-percent chance that such a flood could happen in any given year. Over recent decades, due to global climate change, hundred-year floods have been occurring worldwide with frightening regularity.



Climate change is considered to be a critical global challenge and recurring flood events have demonstrated the growing vulnerability owing to climate change. The impacts of climate change range from affecting agriculture to further endangering food security, to rising sea levels and the accelerated erosion of coastal zones, increasing intensity of natural disasters like floods & droughts, species extinction and the spread of vector-borne diseases.

It is generally recognized that complete prevention from floods is humanly impossible but protection from flood is feasible and a vital necessity. By proper planning, means can be devised to harness the fury of floods to safeguard human life and property. Devoid their destructive power, floods can be used in the service and the welfare of a community.

### **Pakistan's Flood Context and Control Objectives**

Pakistan is a country with diverse type of land and fluctuating pattern of climate. Climate is usually considered hot and dry in Pakistan but it has shown significant obvious variations in last few years. Many districts and urban centers located along the rivers banks are ever on a great risk to confront with various types of floods i.e. riverine flood, flash flood and urban floods particularly in Punjab & Sindh provinces. The floods cause damages to hundred thousand acres of fertile agricultural lands, standing crops and affect adjoining populations with monetary loss in billions of rupees. Major direct flood damages are caused to agricultural lands, standing crops, urban and rural populations, besides, other private & public property.

The riverine floods are generally caused due to heavy concentrated rainfall in the rivers catchments, during monsoon season, which is sometimes augmented by snow melt flows. Monsoon currents originating from Bay of Bengal and resultant depressions (weather system) often result in heavy downpour in the Himalayan foothills, which occasionally generate destructive floods in main rivers and their tributaries. Sometimes exceptionally high flood flows in major rivers are generated due to formation of temporary natural dams by landslide or glacier movement and their subsequent collapse.

Flooding of the Indus River and its tributaries represents the greatest hazard in Pakistan. Floods occur usually in summer season (July - October). Therefore, damages to agriculture sector are mainly to the standing Kharif crops. However, in some cases the inundated lands do not dry up in time and ultimately affecting sowing Rabi crops. The major rivers (Indus, Jhelum, Chenab, Ravi and Sutlej) and secondary rivers (Kabul, Swat etc.) cause flood losses by inundating low lying areas around the rivers bed by damaging irrigation and communication network, besides, land erosion along the rivers banks. In the upper part of the Indus Basin (Punjab & Khyber Pakhtunkhwa), floodwater spilling over the high banks of the rivers generally turns back to the main rivers channel.

In the lower parts of the country i.e. Lower Indus Basin (Sindh province); River Indus is flowing at ridge i.e. higher elevation than adjoining lands. That is why flood embankments have been provided along both sides of the river. The flood water, if breaches the embankments do not return to the main river channel. This largely extends the area and period of inundation resulting in more damages to settlements, standing crops and other private as well as public infrastructure.

Sometimes breaches are occurred in the flood embankments, when the rivers attain the Exceptionally High Flood Level. At times, the flood embankments are breached

at pre-determined locations to save the main structures across main rivers. The remodeling/ rehabilitation works of Barrages, on the basis of 100 years return period has been taken up by the Punjab & Sindh province. The construction of new Khanki Barrage on River Chenab, Rehabilitation of Jinnah & Taunsa Barrages on River Indus, Sulemanki Barrage on River Sutlej, Balloki Barrage over Ravi River and Trimmu and Panjnad Barrages over Chenab River have been completed. Remolding works on Guddu & Sukkur Barrages across River Indus is in progress.

Flood management planning in Pakistan is being carried out to essentially cover the following three specific objectives:

- i. To reduce or eliminate damages to existing properties;
- ii. To prevent future increase in damages; and
- iii. To mitigate the residual hazards.

In Pakistan, flood control planning is a complex problem and calls for great ingenuity and experience on the part of the planners. The nature of flood problems varies in each of the four provinces and federally administered areas due to varying physiographic, climatic, demographic, and socio-economic conditions. Flood problems relating to various provinces are given as under;

### Punjab

- **Flood protection marginal bunds** have been generally constructed either to protect Headworks and other irrigation structures, or to safeguard certain towns, villages & adjoining agricultural lands in the province.
- Due to general topography of the area, **pre-determined breaching sections** have been provided in the Right Marginal Bunds (RMBs) for operation for safety of Headworks/ barrages in case of exceptional high flood flows i.e. likely to exceed the designed level.
- In order to protect areas from floods, flood protection structures in the form of Spurs, Studs and Flood Protection Wallsetc. have been constructed in critical reaches. These structures have protected vast areas and in some cases even large tracks of eroded lands have been reclaimed.

### Sindh

- The Indus River flows on a ridge in Sindh Province and generally, surrounding areas (outside the flood embankments) are lower than the river bed; hence, water once leaving the Indus River does not return to the main channel.
- The escaped water thus causes greater damage to widespread areas, and it persists for a longer period even after flood peaks are over.
- Sindh province is situated at tail end, hence, drain out all rivers and if flood protection measures adopted in the upper Sindh are not properly planned, severe damages are likely to occur in the Province.
- In most of the reaches, a double line of flood embankments has been constructed on both sides of the river from Guddu to few kilometers short of Arabian Sea.
- These flood embankments have been further compartmentalized to contain widespread inundation.

### Khyber Pakhtunkhwa

- The floods in the province are mainly due to flash flood flows in secondary rivers (Kabul, Swat, Panjkora, Khurram etc.) and major hill torrents/flood flow generating nullahs having steep bed slopes, which greatly increase flood velocity and severely erode the banks.
- Mostly flood protection walls/embankments and short spurs have been constructed to save the areas from spill action and erosion.
- A battery of around 40 spurs having considerable shank length with Marginal Bund have been constructed along the right bank of Indus River “Chashma Barrage – Ramak Reach” for protection of D.I. Khan City and adjoining area from devastating flood flows of Indus River.
- A large number of spurs and flood embankments/flood protection walls in critical locations have also been constructed along Kabul, Swat, Panjkora, Kurram rivers and their tributaries including flood flows generating nullahs/hill torrents.

### Balochistan

- Due to peculiar physiographic and climatic characterizes in Balochistan, the bed slopes of rivers and nullahs in Balochistan are very steep.
- It generates flash flood flows with high velocity causing banks erosion and inundations of low lying area along the banks of rivers and their tributaries.
- Mostly flood protection walls/embankments & short spurs have been constructed for protection of orchards, agricultural lands and abadies.
- Flood flows regulators/ flood diversion structures have also been constructed to dissipate the thrust of flood water and use the same for agriculture in the area.

### Federally Administered Areas (Gilgit-Baltistan, AJ&K and Merged Area of Khyber Pakhtunkhwa/ Ex-FATA)

- The bed slopes of rivers and Nullahs in Gilgit-Baltistan, Merged Area KHYBER PAKHTUNKHWA (Ex- FATA) and AJ&K are very steep.
- The flash flood flows generated in main rivers and their tributaries cause severe banks erosion.
- Flood Protection walls and short spurs in PCC & gabion crates are constructed in order to check the spill and erosive action of flood flows in rivers/hill torrents.
- The main purpose of such interventions is to provide protection to abadies, agricultural lands and other private and infrastructure.

### Flood Protection and Irrigation Infrastructure in Pakistan

Five main rivers, namely, the Indus, Jhelum, Chenab, Ravi and Sutlej and their tributaries flow through the country's plains. The Indus, Jhelum and Chenab are known as the **Western Rivers** and Ravi, Beas, and Sutlej known as the **Eastern Rivers**. These rivers supply water to the entire Indus Basin Irrigation System. The rivers have their origin in the higher altitudes and derive their flows mainly from snowmelt and monsoon rains.

The catchment area of Indus is most unique in the sense that it contains seven (7) of the world's highest-ranking peaks, after Mount Everest. These include **K-2 (28,253**

**feet), Nanga Parbat (26,660 feet), Rakaposhi (25,552 feet)** etc. Likewise, barring the polar areas, seven (7) glaciers situated in the Indus catchment, namely **Siachin, Hispar, Biafo, Batura, Baltoro, Barpu and Hopper** are amongst the largest in the world.

The Irrigation System of Pakistan is the largest integrated irrigation network in the world, serving around 45 million acres of contiguous cultivated land. The system is fed by the waters of the Indus River and its tributaries. The irrigation network of Pakistan mainly comprises of 3 major reservoirs (Tarbela, Mangla & Chashma), 19 Barrages, 12 Inter-river Link Canals and 45 independent irrigation canal commands, besides, 435 Large, Medium & Small Dams.

The major storage reservoirs include Tarbela (existing Live Storage Capacity = 5.827 MAF against original storage capacity of 9.70 MAF), Chashma (existing Live Storage Capacity = 0.278 MAF against original storage capacity of 0.70 MAF) on River Indus and Mangla with existing Live Storage Capacity = 7.356 MAF (this includes the additional storage capacity of 2.88 MAF after Mangla Dam Raising allowing Maximum Conservation Level of 1242 feet) against original storage capacity of 5.34 MAF on River Jhelum. The schematic diagram of Indus Basin Irrigation System is given at **Figure 3.2.**

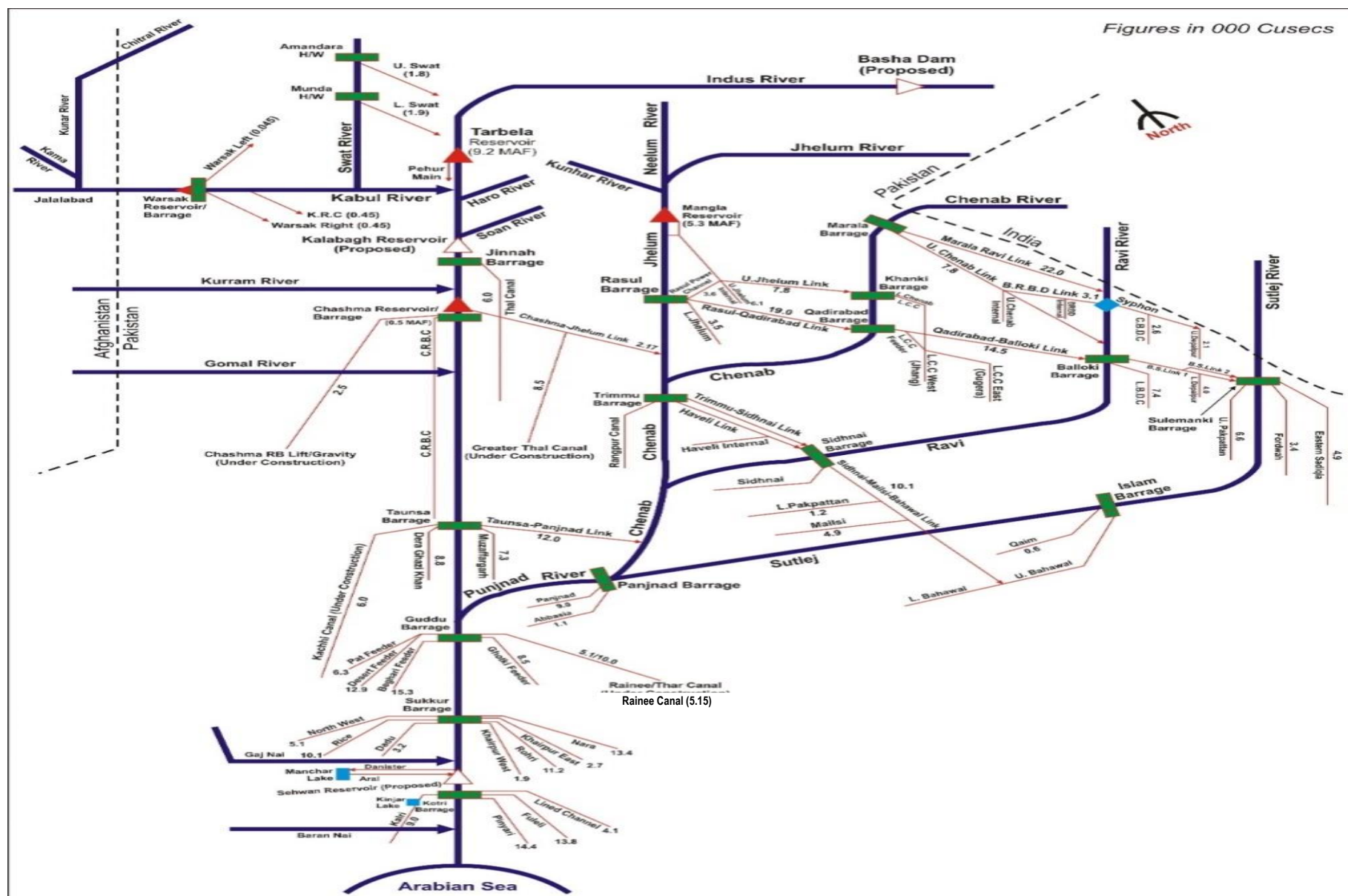


Figure 3.2: Schematic Diagram of Indus Basin Irrigation System



Diversion of river waters into off-taking canals is made through Barrages, which are gated diversion weirs. The main canals in turn deliver water to branch canals, distributaries and minors. The watercourses get their share of water through outlets in the irrigation channels. Distribution of water from a watercourse is made through a time-schedule called "Warabandi". According to IRSA record, the average annual surface water availability from Western and Eastern Rivers is 145.03 MAF (Western Rivers: 138.50 MAF & Eastern Rivers: 6.53 MAF), whereas the maximum inflows recorded was 183.45 MAF (in year 1978-79) and minimum inflows were 99.05 MAF (in year 2001-2002) during the post Tarbela period.

The existing flood management strategy includes flood peaks regulation by three major reservoirs (Tarbela, Chashma on Indus & Mangla on Jhelum), protection of private & public infrastructure, urban/rural abadies and adjoining agricultural lands from spill and erosive action of major and other rivers including Hill Torrents by flood embankments/protection walls and spurs including other interventions, besides, Flood Forecasting & Early Warning System, Rescue & Relief measures in case of flooding situation. The existing flood protection facilities in the four provinces and Federally Administered Areas are given in **Table 3.1**.

**Table 3.1: Existing Flood Protection Infrastructure in Pakistan**

Sr. No.	Zone/Region/ Agency/District	No. of Protection Works
<b>Punjab</b>		
1.	Lahore Irrigation Zone	251
2.	Faisalabad Irrigation Zone	71
3.	Sargodha Irrigation Zone	325
4.	Multan Irrigation Zone	231
5.	Bahawalpur Irrigation Zone	89
6.	D.G. Khan Irrigation Zone	218
<b>Sub-Total (Punjab)</b>		<b>1,185</b>
<b>Sindh</b>		
1.	Guddu Barrage Region	63
2.	Ghotki Feeder Canal Area Water Board	23
3.	Sukkur Barrage Region (Right Bank)	48
4.	Sukkur Barrage Region (Left Bank)	78
5.	Kotri Barrage	42
6.	Left Bank Canal Area Water Board	07
<b>Sub-Total (Sindh)</b>		<b>261</b>
<b>Khyber Pakhtunkhwa</b>		
1.	North Irrigation Zone	439
2.	South Irrigation Zone	345
3.	Merged Area	209
<b>Sub-Total (KHYBER PAKHTUNKHWA)</b>		<b>993</b>
<b>Balochistan</b>		
1.	North Irrigation Zone	159
2.	South Irrigation Zone	96
3.	Canal Irrigation Zone	05
<b>Sub-Total (Balochistan)</b>		<b>260</b>
<b>Total (In four Provinces)</b>		<b>2,699</b>



Sr. No.	Zone/Region/ Agency/District	No. of Protection Works
<b>Gilgit-Baltistan</b>		
1.	Gilgit	02
2.	Hunza/Nagar	08
3.	Sakardu	04
4.	Ghizar	04
5.	Astore	02
6.	Ghanche	09
7.	Diamer	01
<b>Sub-Total (GB)</b>		<b>30</b>
<b>AJ&amp;K</b>		
8.	Bagh	03
9.	Bhimber	06
10.	Kotli & Mirpur	01
11.	Muzaffarabad	02
<b>Sub-Total (AJ&amp;K)</b>		<b>13</b>

### Impacts of Global Warming & Climate Change on Flood Management

Global warming causes climate change, which is a serious issue for the entire world. It is a serious threat to the third world as its impacts will not be felt equally across the earth. Developing countries including Pakistan are much more vulnerable to the impacts of climate change. The melting rate of glaciers in South Asia has increased, which has increased the risk of GLOFs in Pakistan; Shishper glacier's bursting is one example. Pakistan economy has faced significant losses due to environmental damages and degradations.

Pakistan is amongst the top ten countries on the globe experiencing frequent and intense climate change events such as floods, droughts, cyclones, heavy rains, heat waves/extremely high temperatures etc. The average global temperature has increased due to increasing concentrations of carbon dioxide and other greenhouse gases in the atmosphere for last many years. During the last century, it increased by 0.6 degree Centigrade and is likely to increase further by 1.0° C to 4.0° C till the end of the current century.

The most recent extreme climate events witnessed by Pakistan are 2022 floods hitting various parts of the country during the monsoon season. The frequency of occurrence and intensity of floods has considerably increased during the past several years. The water security of the country is also threatened by the climate change. The increasing temperatures in the northern mountains of the country are likely to result in glacier melting, thereby affecting the flows of Indus River System.

The projected effects of global warming include changes in atmospheric and oceanic circulation, and many subsystems of the global water cycle are likely to intensify, leading to altered patterns of precipitation and runoff. Various climate model simulations show complex patterns of precipitation change, with some regions receiving less and others receiving more precipitation than they do now.

Pakistan Meteorological Department (PMD), in a recent monsoon rainfall distribution analysis, assessed that climate change has rendered a 100 km spatial shift towards west in the overall monsoon pattern in the country. Rainfall distribution patterns have not only shifted spatially but also seasonally. The analysis showed that summer monsoon rainfalls have shifted towards late season; similarly, winter rain and snowfall have also shifted towards late February and March. Changing patterns result as emergence of new vulnerable areas to floods which include Khyber Pakhtunkhwa (Khyber Pakhtunkhwa), South Eastern Punjab and Central Sindh.

### Historical Flood Events in Pakistan

Since its creation, Pakistan has faced various severe flood events i.e. 1950, 1955, 1956, 1957, 1959, 1973, 1975, 1976, 1977, 1978, 19981, 1983, 1984, 1988, 1992, 1994, 1995, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2019, 2020 & 2022. The 2010 floods and 2022 floods have been the worst ever in the country. The floods of various magnitudes affected vast areas in the four provinces including Gilgit-Baltistan, Merged Area, Khyber Pakhtunkhwa (Ex-FATA) & Azad Jammu & Kashmir. Owing to adverse impacts of climate change, in the recent years, vulnerabilities of communities to coastal & urban flooding have also increased.

NDMA's Report dated 18<sup>th</sup> November 2022 states that almost 897,014 homes were fully destroyed and a further 1.392 million partially damaged. Furthermore, livelihoods are also heavily impacted by the flooding, which has killed more than 1,164,270 livestock – a critical source of sustenance and livelihoods for many families. A report from the United Nations Office for the Coordination of Humanitarian Affairs, published on August 30, 2022 indicates that around 2 million acres of crops and orchards have also been affected.

Flood damages are caused mainly due to riverine flooding in main rivers and flash floods in Secondary & Tertiary Rivers/Hill Torrents, Coastal flooding due to Cyclone & urban flooding due to torrential rains and inadequate storm drainage facilities, besides, GLOFs in northern parts of the country. The unprecedented floods of 2010 were one of the worst floods in history of the country in which about 1985 people lost their lives, 1,608,184 houses were damaged/ destroyed, 17,553 villages were affected and total area of 160,000 Km<sup>2</sup> was affected.

The floods of Monsoon 2022 are said to have surpassed the 2010 floods as this caused a humanitarian catastrophe with over 33 million people affected and 1739 deaths (*source: NDMA sitrep dated 18<sup>th</sup> November 2022*). There has also been a substantial impact on livestock, homes and other infrastructure across Sindh, Khyber Pakhtunkhwa, Southern Punjab and Eastern Balochistan.

The flooding observed in Monsoon 2023 resulted into life loss of 226, 349 injured and damage to 5,813 houses, 5 Road Bridges and a Road network of 23.92 km. The major historical flood events and their damages are given in **Table 3.2** on the ensuing page.

**Table 3.2: Major Flood Events Witnessed in Pakistan & their damages**

Sr. No.	Year	Direct losses (US\$ million) @ 1US\$= PKR 86	Lives Lost (No)	Affected villages (No)	Flooded area (Sq.Km)
1	1950	488	2,190	10,000	17,920
2	1955	378	679	6,945	20,480
3	1956	318	160	11,609	74,406
4	1957	301	83	4,498	16,003
5	1959	234	88	3,902	10,424
6	1973	5,134	474	9,719	41,472
7	1975	684	126	8,628	34,931
8	1976	3,485	425	18,390	81,920
9	1977	338	848	2,185	4,657
10	1978	2,227	393	9,199	30,597
11	1981	299	82	2,071	4,191
12	1983	135	39	643	1,882
13	1984	75	42	251	1,093
14	1988	858	508	100	6,144
15	1992	3,010	1,008	13,208	38,758
16	1994	843	431	1,622	5,568
17	1995	376	591	6,852	16,686
18	2010	10,056 @ 1US\$= PKR 86	1,985	17,553	160,000
19	2011	3,730 @ 1US\$= PKR 94	516	38,700	27,581
20	2012	2,640 @ 1US\$= PKR 95	571	14,159	4,746
21	2013	2,000 @ 1US\$= PKR 98	333	8,297	4,483
22	2014	440 @ 1US\$= Rs 101	367	4,065	9,779
23	2015	170 1US\$= PKR 105.00	238	4,634	2,877
24	2016	6 1US\$= PKR 104.81	153	43	-
25	2017	-	172	-	-
26	2018	-	88	-	-
27	2019	-	235	-	-
28	2020	-	409	-	-
29	2021	-	198	-	-
30	2022	30,000 1US\$= PKR 225	1,739	6,631	85,000
31	2023	-	226*	-	-
<b>Total</b>		<b>68,225</b>	<b>23,614</b>	<b>203,704</b>	<b>701,558</b>

\* Source: NDMA Sitrep dated 30<sup>th</sup> September 2023. Based on this, 5,813 houses, 5 Bridges and Road network of 23.92 km, besides 1260 No. of livestock was affected by 2023 floods.

IFRM aims at minimizing loss of life from flooding while maximizing the net benefits derived from flood plains. This is the concept that addresses issues of human security against flood risks and sustainable development within the framework of Integrated Water Resources Management (IWRM) and can play an important role in sustainable development and poverty reduction.

Historically, flood plains have been the preferred places for socio-economic activity as is evident from the very high densities of human settlement found there. Floods are a natural phenomenon, with both negative and positive impacts, and generally, should not be considered a hindrance to economic development. Floods play a major role in replenishing wetlands, recharging groundwater and support agriculture and fisheries system, making flood plains preferred areas for human settlements and economic activities. Extreme demands on natural resources due to population growth have forced people and their property to move closer to rivers in many parts of the world. Further, flood control and protection measures have encouraged people to utilize protected and reclaimed areas extensively, thereby increasing flood risks and consequent losses.

Recurrent and extreme flooding, however, pose grave risks to development and have negative impacts on lives, livelihoods and economic activity and can cause occasional disasters. Flood disasters result from the interaction between extreme hydrological events and environmental, social and economic processes. These disasters have the potential to put development back by five to ten years, particularly in developing countries. The spiraling economic losses in developed countries also have given rise to grave concerns. The balancing of development needs and risks is essential. The evidence worldwide is that people will not, and in certain circumstances, cannot abandon flood-prone areas. There is a need, therefore, to find ways of making life sustainable in the floodplains. The best approach is to manage floods in an integrated manner.

The traditional management response to severe floods was typically an adhoc reaction – quick implementation of a project that considered both the problem and its solution to be self-evident, and that gave no thought to the consequences of flood risks for upstream and downstream areas. Thus, flood management practices have largely focused on mitigating floods intensity and reducing their localized damages to private and public property. Traditional flood management has employed both structural and non-structural interventions, besides, physical and institutional interventions. These interventions were employed prior, during and after flooding and have often overlapped.

Traditional flood management interventions include (i) Source Control to Reduce Runoff in the form of Permeable pavements, afforestation artificial recharge; (ii) Storage of Runoff through Detention Basins, check dams and small/medium/large reservoirs etc.; (iii) Remodeling of Barrages/Headworks for enhancing their discharge capacities besides, provision of Bypass/Escape channels, wherever feasible; and (iv) Separation of Rivers and Population through Land-use control, flood plan mapping & zoning, removal of illegal encroachments as per River Law/ Act, construction of flood protection infrastructure; and (v) Emergency Management through Flood Forecasting & Warnings, flood fighting works i.e. strengthening embankments, flow diversion and evacuation of flood affectees to safe places; and finally (vi) Flood Recovery as Compensation of flood affectees and rehabilitation/ restoration of damaged public infrastructure.

Surface water storages (large, medium & small dams), flood embankments and flood flows retention basins, is a traditional approach to attenuating flood peaks. Water storage attenuate floods by slowing the rate of rising waters, by enhancing the time it takes for the waters to attain high level and evade the synchronization of flood peaks, hence, lowering the peak level in the downstream areas. Such storages reservoirs serve multiple purposes i.e. storage of water mainly for irrigation water supplies, hydropower generation including flood management. Storage Reservoirs have to be used in an appropriate combination with other structural and non-structural measures.

Seemingly self-evident, but regularly overlooked in practice, is the need to make flood management a part not only of the planning and design, but also of the operation of reservoirs. Releases of surplus water from reservoirs at the time, when rivers in the downstream areas experiencing high flood flows can create risks, therefore, careful operation of reservoirs can minimize the loss of human life and damages to property due to properly flood flows regulation and releases in the downstream areas. In this context, trans-boundary cooperation is indispensable.

Flood embankments are most likely to be appropriate for floodplains that are already intensely used, in the process of urbanization, or where the residual risks of intense floodplain use may be easier to handle than the risks in other areas i.e. (Landslides or other disturbances).

Land-use control is generally adopted where intensive development on a particular floodplain is undesirable. Providing incentives for development to be undertaken elsewhere may be more effective than simply trying to stop development on the floodplain. Where land is under development pressure, however, especially from informal development, land-use control is less likely to be effective. Flood protection or construction of houses at high elevation is most appropriate where development intensities are low and properties are scattered, or where the warnings times are short. In areas prone to frequent flooding, protection of the infrastructure and the communication links from floods can reduce the debilitating impacts of flood on the economy.

Flood Forecasting & issuance of timely warnings are complementary to all forms of intervention. A combination of timely, clear & accurate warning messages with a high level of community awareness gives the best level of preparedness for self-reliant action during floods. Public education program/awareness campaign is crucial to the success of warnings intended to preclude a hazard from turning into a disaster.

Evacuation is an essential constituent of emergency planning and evacuation routes may be upward into a flood refuge at a higher elevation or outward, depending upon the local circumstances. Outward evacuations are generally necessary where the depths of water are significant, where flood velocities are high and where the buildings are vulnerable. Successful evacuations require planning and awareness among the population of what to do in a flood emergency.

Active community participation in the planning stage and regular exercises to assess the viability of the system help ensure that evacuations are effective. The provision of basic amenities such as water supply, sanitation and security in areas where affectees gather is particularly important in establishing a viable evacuation system.

## **Challenges in Flood Management**

Besides many other challenges, climate change is emerging as perhaps the greatest environmental challenge for the region in general and for Pakistan in particular, causing floods, droughts and increasing hunger, poverty, displacement, soil degradation and deforestation. Rising number of extreme climate events, shift of monsoon rainfall zone from North-east to North-west, intense, concentrated monsoon rains in short time of interval, inconsistent behavior of monsoon and erratic flash flood events are the major future challenges. There is strong need to educate people about these natural disasters and their frequent occurrence in the region including Pakistan.

There is a growing recognition that current approaches regarding flood management are not as sustainable as they might be. Hence, it is imperative to cope with increasing risks of flooding and the uncertainties of climate change more effectively. Increased population pressure and enhanced economic activities in flood prone areas/floodplains, such as the construction of buildings and infrastructure, further increase the risk of flooding. In developing countries with primarily agricultural economies, food security is synonymous with livelihood security. Floodplains contribute substantially to the food production that provides nutrition for the people of these countries.

Asia-Pacific region is under the very frequent and severe impacts of floods because of its geographical composition. Majority of the region's major cities are located nears river banks or coastal areas, which have concentration of population, assets, economic & industrial development and infrastructures. In addition to riverine floods, Pakistan is also facing urban flooding, which is mainly caused due to torrential rains/heavy falls in urban areas, especially those cities which are overcrowded and having inadequate storm water drainage facilities are badly affected almost every year. Flash floods in semi mountainous regions are causing severe damages to private and public properties. Increasing urban flood risk has pushed all national and international organizations to take measures to confront the threats caused by floods and to build flood resilient cities.

Pakistan is a resource constraint country with a fast growing population, low natural resource development based and unfavorable local socio-cultural conditions, and climate change is an additional stress for the country. Educating masses about natural disasters and building up their preparedness at educational institutions can be of great help to minimize the damages of disasters. Media can play its due role in this regard as without its support, awareness cannot be boosted. Areas vulnerable to climate change-induced natural disasters must have adequate flood protection facilities, besides, reliable medium and long range Weather & Flood Forecasting & Warning System at place.

## **Impact of Rapid Urbanization on Flood Management**

The world is experiencing a historically unprecedented transition from predominantly rural to urban living. In 1950, one-third of the world's population lived in cities. Today the number has already reached more than 50% and by 2050, city dwellers are expected to account for more than two-thirds of the world's population. This rapid rise will mainly take place in developing countries. Africa and Asia are likely to be the fastest urbanizing regions. The urban population projected to reach 64% in Asia by 2050 (currently at 48%).

People move from rural environments into cities (urban areas) to seek economic opportunities and better access to basic services. Climate change is likely to accelerate the migration rate into urban areas by altering the livelihood basis from both fishing and



farming and by increasing the occurrence and intensifying the effects of natural hazards. Land use and other human activities influence the peak discharge of floods by modifying how rainfall and snowmelt are stored on and run off the land surface into streams.

Construction of roads and buildings often involves removing vegetation, soil, and depressions from the land surface. The permeable soil is replaced by impermeable surfaces such as roads, roofs, parking lots, and sidewalks that absorb little water, reduce infiltration of water into the ground, and accelerate runoff to ditches and streams. With less storage capacity for water in urban regions and more rapid runoff, urban areas streams rise more quickly during storms and have higher peak discharge rates than rural areas streams. Total volume of water discharged during a flood tends to be more in urban streams as compared to rural areas streams.

### **Urban Floods in Pakistan: Causes, Impact & Control**

Flooding in urban areas can be caused by flash floods, or coastal floods, or river floods, but there is also a specific flood type that is called urban flooding. Urban flooding is specific in the areas that lack drainage of storm water. Urban flooding is specific in the areas that lack drainage of storm water. High intensity rainfall can cause flooding, when the city drainage system does not have the adequate capacity to drain away the runoff generated through concentrated rains. Urban floods are a great disturbance for daily life in the city. During periods of urban flooding, streets can become fast moving rivers, while basements can become fatal traps as they fill with water.

Urban floods are being experienced in Pakistan in different cities, especially in monsoon season, having high population density (Karachi, Lahore, Faisalabad, Multan, Hyderabad, etc.) with unplanned, clogged, encroached and undersized drainage systems. Urban flooding is a relatively serious problem in the city, especially in the dense parts of the city. The Karachi's vulnerability to the urban flooding is due to population growth, blocking of drainage channels, inappropriate land use and urbanization.

Karachi has many large and small drains, but most of them are choked or encroached. Urban flooding takes place due to the insufficient and encroached storm water drainage system, unplanned urbanization and impact of climate change. The climate vulnerability has contributed to the unpredictability of precipitation in many parts of the world and also to frequent urban flooding in Karachi, which is not only capital of Sindh province of Pakistan but the country's biggest city in terms of both population and area. Karachi is most populous city of Pakistan with population of 14.9 million (according to 2017 census). Karachi is hub of governance, education, business, industry, transport, finance and banking.

The urban flooding in Pakistan usually occurs due to the following reasons:

- High intensity of rainfall and uneven rainfall (due to climate change)
- Population growth/ unplanned housing
- Inadequate sewerage/Storm water drains system.
- Encroachments in the drain way
- Inadequate cleaning of Drains/ Nullahs

- Mismanagement at city/provincial government level
- Little height from sea level (In case of Karachi it is only 1.5 meters above mean sea level)

Urban Floods results in accumulation of storm water on streets, markets, houses, hospitals, school roads, railway tracks and in few cases even at airports. Because of the poor storm water drainage capacity. These result in traffic jams, electricity failure, telecommunication network stops working ambulances carrying get stuck on roads traffic problems and over all city life almost stops or hampered. Urban flooding also results into spread of infectious diseases, loss of precious human life, loss of property, disturbed economic activity and stress on National Economy. Karachi is backbone of Pakistan's economy contributing 42 percent of GDP, 70 percent of income tax revenue and 62 per cent of sales tax revenue. Karachi adds Rupees 16 billion to GDP a day.

Based on the review of available literature, the following recommendations may be helpful made to minimize the damages to human lives and public and private properties in Karachi due to urban flooding:

- i) Flood hazard map of Karachi needs to be prepared with respect to the drainage system and different nullahs on the basis of degree of hazards.
- ii) Once hazard mapping is available early warning system needs to be provided on the different nullahs keeping in view the degree of danger so that necessary evacuation may be carried out in case of emergency situation.
- iii) Cleaning of different nullahs/ storm drains may be carried out well before the onset of monsoon season so that blockage in these nullahs/ storm drains can be avoided.
- iv) Government of Sindh may carry out necessary legislation to stop further dumping of garbage into these nullahs by the local inhabitants.
- v) Removal of encroachments in these nullahs needs to be carried out on top priority.
- vi) Carryout mass campaign among the public to raise the awareness of the flood hazards and its consequences.
- vii) Government of Sindh needs to invest in the rehabilitation of storm drains and carry out proper maintenance of the system.

### **3.3 Achievements of FFC**

Since its establishment in 1977, FFC has so far prepared and executed three National Flood Protection Plans, i.e.

National Flood Protection Plan-I (1978-1988),  
National Flood Protection Plan-II (1988-98) &  
National Flood Protection Plan -III (1998-2008)

The details related to flood projects executed under three Plans is given as under:

#### **National Flood Protection Plan-I (1978-88)**

Number of schemes executed	311
Expenditure incurred	Rs 1,729.75 Million
Source of funding	GOP (100%)

Under NFPP-I, emphasis was mainly given on the implementation of structural measures (construction of flood protection structures). Pakistan Meteorological Department (PMD) and WAPDA carried out only maintenance works related to Flood Forecasting & Warning System equipment.

#### **National Flood Protection Plan-II (1988-98)**

Number of schemes executed in the country	170
Expenditure incurred	Rs 805.33 Million
Source of funding	GOP (100%)

#### **Flood Protection Sector Project-I (FPSP-I)**

Expenditure incurred	Rs 4,735.29 Million
Number of schemes executed in the four provinces	256
Co-financed by GOP and ADB	GOP (20%) ADB (80%)

Besides the above, the following activities were also undertaken for improvement of Country's existing Flood Forecasting & Warning System under Flood Sector Protection Project (FPSP-I), which was jointly funded by ADB and GOP.

- Procurement & installation of Meteor-burst Telecommunication System (Phase-I) including one Master Station and 24 remote sensing stations.
- Installation of 10-CM Quantitative Precipitation Measurement Weather Radar at Flood Forecasting Division (FFD) Lahore.
- Pre-feasibilities studies for four Barrages i.e. Sulemanki, Balloki, Trimmu & Panjnad for increasing their design discharge capacity to carry increased flood flows in view of 1992 floods.
- Preparation of Flood Plain Maps of Indus River (Chashma-Taunsa, Taunsa-Guddu, Guddu-Sukkur, Sukkur-Kotri & Kotri-Seas Reach).

**Prime Minister's River Management Programme (1994-96)**

Expenditure Incurred	Rs 613.39 Million
Number of schemes executed	10
Source of funding	GOP (100%)

**Flood Damage Restoration Project (1988-FDRP)**

Expenditure Incurred	Rs 1,874.00 Million
Number of structures restored all over country	2,028
Source of funding	GOP (10%), IDA & ADB (90%)

**Flood Damage Restoration Project (1992)**

Expenditure Incurred	Rs 6,888.36 Million
Number of structures restored all over country including AJ&K	1,980
Source of funding	GOP (20%), IDA, ADB & KfW (90%)

**National Flood Protection Plan-III (1998-2008)****Normal/ Emergent Flood Programme**

Expenditure Incurred	Rs 4,192.35 Million
Number of schemes executed in all over the country including AJ&K	362
Source of funding	GOP (100%)

**Special Grant through President Directive (2000-02)**

Expenditure incurred	Rs 92.035 Million
Number of schemes executed in Gilgit-Baltistan	21
Source of funding	GOP (100%)

**Flood Protection Sector Project-II (FPSP-II)**

Expenditure incurred	Rs 4,165.00 Million
Number of schemes executed in four provinces	101
Source of funding	GOP (20%) & ADB (80%)
Flood Forecasting and Warning System	Rs 432.12 Million

In addition to the above mentioned Civil Works, the following Flood Forecasting & Warning System related activities were also undertaken:

- Procurement & installation of 24 No. HF-Radio Sets;
- Procurement & installation of 20 additional remote sensing stations under existing Meteor-burst Telecommunication System (Phase-II);
- Up-gradation of 10 CM Quantitative Precipitation Measurement Weather Radar procured under FPSP-I in the premises of FFD, Lahore;

- Up-gradation of 5.36 CM Sialkot Weather Radar into 10 CM Quantitative Precipitation Measurement Weather Radar;
- Procurement & installation of a 10 CM Quantitative Precipitation Measurement Weather Radar at Mangla;
- Development of initial/1<sup>st</sup> version of Computer Based Flood Early Warning System (FEWS) through NESPAK, PMD & Delft Hydraulics;
- Expansion of Flood Plain Mapping activity covering major tributaries of River Indus i.e. Rivers Jhelum, Chenab, Ravi & Sutlej;
- Bathymetric Survey & flow measurements of Indus River and its major tributaries (*Sutlej, Ravi, Chenab & Jhelum*) for improvements in discharge rating curves & to collect data for FEWS Model & Flood Plain Mapping activities.

### **Establishment of Flood Forecasting & Warning System for Lai Nullah Basin**

Expenditure Incurred	Rs 348.00 Million
Source of funding	GOP share (3.2%), JICA Grant-in-Aid (96.8%)

The following facilities were procured and installed in the Lai Nullah Basin (Islamabad & Rawalpindi Cities):

- Two No. Telemetry rainfall gauging stations at Golra and Bokra, Islamabad;
- Two No. water level gauging stations at Kattarian Bridge, Rawalpindi and Gawalmandi Bridge, Rawalpindi;
- Master control station in PMD, Islamabad;
- Two monitoring stations at FFC& TMA/Rescue-1122-Rawalpindi respectively;
- Executive Warning Control Room in Rawalpindi Fire Brigade;
- Nine (9) No. Warning Posts at various locations.

### **National Flood Protection Plan –IV (NFPP-IV) Original**

The need for investment in flood sector gained importance after occurrence of 2010 floods. Federal Flood Commission initiated working on formulation of National Flood Protection Plan-IV. For that purpose, consultants were engaged in May 2013 through World Bank Funded Water Sector Capacity Building & Advisory Services Project (WCAP) for preparation of NFPP-IV for next ten years. The National Flood Protection Plan-IV was prepared in close consultation with all stakeholders at Federal and Provincial Governments level. The draft final version of NFPP-IV was submitted by the Consultants to FFC in May 2015.

### **Approval of NFPP-IV Original Version by Council of Common Interest (CCI)**

Through consultative process based on a series of meetings with all the federal and provincial stakeholders, the final draft version of NFPP-IV costing Rs 332.246 billion was submitted to the CCI for approval. NFPP-IV remained under an extensive deliberation process during the four (4) meetings of the Council of Common Interest (CCI) held on

February 29, 2016, March 25, 2016 & December 16, 2016. It was finally approved in its 31<sup>st</sup> meeting held on May 02, 2017. The following decision was taken:

*“The CCI approved the proposed NFPP-IV (2015-25) and decided that the Financing of NFPP-IV would be made by the Federal and Provincial Governments @ 50:50. The Provinces will decide their respective share of contribution amongst themselves and report to the Federal Government”.*

### Need for Updation of NFPP-IV and Preparation of FPSP-III

- In view of devastating 2022-rains/ floods experienced by the country, it became essential to review and update the National Flood Protection Plan (NFPP-IV), to incorporate protection measures against ever-erratic torrential and pluvial floods experienced during 2022. In a meeting chaired by the Prime Minister of Pakistan on 29<sup>th</sup> August 2022, the Prime Minister directed that **“Flood Protection Plan 2017 to be updated and protection measures against flash floods and hill torrents to be included in the Plan”**.
- In compliance to the Prime Minister’s directive, CDWP re-considered the already processed Umbrella PC-I of FPSP-III in its meeting held on 14<sup>th</sup> September 2022 and decided to also update it by including fresh proposals based on lessons learnt from 2022-Floods, specifically in the context of flash floods, hill torrents and drainage system.

### Scope of Sub-Projects proposed under FPSP-III

- **Structural Interventions**, proposed under FPSP-III, include construction of flood embankments/ dikes, spurs, retaining walls, flood diversion/dispersal structures, small/ medium dams for conservation of flood water, strengthening/remodeling of flood embankments/dikes & improvement of drainage network etc. These interventions will be implemented mainly through Irrigation Departments of the four Provinces, Federal Line Departments (G-B, AJ&K and Merged Areas).
- **Non-Structural Interventions** mainly comprise of Improvement works of Flood Forecasting & Early Warning System, Establishment of Regional FF&W Centres (by PMD), Installation of Flood Telemetry Network & Watershed Management Interventions by WAPDA along main, secondary & tertiary rivers and Construction of ecosystem-based interventions by MoCC & EC through Recharge Pakistan Project.
- Abstract of cost and details related to structural and non-structural measures proposed under the updated FPSP-III is attached at **Table 3.3**.
- Details of Important Interventions/Structures and Expected Benefits under FPSP-III is given at **Table 3.4**.



**Table-3.3: Summary of Interventions in Updated Umbrella PC-I of FPSP-III**

Sr. No.	Description	No. of Sub-Projects	Estimated Cost (Rs Million)
<b>A-Structural Interventions</b>			
a.	Punjab	12	29,708.250
b.	Sindh	40	50,570.590
c.	Khyber Pakhtunkhwa (KP)	31	14,157.200
d.	Balochistan	29	44,289.410
e.	Merged Areas, Khyber Pakhtunkhwa	25	1,206.801
f.	Gilgit-Baltistan	10	8,197.507
g.	AJ&K	4	11,052.59
<b>Sub-Total(A)</b>		<b>151</b>	<b>159,182.35</b>
<b>B-Non-Structural Interventions</b>			
h.	WAPDA	05	15,318.743
i.	PMD	02	5,025.390
j.	Recharge Pakistan Project (MoWR + MoCC)	01	6,000.000
k.	LiDAR Survey of floodplains of Indus River & its tributaries (Pak Army Survey Group)	01	779.900
l.	Hill Torrent Management Studies updation (PCRWR)+ Institutional Reforms of attached Departments of	04	457.590
m.	Federal Flood Commission (i) Project Coordination & Management Unit including office renovation (FFC's office building) ii) Project Supervisory Consultants, iii) Studies, iv) Urban Flood Management Works, v) Rainwater Harvesting in Islamabad & vi) Urban flood management study, etc.	Lump sum	7,861.030
<b>Sub-Total(B)</b>		<b>13</b>	<b>35,442.650</b>
<b>Grand Total (A+B)</b>		<b>164</b>	<b>194,625.00</b>

**Table-3.4: Important Interventions/Structures and Expected Benefits**

Description	Sub-Projects along with Estimated Cost (Rs. Million)	Details of Important Interventions/Structures and Expected Benefits
<b>A-Structural Interventions</b>		
Punjab	12 (29,708.250)	<ul style="list-style-type: none"> <li>34 No. Flood embankments &amp; 17 No. Spurs/Studs, Flood Carrying Channels for Vidore &amp; Mithawan Hill Torrents Remodeling of Nutkani Flood Carrying Channel Bela removal upstream Qadirabad Barrage at River Chenab, Modernization of IRI, Lahore</li> <li>Protection of 160,000 people, 5,000 houses, 12 BHU, 20 No. Irrigation Channels, 30 No. schools, 10 No. roads and 31,000 acres of lands</li> </ul>
Sindh	40 (50,570.590)	<ul style="list-style-type: none"> <li>81 River Training works, 79 No. Gabion structure, 51 No. Flood embankments and 66 No. FDR works, Flood Carrying Channel from MNV Head Regulator (RD 224 – 346) along FP Bund</li> <li>Protection of 2,507,800 people, 65,500 households, and 685,000 acres of agricultural lands</li> </ul>
Khyber Pakhtunkhwa	31 (14,157.200)	<ul style="list-style-type: none"> <li>56 No. flood protection/ river training works gabion wall and embankments etc.</li> <li>24,699 acres of agricultural lands, Village abadies &amp; other properties along Rivers Swat, Panjkora, Kabul and their tributaries and hill torrents like Tochi Rivers etc.</li> </ul>
Merged Area of Khyber Pakhtunkhwa	25 (1,206.801)	
Balochistan	29 (44,289.410)	<ul style="list-style-type: none"> <li>80 No. River Training Works, 9 No. Dispersal structures, 9 Small Dams (154,863 Acre-feet), 1 No. Distribution Structure, 39 No. flood embankments and 33 No. FDR Works of 2022</li> <li>Approx. 22,850 people, 3,811 farm families, 5,762 houses, 12,910 acres crop lands, 1,500 livestock and 223 No. Tube Well</li> </ul>

Description	Sub-Projects along with Estimated Cost (Rs. Million)	Details of Important Interventions/Structures and Expected Benefits
Gilgit-Baltistan	10 (8,197.507)	<ul style="list-style-type: none"> <li>Channelization of Nullahs, Construction of Gabion Flood Protection wall and Stud/Spur, &amp; Dispersal Structure in 10 Districts i.e. Gilgit, Diamer, Ghizar, Hunza, Nagar, Astore, Skardu, Shigar, Ghanche &amp; Kharmonig.</li> <li>Around 1,200,000 population, 93,466 acre agricultural lands and 4,500 houses</li> </ul>
AJ&K	4 (11,052.59)	<ul style="list-style-type: none"> <li>26 No. small dams and construction of flood protection wall on the vulnerable locations</li> <li>200 acres agriculture land, Conservation of 55,345 Acre feet of flood water for irrigation (about 19,224 acres) and drinking purposes (0.521 MGD), Population of 520,150, 1,539 Tons Fish annually, Hydropower 566,800 KW</li> </ul>
<b>B-Non Structural Interventions</b>		
WAPDA	05 (15,318.743)	<ul style="list-style-type: none"> <li>Installation of 457 Telemetry Stations on country wide basis as Phase-I of National Master Plan for Flood Telemetry,</li> <li>Formulation of National Watershed Management Plan covering Swat Basin, Indus Basin &amp; Upper Indus Basin, Hazara Area, Haro &amp; Soan River, Gomal, Zhob, Kohat and various hill torrents, Nari Basin Hub Basin, NaiGaj Basin and Gilgit-Baltistan.</li> <li>Besides sub-projects for improved data sets for making more accurate flood forecasts and conducting climate studies, timely flood early warnings etc.</li> </ul>

Description	Sub-Projects along with Estimated Cost (Rs. Million)	Details of Important Interventions/Structures and Expected Benefits
PMD	02 (5,025.390)	<ul style="list-style-type: none"> <li>Improved weather forecast, riverine flood and flash flood forecast, Institutional weather early warning capabilities strengthening and increased satisfaction of end-users, besides others.</li> <li>Six (06) New Regional Flood Forecasting &amp; Early Warning Centers at Karachi, Peshawar, Quetta, Konadas (G-B), Muzaffarabad and Multan. Besides Upgradation of FFD, Lahore &amp; National FF&amp;EW Centre at Islamabad.</li> <li>252 No. Automatic Weather Stations on countrywide basis</li> </ul>
LiDAR Survey of flood plain areas of Indus River and its tributaries (Army's Survey Group)	01(779.900)	<p>Selected River Reaches</p> <ul style="list-style-type: none"> <li>Capture High Resolution images along with accurate terrain information/ DEMRiver Indus include Section I (Kalabagh-Chashma), Section II (Chashma- Taunsa), Section III (Taunsa- Guddu), Section IV (Guddu- Sukkur) and Section V (Sukkur-Kotri);</li> <li>River Chenab (Marala- Trimmu);</li> <li>River Jhelum (Rasul- Trimmu); &amp; River Kabul (Warsak- River Indus)</li> </ul>
Recharge Pakistan Project (MoWR + MoCC)	01 (6,000.000)	<ul style="list-style-type: none"> <li>This long-term project envisions that by 2050, ecosystem-based adaptation contributes towards better climate resilience, water and food security and sustainable livelihood.</li> <li>More than 10 million people will directly benefit from the project, while 20 million people across 50 vulnerable districts of Pakistan will be the indirect beneficiaries.</li> <li>The project will be implemented in selected sites, spanning over a stretch of 1,300 km of Indus River, across Khyber Pakhtunkhwa, Punjab, Sindh and Balochistan.</li> </ul>

Description	Sub-Projects along with Estimated Cost (Rs. Million)	Details of Important Interventions/Structures and Expected Benefits
Hill Torrent Management Studies updation (PCRWR)+ Institutional Reforms of attached Departments of MoWR	04 (457.590)	<ul style="list-style-type: none"> <li>Minimize environmental degradation of catchment areas</li> <li>Green interventions in Gilgit-Baltistan by providing               <ul style="list-style-type: none"> <li>→ 20 No. Solar-Powered Lifting Pumps,</li> <li>→ 20 water storage ponds,</li> <li>→ drip irrigation to irrigate 100 hectors barren lands,</li> <li>→ 20 orchards sites and afforestation of trees, grasses and hedges</li> </ul> </li> <li>Besides in Thar Desert,               <ul style="list-style-type: none"> <li>→ 500 Water Tanks,</li> <li>→ 10 No. Rainwater Harvesting Katcha Ponds,</li> <li>→ 2 No. Retention Dams/ Check Dams,</li> <li>→ Rehabilitation of 10 No. existing local ponds</li> <li>→ Rehabilitation of 8 No. Dug Wells and</li> </ul> </li> <li>Promotion of saline agriculture in 50 acres of lands in Thar.</li> </ul>
Federal Flood Commission	7,861.030	<ul style="list-style-type: none"> <li>→ Project Coordination &amp; Management Unit including office renovation (FFC's office building)</li> <li>→ Project Supervisory Consultants,</li> <li>→ Important Technical Studies</li> <li>→ Urban Flood Management Works,</li> <li>→ Rainwater Harvesting &amp; Urban flood management studies, etc.</li> </ul>

### Socio-Economic Benefits related to FPSP-III

- The implementation of FPSP-III is expected to accrue following benefits: -
  - Saving of about 15.761 million populations from future floods;
  - Protection of 8.050 million Acres of agriculture land from inundation
  - Protection of 2.2 million houses;
  - Protection of 76 schools;
  - Protection of 331 Km Metalled Road;
  - Protection of 64 villages;
  - Protection of 223 Tube Wells; and
  - Protection of 3,825 Farm Families

*(Benefits derived from sub-projects/proposals submitted by PIDs/FLAs).*

### **Approval Status Agencies**

- Regarding FPSP-III, it is stated that a Pre-CDWP meeting was held on March 16, 2023 to review the umbrella PC-I of FPSP-III (updated), wherein the project was recommended for consideration of CDWP/ ECNEC subject to clarification of some observations of PD&SI Division.
- Replies to Pre-CDWP decisions/ observations were submitted by FFC to PD&SI Division on April 12, 2023 with the request to place the project in the next meeting of CDWP/ECNEC for its approval.
- Thereafter, CDWP considered the project in its meeting held on May 23, 2023 and approved/ recommended the project for ECNEC's consideration.
- Consequently, updated Umbrella PC-I costing Rs 194.625 billion stands approved by the ECNEC in its meeting held on June 27, 2023.
- Subsequently, Ministry of Water Resources has issued Administrative Approval on July 25, 2023.
- The project will be implemented in the next five (05) years period.

### **Financing Arrangements & Potential Donor Agencies**

- ECNEC approved the project with following financing plan: -
  - GOP Equity = 20% Federal Components + 10% Provincial Components
  - Provinces = 10% Provincial Components
  - Donor Financing = 80%
- PD&SI Division has kept Rs. 10 billion (Rs. 1 billion GoP as local share & Rs. 9 billion as external financing) under PSDP 2023-24 for implementation of FPSP-III updated.
- Provinces have already been requested to ensure matching Provincial funds under their respective ADPs of current financial year. Subsequently, PID, Balochistan allocated Rs. 232.408 million under ADP 2023-24 for their FPSP-III sub-Projects. Likewise, Government of Punjab also approved an ADP allocation of Rs. 445.63 million under C.F.Y 2023-24 for their FPSP-III sub-projects subject to concurrence from Election Commission of Pakistan.
- EAD was requested on August 18, 2023 to secure external financing from each agency/ donors (As per ECNEC decision)
- For implementation of structural measures of FPSP-III, pipeline financing so far indicated by Islamic Development Bank (IsDB) was worth USD 240 million while by Asian Infrastructure Investment Bank (AIIB) worth USD 120 million, however, it has not materialized yet.
- EAD, PD&SI Division and Ministry of Finance are yet to decide Loan Agreements and Grant Funding required for implementation of FPSP-III updated.

### **Coordination mechanism with Provinces and other Stakeholders**

- Project Steering Committee under Deputy Chairman Planning Commission has been notified (August 29, 2023).



- ADB & NDRMF have been requested to fund establishment of Project Coordination & Management Unit in line with approval of ECNEC.
- MOU between FFC and NDMRF has been signed for Joint Appraisal and Joint Monitoring of the updated NFPP-IV/ FPSP-III sub-projects.
- Capacity Building of under-staffed and under-privileged FFC is direly needed for implementation of updated FPSP-III/ NFPP-IV.

### **Timelines**

- The project will be implemented in the next five (05) years period.
- Nevertheless, it is pertinent to mention that as per the approval of ECNEC, the financing modality of FPSP-III is 80:20 (80% from external donors & 20% by GoP) and without any loan/ grant agreement/formalities from the external donors, implementation of FPSP-III could not be materialized.
- Considering the above constraint, local/ GoP share of 10,000 million allocated under PSDP 2023-24 may not be utilized upto 30<sup>th</sup> June 2024.

### **Current Status (FPSP-III)**

- Annual Work Plan (2023-24) for updated FPSP-III has been finalized based on Stakeholders Meeting held on September 05, 2023 and stands submitted to MoWR.
- 1<sup>st</sup> Meeting of FFC's Securitizing Committee on FPSP-III sub-Projects was held on September 18, 2023
- Six (06) Sub-Projects of FPSP-III project were considered in the above meeting. The Committee suggested some improvements in the project proposals (PC-Is/ PC-IIs), thereafter the schemes will be reconsidered by the forum.
- 2<sup>nd</sup> Meeting of FFC's Securitizing Committee on FPSP-III sub-Projects was held on December 18, 2023
- 13 Sub-Projects of FPSP-III project were considered in the above meeting. Out of those 05 were cleared whereas 09 were deferred.
- PC-I for establishment of PCMU for FPSP-III has been submitted to MoWR on February 07, 2024 for approval and arrangements of funds after incorporation of replies /compliance to MoWR's observations. Corrected PC-I stands uploaded on i-PAS on March 28, 2024.

### **Current Status (NFPP-IV updated)**

- In compliance to the PM's directives dated August 29, 2023, M/s Deltares of Netherlands is updating NFPP-IV through ADB financing and in consultation with all concerned federal and provincial stakeholders mainly the Federal Flood Commission (FFC).
- For the above, FFC extended all possible support to ADB for NFPP-IV updation and organized/ hosted many stakeholders meetings. Subsequently, final stakeholders consultative Workshop on the updated Plan, prepared hitherto, on August 29, 2023.

- Subsequently, FFC received draft versions of NFPP-IV (Sep & Nov 2023 and January & February 2024) which were reviewed by FFC for want of certain improvements required in the document.
- The draft finalized version of February 2024 was discussed in consultative meeting of PD&SI Division on February 20, 2024, wherein PD&SI Division directed to include 4RF/non FPSP-III/NFPP-IV (without cost implications), circulate the draft plan among the Provinces / respective FLAs and seek their endorsement of respective sub-projects and their certificates that these sub-projects are intended for flood protection works that emerged after 2010 and 2022 floods.
- Subsequently, FFC ensured inclusion of 4RF/non FPSP-III/NFPP-IV projects of provinces in Updated NFPP-IV through ADB consultants. FFC also approached all stakeholder departments for providing the requisite endorsement letter and certificates. The same have been received from the concerned agencies.
- In line with the above, modified draft Updated NFPP-IV document containing requisite endorsement/

### 3.4 Normal/ Emergent Flood Programme

Federal Flood Commission is the federal coordinating body for implementation of Normal/ Emergent Flood Programme, which was started in (1978-79). It is a yearly program in which Provincial Irrigation Departments and Federal Line Agencies submit their schemes (based on their shares) each year, which are processed by FFC for technical clearance of Scrutinizing Committee of FFC, approval of DDWP/CDWP and release of funds by Planning Commission/Finance Division to the executing agencies.

The award of contract, execution and disbursement is the exclusive responsibility of Provincial Irrigation Departments and Federal Line Agencies. The urgent nature flood protection works are proposed by the Provincial Irrigation Departments and Federal Line Agencies for execution under Normal/Emergent Flood Programme.

Around 373 number flood project costing Rs 9.420 billion have been approved for implementation through Normal/Emergent Flood Programme during the period 2007-08 to 2021-22. However, due to inadequate budget allocation under PSDP each year (*minimal as compared to the Provinces & Federal Line Agencies demands*) for Normal/Emergent Flood Programme, the execution of some urgent nature flood protection schemes remained un-attended. It has now been merged under the recently approved FPSP-III.

The budget demand by the Provinces and Federal Line Agencies, budget allocated and actually released during the past years to PIDs & Federal Line Agencies is given in **Table 3.5**.

**Table 3.5: Status of Budget Demanded and Allocated during 2010-11 to 2022-23**

(Rs. Millions)

Sr. No.	Financial Year	Funds Demanded*	Budget Allocation under PSDP		Funds Released
			Original	Revised	
1.	2010-11	3,500.00	740.798	735.752	276.714
2.	2011-12	4,000.000	894.000	844.194	567.095
3.	2012-13	4,000.000	900.000	597.483	419.325
4.	2013-14	4,500.000	1,000.000	1,000.000	852.650
5.	2014-15	5,000.000	1,000.000	1,000.000	897.903
6.	2015-16	5,500.000	1,000.000	964.430	964.430
7.	2016-17	5,515.000	500.000	500.000	267.500
8.	2017-18	11,223.516	500.000	500.000	244.010
9.	2018-19	10,000.00	1,000.000	1,000.000	610.000
10.	2019-20	10,000.00	500.000	500.000	500.000
11.	2020-21	10,000.00	1500.000	0.000	0.000
12.	2021-22	10,000.00	1500.000	720.368	720.368
13.	2022-23	10,000.00	750.000	1224.536	1224.536
<b>Total</b>		<b>93,238.516</b>	<b>11,784.798</b>	<b>9,586.763</b>	<b>7547.988</b>

\* Funds demanded by PID'S & FLA'S for execution of flood protection works

An amount of Rs. 1224.536 million was allocated under PSDP (2022-23) for Normal/ Emergent Flood Programme.

### **Summary of Investment on Flood Projects (GOP Grants/ Foreign Aid)**

The summary of investment on flood projects through GOP grants & foreign aids coordinated by FFC since 1978-79 to June 2023 is given in **Table 3.6**.

**Table 3.6: Summary of Federal Investment on Flood Protection Works**

Sr. No.	Flood Plans/ Programs	Location	No. of Schemes	Expenditure (Rs Million)
<b>1. NFPP-I (1978-88)</b>				
i.	Normal Annual Development Programme GOP funded	Countrywide	311	1,730
<i>Sub-Total (NFPP-I)</i>			<i>311</i>	<i>1,730</i>
<b>2. NFPP-II (1988-98)</b>				
i.	Normal/Emergent Flood Programme	Countrywide	170	805

Sr. No.	Flood Plans/ Programs	Location	No. of Schemes	Expenditure (Rs Million)
ii.	First Flood Protection Sector Project (FPSP-I) Co-financed by GOP & ADB	Four Provinces	256	4,735
iii.	Prime Minister's River Management Programme (1994-96)	Punjab, KP & Balochistan	10	613
<i>Sub-Total (NFPP-II)</i>			<b>436</b>	<b>6,153</b>
<b>3. NFPP-III (1998-2008)</b>				
i.	Normal/Emergent Flood Programme	Countrywide	362	4,192.348
ii.	Second Flood Protection Sector Project FPSP-II (1998-2007) Co-financed by GOP & ADB	Four Provinces	101	4,165.00
iii.	Special package executed through President Directives (2000-02)	Gilgit-Baltistan	21	92.035
iv.	Lai Nullah Flood Forecasting & Warning System through JICA grant-in-aid	District Rawalpindi & ICT	1	348.00
<i>Sub-Total (NFPP-III)</i>			<b>485</b>	<b>8,797</b>
<b>4. Normal/Emergent Flood Programme</b>				
i	Normal/Emergent Flood Programme (2008-09 to 2022-23)	All over country	373	9,420
<i>Sub-Total (N/EFPP)</i>			<b>373</b>	<b>9,420</b>
<b>Total (1+2+3+4)</b>			<b>1588</b>	<b>26,100</b>
<b>5. Flood Damages Restoration Projects</b>				
i.	1988-Flood Damage Restoration Project	Four Provinces	2,028	1,874
ii.	1992-Flood Damage Restoration Project	Countrywide	1,980	6,888
<b>Grand Total</b>			<b>4,008</b>	<b>8,762</b>

### 3.5 Institutional Flood Management Mechanism

Flood management is a multifunctional process involving following a number of organizations. Government Organizations, which play major role in the flood management, are:

- Irrigation Departments of the four Provinces (Punjab, Sindh, Khyber Pakhtunkhwa and Balochistan);
- Irrigation & Water Management Department, Government of GB,
- Irrigation & Small Dams Directorate, Government of AJ&K.
- PMD/Flood Forecasting Division, Lahore.
- Water and Power Development Authority (WAPDA).
- Office of the Pakistan Commissioner for Indus Waters (O/o PCIW).
- Federal Flood Commission (FFC).
- National Disaster Management Authority (NDMA).
- Pakistan Army

- National Highway Authority (NHA)/ Provincial Communication & Highway Departments
- Pakistan Railways
- Provincial Disaster Management Authorities, GB-DMA and SDMA including District Administrations/ DDMAAs

Major functions of the above organizations are briefly described hereinafter:

### **Provincial Irrigation Departments (PIDs)**

Provincial Irrigation Departments (PIDs) play a front line role in flood management, fighting and mitigation. Major flood related functions include:

- i. Operation and maintenance of Barrages, Irrigation & Drainage Networks, including flood protection structures, besides, measurement of discharges at control points (Barrages/Headworks) across main rivers;
- ii. Planning, design, construction of new Irrigation, Drainage & Flood Protection/ River Training projects;
- iii. Collection and transmission of Rivers flows data to FFD, Lahore, FFC and other concerned organizations for taking further action at their end;
- iv. Establishment & Operation of Flood Warning Centre during the monsoon season each year for sharing flood flows data and other information, besides, timely dissemination of the flood forecasts/warnings to concerned quarters;
- v. Preparation & implementation of the Flood Fighting Plans during monsoon season every year.

### **Water and Development Authority (WAPDA)**

- i. WAPDA is actively involved in the flood forecasting process as it provides water levels of major reservoirs (Tarbela, Chashma & Mangla), river flows and rainfall data collected through Flood Telemetric System/Gauged sites in the catchment areas of major rivers;
- ii. The system is supplemented by Meteor-burst communication system. WAPDA supports another hydrometric data measurement and transmission system through its Surface Water Hydrology Project;
- iii. WAPDA's Flood Telemetric Network is directly linked with FFD, Lahore. WAPDA provides hydrometric flood data and water levels, inflows/ outflows of Tarbela, Chashma and Mangla reservoirs to FFD, Lahore, FFC and other concerned organizations;
- iv. Coordination between FFD Lahore and WAPDA has considerably improved after the 1992-flood disaster;
- v. Regular meetings in the office of General Manager (Planning & Design) are held during flood season and necessary instructions are issued to Tarbela and Mangla Dam Flood Management Committees.

### **Provincial Disaster Management Authorities (PDMAs)**

- i. Ultimate aim of flood warnings is to reduce the loss of life and damages to property of the community living in the flood prone/high risk areas;
- ii. Provincial Disaster Management Authorities are responsible for disaster preparedness, preparation of emergency response plan, rescue and relief

- measures and rehabilitation plan and its approval from Provincial Government before implementation;
- iii. They examine the vulnerability of various parts of the province to different disasters and specify prevention or mitigation measures; lay down guidelines for preparation of disaster management plans by the Provincial Department and District Authorities; evaluate preparedness at governmental levels to respond to disaster and enhance preparedness; coordinate response in the event of disaster; give directions to DDMA's regarding actions to be taken in response to disaster; and promote general education, awareness and community training etc. pertaining to all disasters including floods;
  - iv. Relief functions at the District and Tehsil/Union Council level are now performed through the District Disaster Management Authorities, who coordinate with the concerned departments to carry out the disaster management functions at the District level.

### Pak Army

- i. Pak Army's Corps of Engineers under the command and control of Engineer-in-Chief (E-N-C) provide necessary help to the civil authorities to carry out rescue and relief operations during floods;
- ii. Provincial Governments facilitate Pak Army in providing necessary logistic support/equipment (boats, life jackets, vehicles, tents etc.) for such operations.
- iii. Pakistan Army's flood related functions encompass all the three phases of flood operations from the pre-flood to post flood phases including the important flood phase;
- iv. Pre-flood phase is the flood preparatory phase during which the adequacy and serviceability of the flood fighting equipment is ensured;
- v. Pre-flood meetings are also held at the Corps Head Quarters and Engineer Directorate, GHQ in order to review the arrangements of PIDs, PDMA's & Federal Line Agencies for handling flood situation;
- vi. Pre-flood inspections of the flood protection structures are carried out by the respective Commander Corps of Engineers alongwith concerned field formations of Provincial Irrigation Departments for their respective areas to ensure that the flood protection structures (Bunds, Barrages, Spurs etc.) are in satisfactory state of maintenance. Deficiencies, if any, are brought into the notice of PIDs;
- vii. Availability of flood fighting material and sufficient stock of explosives is ensured at pre-determined breaching sections to activate the pre-determined breaching sections, whenever required;
- viii. An officer of the 4 Corps Engineers is placed on duty in the Flood Warning Centre, Lahore, to keep a close watch on the flood situation;
- ix. All flood forecasts and warnings are communicated to the CC Engineers 4 Corps in time, which are transmitted to the D.G. Engineers and all other CC of the Engineers;
- x. In the event of floods, units of the Pak Army move out to their respective areas of responsibility and carry out the relief and rescue operations in coordination with the respective civil administration;
- xi. A post flood coordination meeting is held under the Chairmanship of Engineer-in-Chief/D.G. Engineers to discuss the performance of all flood management related agencies with the view to bring about the necessary improvements in future.



**Office of Pakistan Commissioner for Indus Waters (O/o PCIW)**

- i. Pakistan has a unique flood-forecasting problem in the sense that major part of the flood generating in upper catchments of Rivers Sutlej, Ravi, Jhelum and Chenab lie across the border in India/ held Kashmir;
- ii. A number of water storage reservoirs have been constructed over Eastern Rivers (Ravi & Sutlej) across the border. As a result, the free flood flow conditions are disrupted making the operation of the rainfall/runoff model extremely difficult;
- iii. The situation underlines the need for the acquisition of rivers flow data from across the border in respect of important sites over the rivers in India/held Kashmir;
- iv. Consequently, an agreement had been signed between the two countries in 1989 through their respective Commissioners for Indus Waters, which includes provision/ sharing rivers flows data with India such rivers flow and rain data as is considered important for flood forecasting in Pakistan. A number of river flow stations are specified for this purpose;
- v. The Pakistan Commissioner for Indus Waters receives the Chenab River and Eastern Rivers (Ravi & Sutlej) data normally once in a day;
- vi. The data is then passed on to the FFD, Lahore for preparation and issuance of flood forecast to concerned organizations;
- vii. Frequency of data reception is increased to six hourly and even to hourly in case of severe flood situation;
- viii. Pakistan Commissioner for Indus Waters is thus responsible to provide to FFD, Lahore, the much-needed data obtained from India for use in the flood forecasting models to ensure accurate forecasts for Rivers Sutlej, Ravi, Jhelum & Chenab;
- ix. Pakistan Commissioner for Indus Waters is the only forum through which any clarification or further information can be obtained from India with regard to flood flows data of Chenab & Eastern River (Ravi & Sutlej).

**National Disaster Management Authority (NDMA)**

- Government of Pakistan had embarked upon establishing appropriate policy to minimize risks and vulnerabilities and passed NDMA ordinance 2006;
- National Disaster Management Authority (NDMA) serves as focal point and coordinating body to facilitate implementation of disaster risk management strategies;
- This necessitates NDMA to directly interact/communicate with all stakeholders, including Ministries, Divisions, and Departments in relaxation to normal communication channel;
- NDMA is an expedient to provide an effective national disaster management system and for matters connected therewith and incidental thereto. As per National Disaster Management Authority Act-2010, the main functions of NDMA are as under:
  - i. Act as implementing, coordinating and monitoring body for disaster management;
  - ii. Prepare the National Plan to be approved by the National Disaster Management Commission;
  - iii. Implement, coordinate and monitor the implementation of the national policy;

- iv. Lay down guidelines for preparing Disaster Management Plans by different ministries or departments and the provincial authorities;
- v. Provide necessary technical assistance to provincial government and provincial authorities for preparing their Disaster Management Plans in accordance with the guidelines laid down by the National Disaster Management Commission;
- vi. Coordinate response in the event of any threatening disaster situation or disaster;
- vii. Lay down guidelines for the concerned ministries or provincial governments and provincial authorities regarding measures to be taken by them to response to any threatening disaster situation or disaster;
- viii. For any specific purpose or for general assistance requisition the services of any person and such person shall be co-opted as member and exercise such power as conferred upon him by the authority in writing;
- ix. Promote general education and awareness in relation to disaster management;
- x. Perform such other functions as the National Disaster Management Commission may require performing.

#### **Flood Forecasting Division (FFD), Lahore**

- FFD, Lahore, the specialized unit of Pakistan Meteorological Department, plays a pivotal role in the Flood Forecasting & issuance of Warnings to concerned quarters;
- It obtains hydro-meteorological data from the various National and International sources, which is then analyzed to produce weather /flood forecasts & warnings and disseminated to various Federal/Provincial organizations and electronic/print media through various means and also uploaded on PMD Website.

#### **Role of Federal Flood Commission in Flood Management**

FFC mainly plays coordination role among Provincial and Federal Government Organizations dealing with flood management in the country for avoiding loss of life and minimizing damages to agricultural lands and other public and private property. However, managing the flood water is the sole responsibility of Provincial Irrigation Department and Federal Line Agencies.

#### **Pre-Monsoon Season Action Taken by FFC**

- FFC chalks out pre-emptive measures for better flood management during monsoon season.
- For that purpose, first Pre-Monsoon 2023 meeting of Federal Flood Commission was held on 6<sup>th</sup> March 2023 under the Chairmanship of Chief Engineering Advisor/ Chairman Federal Flood Commission in the Committee Room of office of CEA & CFFC in order to review the progress on post 2022 flood activities and preparatory works for Monsoon Season 2023. Accordingly, necessary directions regarding

pre-emptive measures for Monsoon Season 2023 were issued to concerned organizations.

- 2nd Pre-Monsoon 2023 meeting of Federal Flood Commission was held on 7<sup>th</sup> June 2023. The purpose of the meeting was to review the preparedness for Monsoon Season 2023.

### **Role of FFC during Monsoon Season**

- 58<sup>th</sup> Annual meeting of FFC was organized on 11<sup>th</sup> July 2023 in the Committee Room No. 5, 2<sup>nd</sup> Floor, Parliament House Building, Islamabad. The Honourable Federal Minister for Water Resources chaired the meeting. The meeting was attended by all stakeholders for presenting their status of preparedness. Necessary directions were issued to concerned organizations for assuring the safe passage of flood flows during Monsoon Season 2023.
- Flood Communication Cell established in FFC started working on round the clock basis with effect from 15<sup>th</sup> June 2023 and worked on 24-hour basis during the entire Monsoon Season (15<sup>th</sup> June - 15<sup>th</sup> October 2023) for obtaining weather, rainfall, Rivers flow data and reservoirs water levels including inflows/outflows, besides, other flood situation information as received from FFD, Lahore/PMD, PCIW, WAPDA, PIDs, NDMA, PDMA, GBDMA, FDMA, SDMA etc.;
- FFC issued daily Flood Situation Reports (DFSR) on daily basis to higher ups and Flood Management related agencies, based on Weather Forecasts/ Advisories and Rainfall & Rivers flow data as received from FFD, Lahore/PMD, PCIW, WAPDA & PIDs etc.
- This report highlighted the discharges (inflows/outflows) of the main rivers of the Indus River System (i.e. rivers Indus, Jhelum, Chenab, Ravi, Sutlej and Kabul) at important control structures alongwith water levels and storage position of major reservoirs (i.e. Tarbela, Chashma & Mangla) on daily basis. It also indicated the then prevailing meteorological features alongwith weather forecast for the ensuing 24 hours received through FFD, Lahore. The report contained a comprehensive analysis of the situation and relevant & timely suggestions for effective reservoir/ flood management throughout the country.
- In addition to DFSRs, fourteen (14) Press Releases/ Weather Advisories, one (01) Flood Alert, three (03) Significant Flood Warnings and two (02) GLOF Alerts were issued by Flood Communication Cell of FFC;
- Responsibility for response/reaction to warnings issued by PMD/FFD, Lahore & FFC rests upon the concerned Federal and Provincial organizations including District Administrations.

### **Post Monsoon Season Role of FFC**

- FFC technically scrutinizes the PC-Is of all such flood projects through S.C of FFC and submit to Ministry of Water Resources for approval of DDWP/CDWP. Two meetings of Scrutinizing Committee of FFC were organized on 18<sup>th</sup> September 2023 and 18<sup>th</sup> December 2023, wherein flood protection schemes proposed for implementation under Flood Protection Sector Project-III (FPSP-III) were technically examined.

- Post Monsoon 2023 meeting of Federal Flood Commission (FFC) was held on 27<sup>th</sup> November 2023, which was attended by all stakeholders. Necessary directions were issued to concerned organizations for taking immediate steps for implementation of decisions taken in the said meeting.
- Pre-feasibility site inspections of three (03) No. flood protection schemes of Sindh province, proposed for implementation under FPSP-III, were carried out by FFC's Monitoring Team from 13<sup>th</sup> to 16<sup>th</sup> November 2023.
- Pre-feasibility site inspections of two (02) No. flood protection schemes of AJ&K, proposed for implementation under FPSP-III, were carried out by FFC's Monitoring Team from 16<sup>th</sup> to 17<sup>th</sup> November 2023.

### **Flood Warning Dissemination System**

- Monsoon Season normally starts in 1<sup>st</sup> week of July (*sometimes, it starts little early*) and ends in last week of September (*sometimes prolongs up to mid-October*).
- Flood Warning Centers of all flood management related agencies start functioning from 15<sup>th</sup> June every year for collecting weather & flood flow data and keep continue upto 15<sup>th</sup> October.
- During this period, effective interaction and communication between various floods related provincial as well as federal agencies is maintained on round-the-clock basis in order to counter any eventuality due to monsoon rains/ floods.

## **3.6 National Master Plan for Flood Telemetry**

### **Background**

Pakistan's major Hydrologic Units are Indus River Basin, Kharan Desert Basin and Makran Coastal Basin. Main rivers originate from Indus River Basin (IRB) of the northern mountains of Himalays, Karakoram, Hindukush ranges and Kashmir. Indus River is the twelfth largest river in the world and a trans-boundary river in Asia

Pakistan's major Hydrologic Units are Indus River Basin, Kharan Desert Basin and Makran Coastal Basin. Main rivers originate from Indus River Basin (IRB) of the northern mountains of Himalays, Karakoram, Hindukush ranges and Kashmir. Indus River is the twelfth largest river in the world and a trans-boundary river in Asia.

Since the last few decades, climate change has significantly influenced the flood flows in the country and Pakistan has become one of the highly vulnerable countries regarding floods. The rational prevention of natural disasters, such as floods and droughts, is strongly connected with a forecasting technology which cannot be achieved without hydro-meteorological observations. Adequate and accurate hydro-meteorological data at fine time scale is very important and it is essential to improve the monitoring infrastructures by leveraging the modern technologies for remote control areas and data management for performing a range of hydrological studies. The existence of a dense telemetry network of instruments is required to be able to model, predict and plan for catastrophic events which have obvious negative impacts on public health and socio-economic aspects in the country.

The National Master Plan for Flood Telemetry has been prepared by WAPDA, under the overall coordination of FFC and with the technical assistance of ADB in the form of Technical Expert. It is proposed to be implemented in five years with estimated cost of Rs 13,591 Million. Its purpose is to bring improvement in the Flood Early Warning System on country-wide basis including four provinces, GB and AJ&K. The implementation of National Master Plan for Flood Telemetry Network (Phase-I: installation of 457 telemetry stations) has been included in the umbrella PC-I of Flood Protection Sector Project (FPSP-III) which stands approved by the ECNEC on 27th June 2023. Provinces/ Agencies wise detail of Telemetric Stations proposed under Phase-I and II is given in **Table 3.7**.

The National Water Policy-2018 also includes telemetric monitoring as one of the major interventions required to be implemented by 2030 (refer Para 28.11 of NWP) and reflects the following:

- (a) Real-time monitoring of river flows by IRSA through inter alia telemetric monitoring to maintain transparent water accounting system and to check the increasing trend of unaccounted-for water in the Indus System of Rivers (refer Para 28.4 (v) of NWP).
- (b) To maintain a reliable assessment of water resources in the country, federal and provincial water sector organizations would develop a standardized and uniform mechanism for data collection of various parameters of water resources including but not limited to rivers/ canals gauge and discharge, rainfall/ snowfall depth to groundwater table, surface/ subsurface water quality parameters, river canal and reservoir sedimentation

### **Scope of Work under the Plan:**

The scope of work under the Plan is briefly given as under:

- (i) Review the status of existing Hydrological Gauging Network (telemetry/ manual) installed by WAPDA, PIDs/ FLAs, their condition and their data sharing mechanism as required for an assessment.
- (ii) Establish the requirement for installation of telemetry system across the country based on gaps in existing system, hydrological condition of respective catchments/ sub-catchments fulfilling International Data Standards/requirements to ensure registering of flow in all main rivers, secondary and tertiary rivers, small nullahs and streams, so that exact/real-time estimate of flood discharges entering into main Indus & its tributary rivers (Jhelum, Chenab, Ravi, Sutlej and Kabul Rivers) is available for precise flood forecasting.
- (iii) Prepare National Master Plan including all necessary details alongwith GIS Maps prepared for identified locations for telemetry stations in Pakistan.

### **Project Objectives:**

- (i) The project will help the concerned provincial department, for effective planning of their inflows and outflows as per seasonal variations for the delivery of water at farm level.

- (ii) It will complement the ability of various authorities managing the water reservoirs of the country to effectively carry out their functions as per factual Hydro-resources availability.
- (iii) This project will also cater needs of Flood Forecasting Division of Pakistan (FFD), Pakistan Meteorological Department (PMD), National Disaster Management Authority (NDMA) & Provincial Disaster Management Authority (PDMA) to issue early warnings which also help take early flood relief works at district level about upcoming floods to minimize panic in society that is created by sudden flood.
- (iv) This in turn would also help in better planning of water sector projects and better operation of existing water storage dams and hydropower facilities.
- (v) Data generated by the project would help in studies and assessments related to climate change, the environment and disaster management.
- (vi) Real-time monitoring of river flows by IRSA through inter alia telemetric monitoring to maintain transparent water accounting system and to check the increasing trend of unaccounted-for water in the Indus System of Rivers (refer Para 28.4 (v) of NWP).
- (vii) To maintain a reliable assessment of water resources in the country, federal and provincial water sector organizations would develop a standardized and uniform mechanism for data collection of various parameters of water resources including but not limited to rivers/ canals gauge and discharge, rainfall/ snowfall depth to groundwater table, surface/ subsurface water quality parameters, river canal and reservoir sedimentation.

#### **Project Benefits:**

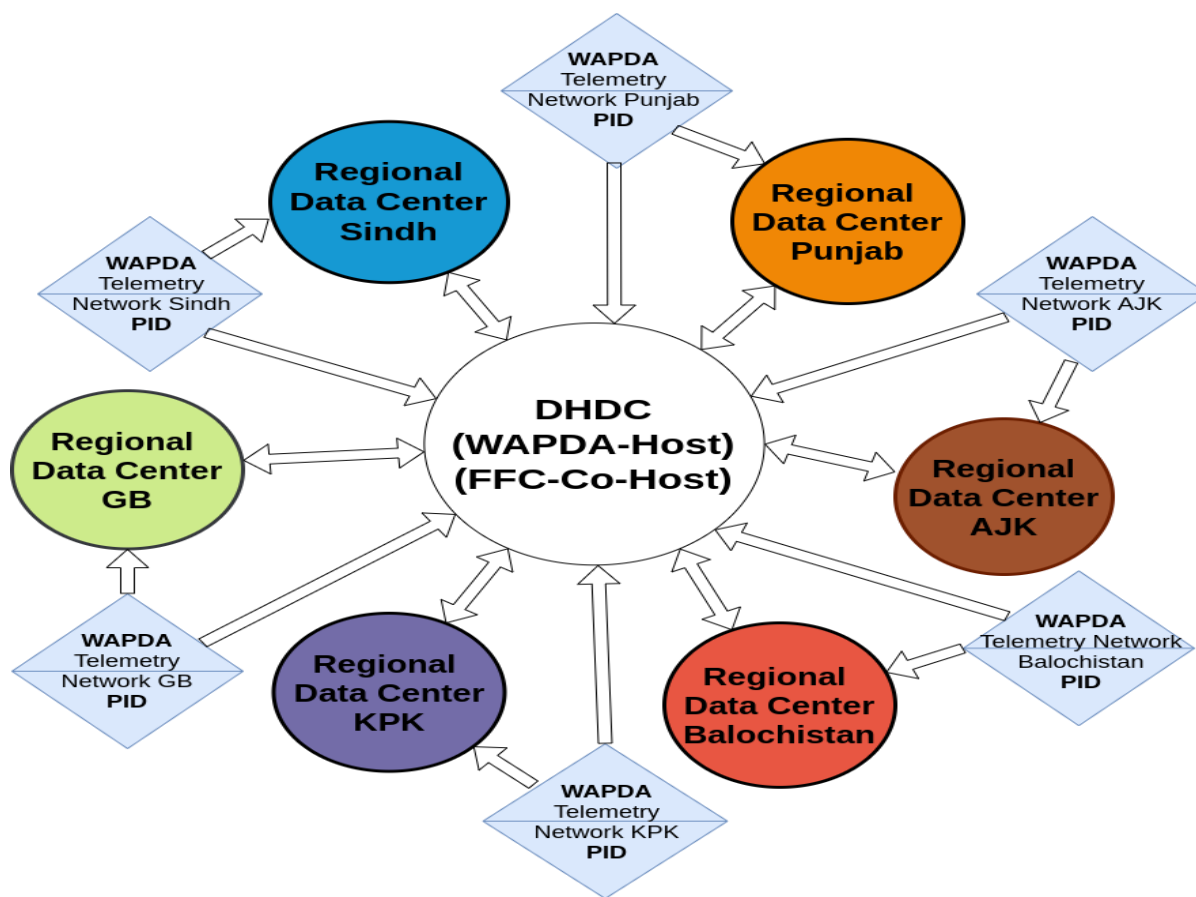
- (i) The benefits of the project are beyond financial limits and cannot be measured in quantitative terms as precious human lives, property and livestock are involved in it.
- (ii) This project will complement the ability of various stakeholders including Indus River System Authority (IRSA), the Federal Flood Commission (FFC), the Pakistan Commissioner for Indus Water (PCIW) and the Pakistan Meteorological Department (PMD), Provincial Irrigation Departments (PIDs) to manage and operate the water infrastructure the water reservoirs of the country to effectively carry out their functions as per factual Water & Power resources availability.
- (iii) This project will help Irrigation Department of various provinces of Pakistan to effectively plan their inflows and outflows as per seasonal variations for the delivery of water at Farm level.
- (iv) This project will also cater for the needs of National Disaster Management Authority and the Provincial Disaster Management Authorities (PDMAs) enabling them quick rescue, relief activities at the district level about upcoming floods.



- (v) This project will help to minimize panic in society that is created by sudden flood in hill torrents areas.
- (vi) This project will also help to design various hydropower projects.
- (vii) This project will help to reduce human errors and improve Upper Indus Basin hydro-meteorological data quality Operational costs will also be reduced by decreasing the manpower. Continuous measuring and reporting of data with high frequency will also be achieved through this Project.
- (viii) Trained staff will be available for processing and management of data after project completion.

**Table 3.7: Summary of Provinces/ Agencies wise detail of Telemetric Stations proposed under Phase-I and II NMP for Flood Telemetry**

Sr. No.	Province/Region	Phase-I	Phase-II	Total
		No. of Stations	No. of Stations	No. of Stations
1.	Punjab	114	37	151
2.	Sindh	30	16	46
3.	Khyber Pakhtunkhwa	90	46	136
4.	Balochistan	149	58	207
5.	Gilgit Baltistan	48	36	84
6.	AJ&K	26	57	83
<b>Total:</b>		<b>457</b>	<b>250</b>	<b>707</b>



**Figure 3.3: Proposed Inter-Connected Hydro-Meteorological Observation Networks, Regional Data Centers and the Digital Hydro Data Center (DHDC), Lahore**

### 3.7 Projects under JICA Grant-in-Aid Programme

Following two proposed projects are being in process for implementation under JICA Grant-in-Aid Programme:

- I. Flood Management Enhancement Project to Islamic Republic of Pakistan (Flood and Telemetry) (Grant Aid Project: Improvement of River Dike and Installation of Telemetry System)
- II. Capacity Development of Effective River Dike Management Response to 2022 Floods in Islamic Republic of Pakistan (Technical Assistance Project)

#### **Flood Management Enhancement Project to Islamic Republic of Pakistan (Flood and Telemetry)**

In response to the request from the Government of Islamic Republic of Pakistan, the Government of Japan signed the minutes of discussion for the above project on 23<sup>rd</sup> July 2023 at Islamabad. After the research and discussions, Japan international Cooperation Agency (JICA) dispatched the Expert Survey Team for the outline design of the Project for Flood Management Enhancement to Pakistan. The team held a series of discussions with the officials of Government of Pakistan and in the course of discussions both sides have confirmed that the project may be composed of two major parts Flood and Telemetry.

In case of floods sites may be surveyed only in Hazara region in KPK for which 19 number of sites were proposed by the Government of KPK in Haripur, Aboutabad and Mansehra districts. JICA team visited and surveyed all sites and short listed with high and medium priority four sites in Haripur and Mansehra Districts.

While installation of 45 telemetry stations, it has been confirmed to install both in Punjab and KPK. The breakup of the requested items by Government of Pakistan are as follows:

- Hydrological and Hydraulic Observation Network
- Central Data Management centers in Islamabad (FFC) Ministry of Water Resource Building and Central Data Management center in Lahore (WAPDA) in the existing building of WAPDA Town Lahore.
- Automatic weather Observation System (AWS).
- Training Component

Concept Clearance Proposal was considered in the pre-CDWP/CCC meeting held on 21<sup>st</sup> June, 2023 wherein it was recommended for approval from the CDWP/ CCC subject to certain observations.

JICA deputed consultants for preparatory survey of the proposal during September to November 2023 and after site survey and thorough consultations, Minutes of Discussions (MD) signed with the JICA consultants and Office of CEA/ CFFC, WAPDA, Irrigation Department, Government of Khyber Pakhtunkhwa and Economic Affairs Division (EAD) on 2<sup>nd</sup> November 2023.

Modified CCP is under process for approval from the CDWP/CCC.

### **Capacity Development of Effective River Dike Management Response to 2022 Floods in Islamic Republic of Pakistan**

Since its creation, Pakistan has faced various severe flood events however, the 2010 and 2022 floods were worst ever in the history of Pakistan. Keeping in view the JICA Head quarter dispatched Disaster Management Advisory Team to Pakistan on flood perspective from October 31<sup>st</sup> to November 11<sup>th</sup> 2022.

The main purpose of the JICA Advisory Mission was to discuss about new Technical Cooperation Projects specifically on flood management and Rehabilitation works of Damaged Dikes/Embankments on Indus River and on flood telemetry Projects. JICA HQ team holds three meetings with FFC, WAPDA, and PIDs under the Chairmanship of CEA/CFFC. Besides, JICA HQ team also visited the flood effected sites of flood embankment downstream Suker Barrage (S.M. Bund). Finally Technical Cooperation Application document submitted by FFC, Ministry of Water Resources to Embassy of Japan in Pakistan through EAD for the consideration of the Bunds Improvement under Technical Cooperation Project under JICA Grant In Aid Program.

Major purpose of the Technical Cooperation is supposed:

- To carry out a comprehensive analysis of Flood 2022 and post flood disaster management through identifying the mechanism of floods and river flood prevention infrastructures. There is also a dire need of modernization of FFC to improve its working.

- To undertake scientific assessment of various flood generation of various flood generating processes of historic flood events basis for the improvement in the flood telemetry, flood forecasting practices and flood mitigation structures.
- Assessment of flood protection infrastructures i.e. river dikes
- Training capacity building of FFC's existing HR (in-country/abroad seminars) including Seminars, workshop and short term courses.
- To enhance the Capacity building of FFC, Irrigation Department Government of Punjab and Sindh to manage river dikes along Indus River basin.

The project is scheduled to be completed in February 2025.

First Joint Coordination Committee (JCC) meeting was held on 14<sup>th</sup> December 2023 wherein Work Plan of the subject Project was finalized.

### 3.8 National Master Plan on Drainage

The Indus River is one of the longest and largest rivers in the world in terms of annual flow. It flows through China (Western Tibet), India (Ladakh) and Pakistan. Originating in the Tibetan Plateau in the vicinity of Lake Manasarovar, the River runs a course through the Ladakh region of India, towards Gilgit-Baltistan and then flows in a southerly direction along the entire length of Pakistan to merge into the Arabian Sea near the port city of Karachi in Sindh Province. It is the longest river of Pakistan. The river has a total drainage area exceeding 1,165,000 km<sup>2</sup> (450,000 sq mi). The Indus River has a total average annual flow of about 138 Million Acre Feet (MAF), of which around 104 MAF of water is diverted to canals. Its major left bank tributaries are the Chenab, Jhelum, the Ravi, the Beas, and the Sutlej. The northern part of the Indus Valley, with its tributaries, forms the Punjab region, while the lower course of the river is known as Sindh and ends in a large delta.

Pakistan experienced devastating rains and floods in 2022. The country received unprecedentedly abnormal rains from July – August 2022 period, especially in the lower half of the country, which generated High Flows in various, hill torrents on a countrywide basis. Among those, some of the Hill Torrents of D.G Khan in the Koh-e-Suleiman range (Sanghar, Vehova, Kaura, Sori Lund etc.) received historically high floods which resulted into high flood situation in Taunsa Barrage (Indus River) and downstream. The hill torrents of Kirthar Range in Sindh and various hill torrents in Khyber Pakhtunkhwa and Balochistan also received high flood flows. As a result, extreme hydro-meteorological events (torrential rainfall) generated flash floods in hill torrents areas of Punjab (D.G. Khan), Balochistan (Lasbela, Barkhan), Khyber Pakhtunkhwa, and Azad Jammu & Kashmir.

Damages caused by Floods 2022 were mostly due to floods peaks on hill torrents of Koh-e-Suleiman and Khirther range in Punjab and Balochistan. It was also observed that during 2022 monsoon season, hill torrents generated almost 9 MAF of flood water. Considering the interprovincial concerns related to drainage of torrential flood water, Federal Minister for Water Resources convened a preliminary discussion on July 07, 2023 in Parliament House Islamabad. Therein, he directed to formulate a comprehensive and all-inclusive National Drainage Master Plan to holistically address the Inter-Provincial drainage issues of Sindh, Baluchistan, Khyber Pakhtunkhwa & Punjab in the context of

2022 torrential flash flooding. The Minister directed Chairman FFC to lead the process for stakeholders consultation for formulation of Master Plan on flood drainage.

In response to the devastating pluvial Flood-2022 and mitigate future risks of Climate Change, it is crucial to implement robust strategies for quantifying un-gauged watershed runoff and taking preventive measures to redirect floodwater to water-scarce areas.

### 3.9 Meetings/ Workshops/ Seminars organized by FFC during the Calendar Year 2023

Meetings/ Workshops/ Seminars organized by Flood Wing during the Calendar Year 2023 are given below in **Table 3.8**.

**Table 3.8: Meetings Organized by FFC during Year 2023**

Sr. No	Name of Meetings	Date
1.	Meeting with PCRWR	18 <sup>th</sup> January 2023
2.	Meeting regarding Updation of the NFPP-IV with ADB's Consultants Team under the Chairmanship of CEA/CFFC	18 <sup>th</sup> January 2023
3.	Meeting with JICA advisors on Flood Management	20 <sup>th</sup> January 2023
4.	Meeting with Netherlands Embassy Officials	24 <sup>th</sup> January 2023
5.	Meeting with JICA Team	31 <sup>st</sup> January 2023
6.	2 <sup>nd</sup> JICA Progress Review Meeting	2 <sup>nd</sup> February 2023
7.	Meeting with ADB on NFPP-IV (WAPDA, PMD, GB, AJ&K & Punjab)	2 <sup>nd</sup> February 2023
8.	Meeting with ADB on NFPP-IV (KP, Balochistan & Sindh)	3 <sup>rd</sup> February 2023
9.	ADB Meeting	13 <sup>th</sup> February 2023
10.	JICA Stakeholders Workshop on Flood Control Planning and Flood Bunds Inspection	14 <sup>th</sup> February 2023
11.	2 <sup>nd</sup> Progress Review Meeting for GoP funded Normal/Emergent Flood Programme during current FY 2022-23 under the Chairmanship of CEA/CFFC.	15 <sup>th</sup> February 2023
12.	Meeting JICA Experts	20 <sup>th</sup> February 2023
13.	Debriefing Session/Wrap Up Meeting with ADB's Foreign Mission to Pakistan on NFPP-IV Updation under the Chairmanship of Secretary MoWR	3 <sup>rd</sup> March 2023
14.	1 <sup>st</sup> Preparatory Meeting of FFC regarding Preparedness for Monsoon 2023 under the Chairmanship of Secretary MoWR	6 <sup>th</sup> March 2023
15.	Courtesy Call – FFC (JICA Headquarter Mission)	6 <sup>th</sup> March 2023
16.	JICA Headquarters Mission- Meeting with Chairman FFC for detail contents of Technical Cooperation Project based on Pre-Flood Seminar's findings and Minutes Signing	13 <sup>th</sup> March 2023
17.	Meeting of JICA Team for the Project for "Improving of Meteorological Observations Weather Forecasting and Dissemination" with FFC and PMD	22 <sup>nd</sup> March 2023
18.	15 <sup>th</sup> Progress Review Meeting of FFC to review progress on Honorable Supreme Court related to Constitution Petition No. 62 of 2010	6 <sup>th</sup> April 2023

Sr. No	Name of Meetings	Date
19.	Stakeholder Consultative Meeting with ADB's Consultative on NFPP-IV Updation	11 <sup>th</sup> April 2023
20.	8 <sup>th</sup> Meeting of the Coordination Committee for Sindh Province	2 <sup>nd</sup> May 2023
21.	2 <sup>nd</sup> Pre-Monsoon Meeting of FFC regarding preparedness for Monsoon Season 2023	7 <sup>th</sup> June 2023
22.	Visit of JICA Team regarding the preparatory survey of the project for Flood Management Enhancement	19 <sup>th</sup> & 20 <sup>th</sup> June 2023
23.	Stakeholders Consultative meeting with ADB/ADB's Consultant Team on NFPP-IV Updation	4 <sup>th</sup> July 2023
24.	Stakeholders Consultative meeting on the Project titled "the Project for Flood Management Enhancement" under JICA Grant assistance under the CEA/CFFC	5 <sup>th</sup> July 2023
25.	58 <sup>th</sup> Annual Meeting of FFC	11 <sup>th</sup> July 2023
26.	Meeting on proposed Master Plan on Drainage	11 <sup>th</sup> July 2023
27.	JICA Meeting with WAPDA, PID, Khyber Pakhtunkhwa and FFC.	17 <sup>th</sup> July 2023
28.	JICA-Preparatory Survey for the Project for Flood Management Enhancement	21 <sup>st</sup> July 2023
29.	NFPP – IV Updation; Meeting of the ADB's Consultants with the Department Responsible for Urban Flood Management	26 <sup>th</sup> July 2023
30.	Meeting with Irrigation Departments of Four Provinces, GB and AJ&K and WAPDA regarding projects for NFPP-IV	4 <sup>th</sup> August 2023
31.	One Day Workshop On Flood Stakeholders Meeting/ Workshops In Collaboration With JICA	22 August 2023
32.	Meeting regarding for Finalization of work Plan for Sub-Projects Proposed for Implementation Under ECNEC Approved Umbrella PC-1, Updated FPSP-III	5 <sup>th</sup> September 2023
33.	3 <sup>rd</sup> Meeting of FFC On Drainage Master Plan	15 <sup>th</sup> September 2023
34.	Scrutinizing Committee Meeting of FFC on FPSP-III Sub-Projects	18 <sup>th</sup> September 2023
35.	Meeting Regarding Minutes of Discussion by JICA	25 <sup>th</sup> to 27 <sup>th</sup> October 2023
36.	High Level Meeting to Review Progress Regarding Implementation of ECNEC's Approved Umbrella PC-I of Flood Protection Sector Project-III (FPSP-III Updated)	27 <sup>th</sup> October 2023
37.	Meeting Regarding Signing of Minutes of Discussion with JICA	2 <sup>nd</sup> November 2023
38.	Post Monsoon 2023 Meeting of FFC	27 <sup>th</sup> November 2023
39.	Meeting with CDM smith's Team on ADB's Technical Assistance Project (TA-10036 Pak) for Enhanced Flood Resilience in Pakistan	28 <sup>th</sup> November 2023
40.	4 <sup>th</sup> Meeting of FFC on Drainage Master Plan	30 <sup>th</sup> November 2023
41.	2 <sup>nd</sup> Scrutinizing Committee Meeting of FFC on FPSP-III Sub-Projects	18 <sup>th</sup> December 2023
42.	3 <sup>rd</sup> Meeting of the Technical Committee on MoWR- Related SDG indicators	18 <sup>th</sup> December 2023



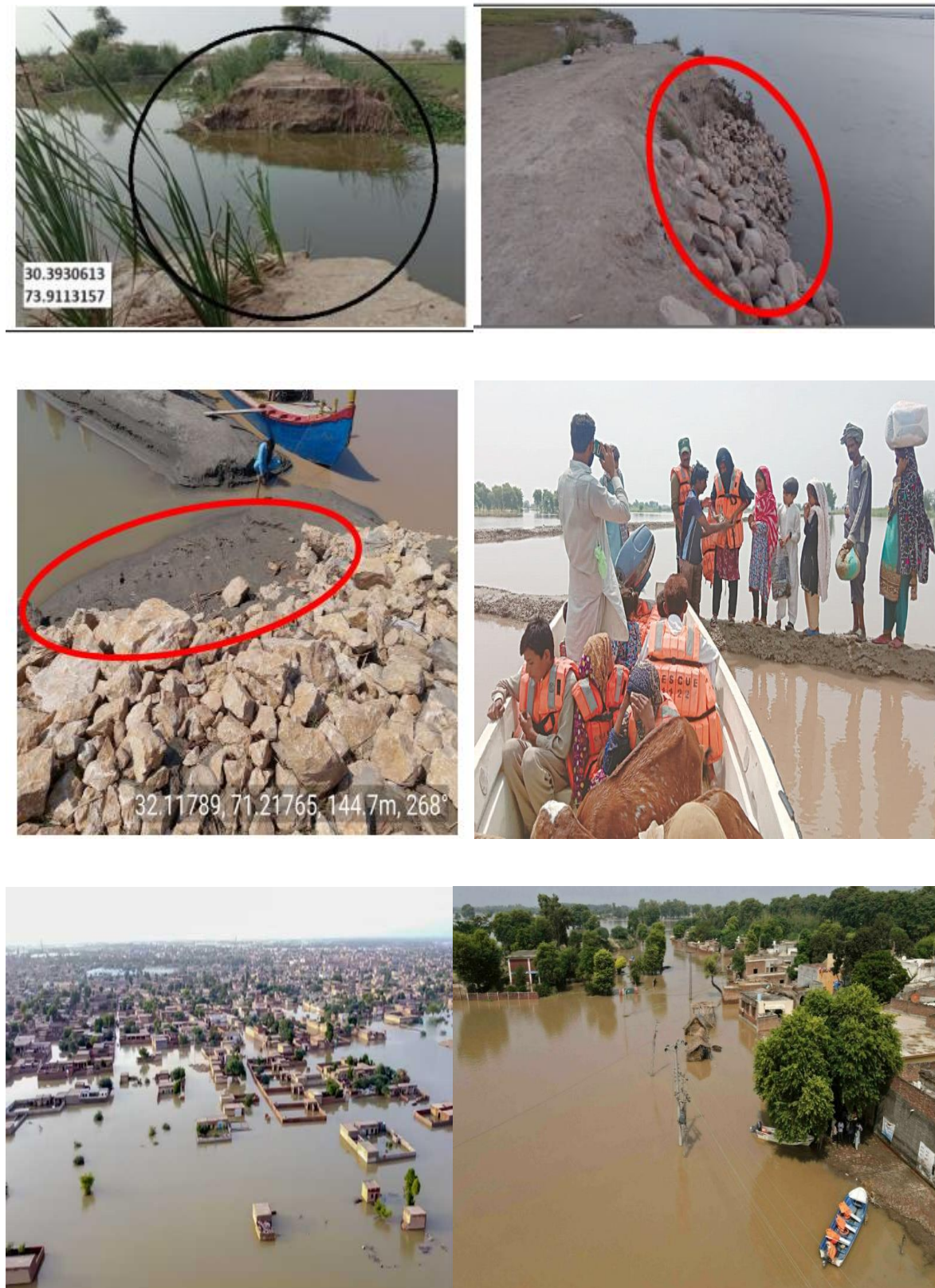
Sr. No	Name of Meetings	Date
43.	Joint Coordination Committee Meeting of JICA on the Project Titled “ Capacity Development of Effective River Dike Management Response to 2022 Floods”	14 <sup>th</sup> December 2023

### 3.10 Inspection/ Field Monitoring Visits conducted by FFC during the Calendar Year 2023

The monitoring teams of FFC carried out field visits of flood protection schemes implemented or proposed for implementation under Federal PSDP during Calendar Year 2023. Field Visits conducted by Flood Wing during the Calendar Year 2023 are given below in **Table 3.9**.

**Table 3.9: Field Visits conducted by FFC during the Year 2023**

Sr. No	Name of Schemes	Date of Visit
1.	Construction of flood protection structures along Swat River and its Tributaries in Tehsil Matta and Khwazakhela, District Swat, Estimated Cost Rs. 149.03 Million	6 <sup>th</sup> February 2023
2.	Construction of flood protection wall at Qadirabad, Chahter, Rehra, Dhuli Bridge, HUDA Bridge, Manjari and DholQazian in District Bagh, Estimated cost Rs. 147.602 million (Seven Sub-Works)	16 <sup>th</sup> -17 <sup>th</sup> November 2023
3.	Construction of flood protection infrastructure on right & left Bank of River Nellum at Makri and ChellaBandi, District Muzaffarabad, Estimated Cost Rs. 162.098 million (Two sub-works)	
4.	Construction of T-Spur and stone apron at mile 135/5 along S.M bund (Bhanoth) in Hala Bund Sub Division. Estimated Cost Rs. 874.082 million	13 <sup>th</sup> - 16 <sup>th</sup> November 2023
5.	Rehabilitation of Qadirpur Shank Bund & Construction of stone studs and T-Head, Estimated Cost Rs. 3,404.763 million	
6.	Rehabilitation/ Restoration of Malir Weir-I, II, III and Thado Dam, Estimated cost Rs. 13,950.541 million	



**Figure 3.4: 2023 Rains/ Floods in Pakistan**

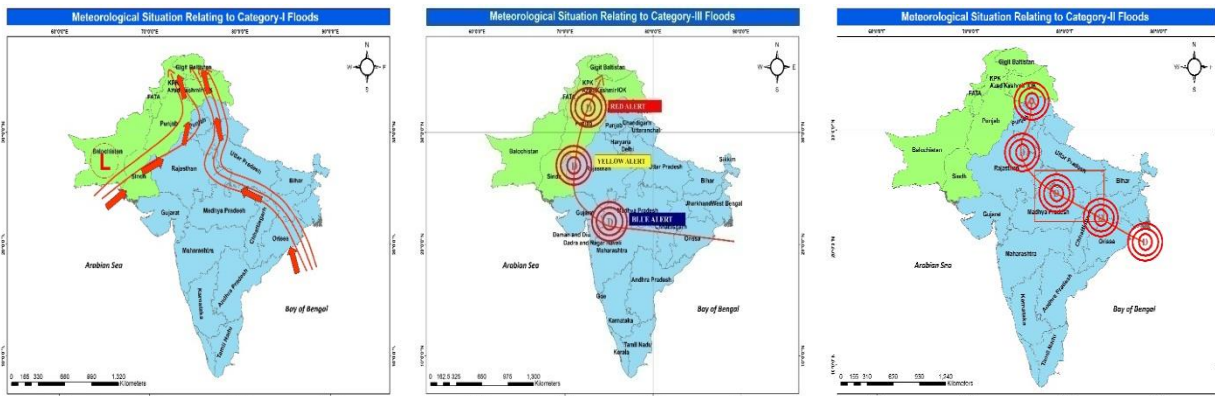
### 3.11 Monsoon Season 2023

Pakistan has been subjected to regular flooding throughout history. In the last 80 years, the frequency of disastrous flood events in the region has been more than one in four years.

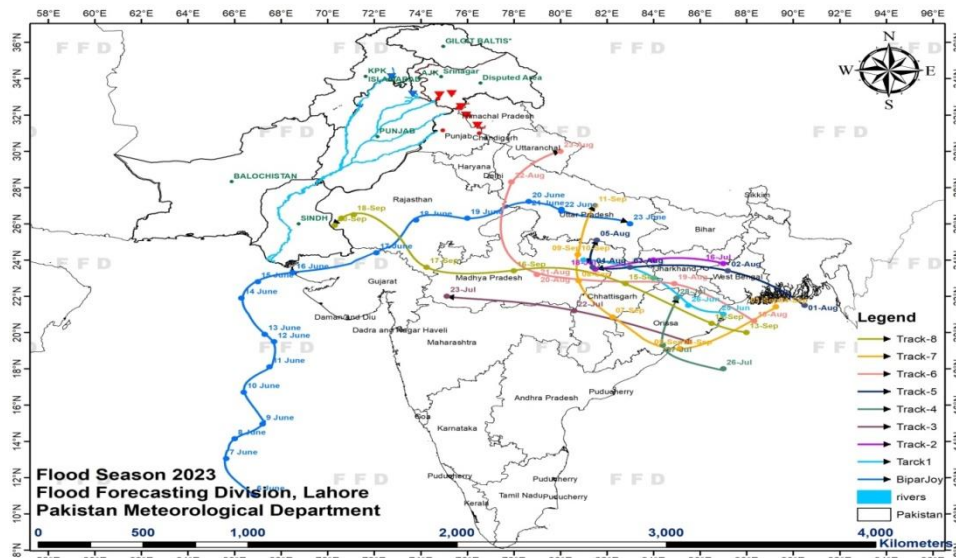
The country has observed changing weather patterns, including variations in precipitation and temperatures, increased frequency and severity of tropical storms and coastal rains, glacial melt, glacial lake outburst flooding, sea level rise, loss of biodiversity, desertification, and droughts. The plains of Punjab and Sindh have experienced extended and frequent riverine floods and heat waves, affecting economic and human development.

#### Climatology of Monsoon Tracks Monsoon

Schematic diagram of three flood bearing mechanisms during summer monsoon season (source: Pakistan Meteorological Department) is given below:



**Figure 3.5: Schematic Diagram of Category I, II & III Floods**



**Figure 3.6: Monsoon Tracks 2023**

Total Number of Lows=08 Number of Lows enters in Pakistan=Nil



## Rainfall Analysis for Monsoon Season 2023

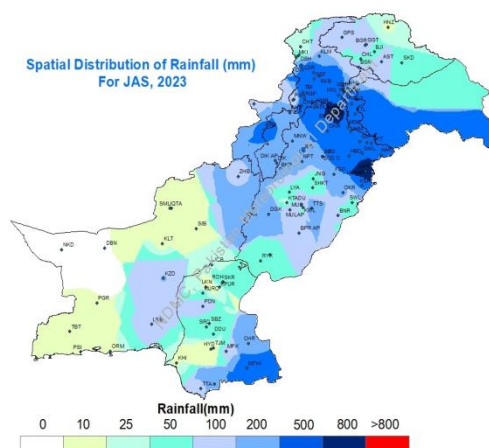
Pakistan Meteorological Department (PMD) in its Monsoon Season 2023 Weather Outlook had forecasted '**Normal**' Monsoon rainfall. Upper Punjab, Khyber Pakhtunkhwa and Azad Jammu & Kashmir were expected to receive '**slightly Above-Normal**' rainfall but within **5%** departure from the '*Normal*'. Sindh and south-western parts of Balochistan were expected to receive '**Normal**' to '**Slightly below Normal**' rainfall during the season. However, PMD had also cautioned that notwithstanding forecast of normal rains, the possibility of floods could not be neglected as one severe spell could cause the situation to change drastically.

As per PMD's **Monsoon 2023 (1 July - 30 September) Report**, the monsoon season in Pakistan this year began on July 3, 2023, which was two days later than its usual start date of July 01. However, there was a significant monsoon rainfall during the month of **July**, followed by a sudden decline in **August 2023**. **September 2023** saw near-average rainfall. To sum it up, Pakistan experienced near-average rainfall during the entire monsoon season, with a **+4% deviation from the normal**. On a regional scale, Punjab had near-average rainfall (-1%), while Azad Jammu and Kashmir (AJK) (-14%) and Khyber Pakhtunkhwa (KP) (-17%) received below average rainfall. Sindh (+29%) and Balochistan (+18%) had above-average rainfall, and Gilgit-Baltistan (GB) experienced exceptionally high rainfall, with a 90% increase.

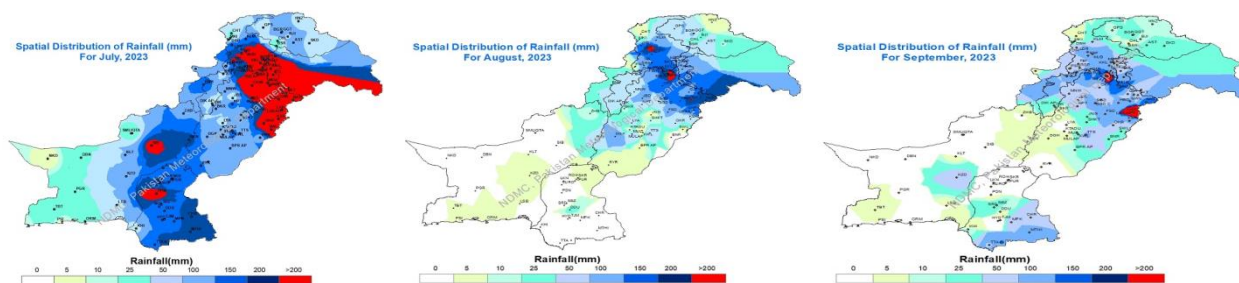
As per the **Global Change Impact Studies Centre(GCISC)**, during 2023 Monsoon, 0.5 °C to 1 °C above normal temperature was observed, which was an anomaly. As per future projections, according to them, 1.5 °C to 2 °C rise in temperature might take place and the rise in temperatures in Northern parts of Pakistan might be higher as compared to Southern Parts. Also during Monsoon 2023, above normal rains were observed in Sindh & Balochistan. In future, because of higher temperatures, higher cloud formation might take place due to higher evaporation. That might cause more rains.

The last 60 years' rainfall analysis has indicated reduction in rainfall in Kashmir. The Monsoon 2023 had penetrated more towards Southern parts of the country due to change in atmospheric conditions. As a result, Southern Parts received more rains, whereas upper parts received less rainfall. Also, high temperatures would cause more glacial melting & subsequent glacial depletion. Due to climate change, not only floods, but also droughts would occur frequently. Analysis shows that in 2022, floods due to rains occurred in southern parts whereas there was less rainfall in the upper parts where dams were built.

## Actually observed Rainfall Situation:



**Figure 3.7: Cumulative Rainfall 2023 Monsoon**



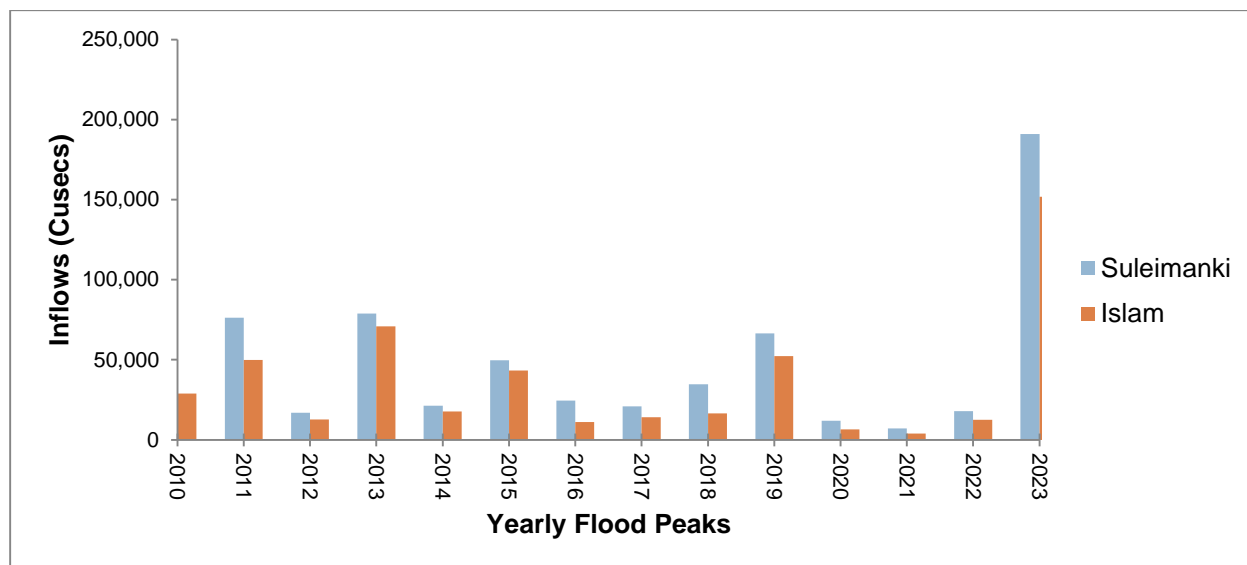
**Figure 3.8: Rainfall Observed during July-August& September 2023**

### 3.13 Analysis of Monsoon 2023 Floods

Traditionally, monsoon rains occur mostly in the catchments of Jhelum, Chenab, Ravi, Beas and Sutlej. Occasionally, these currents cross Himalaya and cause precipitation in the upper watersheds of Indus River like occurred in year 2010. During 2022, monsoon rains initially impacted southern parts of the country (Balochistan, Sindh and their urban centers). Thereafter Heavy to Very Heavy Rains occurred in Southern Punjab particularly in the Koh-e-Suleiman Range, generating record floods in hill torrents of D.G. Khan and Rajanpur Districts. Finally, Monsoon rains caused 'High to Very High Floods' particularly in Swat and Panjkora Rivers of Kabul Basin as well as in local tributaries of Indus River upstream of Tarbela.

In case of Monsoon 2023, High to Exceptionally High Flood Situation was observed in River Sutlej. Due to cumulative outflows from India's Pong Dam (which controls River Beas) and Bhakra Dam (which controls River Sutlej), River Sutlej attained Exceptionally High Flood at Ganda Singh Wala with peak discharge of 278,297 cusecs on 19th August 2023 and Very High Flood at Sulemanki with peak discharge of 191,053 cusecs on 22nd August 2023, causing inundation in nearby villages. High flood reportedly damaged standing crops and houses on both sides of River Sutlej in Kasur district besides washing away of embankments, settlements, etc. It also reached High Flood at Islam with 151,904 cusecs flows on 25th August 2023. Comparisons of river flows at Sulemanki and Islam

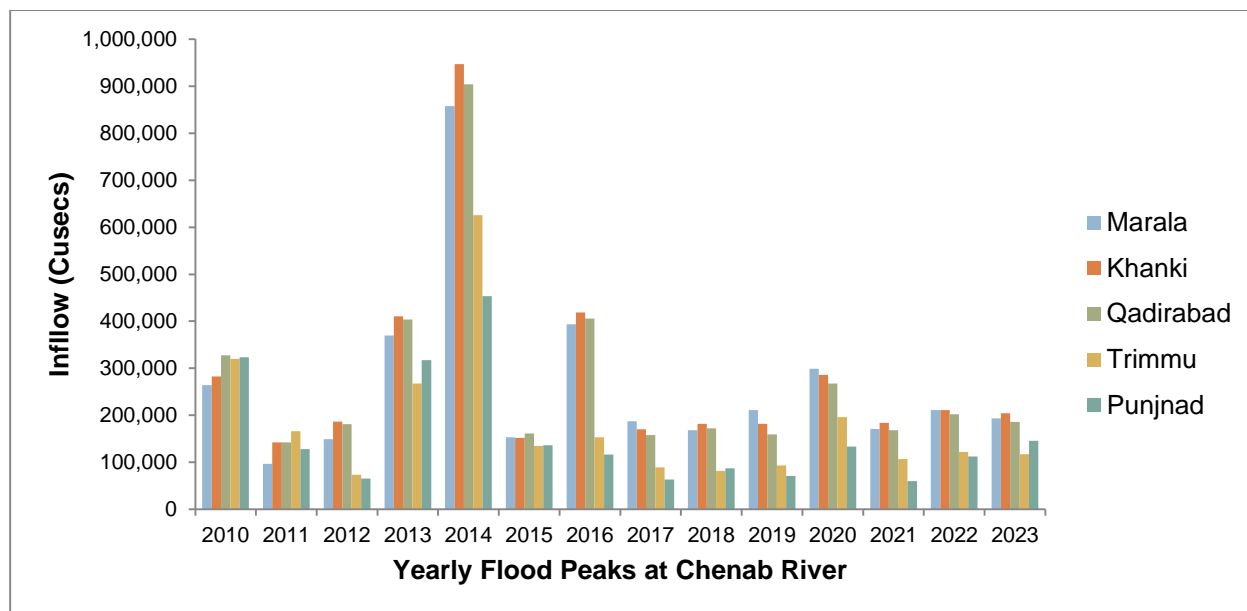
barrages from 2010 to 2023 is given in Fig. 3.11 which shows the river inflow was maximum during 2023 floods.



**Figure 3.9: Comparison of Flood Peaks on Sutlej River**

### Rivers Hydrological Situation during Monsoon 2023

River Chenab attained High Flood at Khanki on 20th July 2023 reaching a peak discharge of 204,041 cusecs. The Flood situation in other main rivers (i.e. Indus, Kabul & Ravi) remained in Low to Medium Range. Normal Flows were observed in River Jhelum during the Monsoon Season 2023. Comparisons of river flows at Marala, Khanki, Qadirabad, Trimmu and Punjnad barrages from 2010 to 2023 is given in Fig. 3.12 which shows lesser inflows in Chenab during Year 2023 as compared to Year 2014.



**Figure 3.10: Comparison of Flood Peaks on Chenab River**



### Major Reservoirs storage position during Monsoon 2023

Tarbela Dam attained its Maximum Conservation Level (MCL) of 1550 feet on 11th August and 17th August 2023. After some respite, it again retained its MCL from 28th August to 8th September 2023 (i.e. Tarbela remained in its MCL stage for 14 days during Monsoon 2023). Mangla Dam also achieved its full level of 1242.00 feet from 17th August to 21st August 2023.

### Escapages below Kotri during 2023 Monsoon

Escapages below Kotri Barrage observed during the Monsoon Season 2023 are given in **Table 3.10**

**Table 3.10: Downstream Kotri Escapages Kharif 2023 (April-September 2023)**

Month	Releases in MAF
April	0.000
May	0.000
June	0.056
July	2.215
August	9.073
September	2.448
<b>Total</b>	<b>13.792 MAF</b> (including Flows from Manchar Lake)

Source: IRSA

### Lessons learnt from 2023 Floods

- Keeping in view impacts of Climate Change, all efforts be made to adopt nature based solutions.
- Removal of encroachments such as Private/Zimeendara Bund by the concerned Provincial Irrigation Departments well before the onset of Monsoon Season.
- Ensure infrastructure resilience to Climate Change in view of current climate changes/weather patterns.
- Completion of under construction dams at the earliest.
- Immediate execution of all planned/approved dams so that flood excess water may be stored without causing havoc to downstream population.
- Enhanced best coordination management with Indian Commissioner for Indus Waters (ICIW) with respect to Eastern rivers so that necessary arrangements be made in time to manage the flood disasters.
- Immediate implementation of approved Umbrella PC-I of FPSP-III.
- Management of hill torrents and beneficial use of their waters.
- Immediate formulation of National Watershed Management Plan.

### 3.14 Flood Peaks Recorded during Major Historical Floods

Highest ever recorded flood peaks at various control points of Indus Basin are given in the **Table 3.11**.

**Table: 3.11: Historic Peak Discharges (Cusec) in Major Rivers**

Site	Design Capacity	Historic Max. Flood	Peak of 1973	Peak of 1975	Peak of 1976	Peak of 1988	Peak of 1992	Peak of 1993	Peak of 1994
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
River Indus									
<b>Tarbela</b>	15,00,000	6,04,000 30-7-2010	4,20,000	-----	3,04,000 3- 8-76	4,50,000 4-8-88	5,00,000 10-9-92	3,70,000 10-7-93	
<b>Kalabagh</b>	9,50,000	9,50,000 14-7-42	5,64,000 20-7-73	6,02,541 21-8-75	8,61,965 2- 8-76	6,05,000 2-8-88	8,49,245 10-9-92	3,77,491 11-7-93	
<b>Chashma</b>	9,50,000	10,36,673 2-8-2010	5,10,000 22-7-73	555,300 23-8-75	7,86,600 3- 8-76	5,80,000 3-8-88	6,68,336 11-8-92	4,05,180 15-7-93	
<b>Taunsa</b>	11,00,000	9,59,991 28-8-2010	5,67,623 29-7-73	5,24,495 26-8-75	6,75,233 7- 8-76	5,60,000 28-7-88	6,55,079 14-9-92	3,81,000 28-7-93	
<b>Guddu</b>	12,00,000	11,99,672 15-8-76	10,83,742 18-8-73	10,02,496 30-8-75	11,99,672 15-8-76	11,62,653 30-7-88	10,86,919 18-9-92	6,26,410 31-7-93	
<b>Sukkur</b>	9,00,000	11,61,000 16-8-76	10,77,000 21-8-73	10,25,000 2-9-75	11,61,000 16-8-76	11,18,856 31-7-88	10,68,072 20-9-92	5,69,160 2-8-93	
<b>Kotri</b>	8,50,000	9,81,000 14-8-56	7,86,000	4,76,000	7,65,000	6,48,290 11-8-88	6,89,309 30-9-92	4,20,417 5-8-93	
River Jhelum									
<b>Mangla</b>	10,60,000	10,90,000 10-9-92	2,20,000 9-8-73	1,09,000 29-8-75	4,80,060 3-8-76	4,25,515 16-7-88	10,90,000 10-9-92	3,36,110 10-7-93	
<b>Rasul</b>	8,50,000	9,52,170 10-9-92	2,69,976 9-8-73	1,25,597 30-8-75	2,69,330 4-8-76	2,61,664 17-7-88	9,52,170 10-9-92	1,07,108 11-7-93	
River Chenab									
<b>Marala</b>	11,00,000	11,00,000 26-8-57	7,70,000 9-8-73	5,82,600 16-7-75	5,49,400 1-8-76	7,50,975 25-9-88	8,45,090 10-9-92	4,09,490 11-7-93	
<b>Khanki</b>	8,00,000	10,86,460 27-8-57	10,00,496 10-8-73	6,66,241 16-7-75	6,15,043 2-8-76	8,64,220 26-9-88	9,10,512 10-9-92	4,30,410 11-7-93	
<b>Qadirabad</b>	9,00,000	9,48,530 11-9-92	8,54,341 10-8-73	6,69,819 17-7-75	6,28,741 2-8-76	8,92,299 26-9-88	9,48,530 11-9-92	4,43,053 11-7-93	
<b>Trimmu</b>	6,45,000	9,43,225 8-7-59	7,52,910 12-8-73	4,58,247 20,7,75	7,06,433 10-8-76	5,84,110 19-7-88	8,88,117 14-9-92	3,36,761 13-7-93	
<b>Panjnad</b>	7,00,000	8,02,516 17-8-73	8,02,516 17-8-73	4,77,846 29-7-75	7,10,000 12-8-76	5,07,345 27-7-88	7,44,152 18-8-92	3,35,136 20,7,93	
River Ravi									
<b>Madhopur</b>	-----	9,20,000 25-9-88	-----	-----	-----	9,20,000 25-9-88	1,55,000 10-9-92	4,50,000 10-7-93	
<b>Jassar</b>	2,75,000	6,80,000 5-10-55	2,27,500 10-8-73	2,06,300 17-7-75	1,70,150 9-8-76	1,21,800 25-9-88	1,48,543 11-9-92	1,30,470 11-7-93	
<b>RaviSyphon</b>	4,50,000	6,59,000 6-10-55	2,16,000	1,66,000	1,82,000	3,25,040 27-9-88	80,683 12-9-92	1,28,188 13-7-93	
<b>Shahdara</b>	2,50,000	5,76,000 22-9-88	2,37,380 11-8-73	1,83,330 18-7-75	1,70,175 10-8-76	5,76,000 27-9-88	62,641 12-9-92	91,415 14-7-93	
<b>Balloki</b>	2,25,000	3,36,200 28-9-1988	2,43,908 13-8-73	1,80,205 20-7-75	2,53,974 11-8-76	3,89,845 28-9-88	1,12,157 13-9-92	1,49,392 15,7,93	
<b>Sidhnai</b>	1,50,000	3,30,210 2-10-88	2,10,339 18-8-73	1,22,251 25-7-75	2,44,348 15-8-76	3,30,210 2-10-88	95,510 16-9-92	1,20,274 19-7-93	
River Sutlej									
<b>Sulemanki</b>	3,25,000	5,98,872 8-10-55	1,77,081 15-8-73	48,688 21-9-75	1,18,582 6-9-76	3,99,453 30-9-88	1,97,293 3-9-92	1,62,092 16-7-93	
<b>Islam</b>	3,00,000	4,92,581 11-10-55	1,66,453 17-8-73	46,996 23-9-75	1,11,427 8-9-76	3,08,425 4-10-88	1,82,637 7-9-92	89,705 19-7-93	

Table continuing ahead on the subsequent page

**Table: 3.11: Historic Peak Discharges (Cusec) in Major Rivers (Continued)**

Site	Peak 1994	Peak 1995	Peak 1996	Peak 1997	Peak 1998	Peak 1999	Peak 2000	Peak 2001	Peak 2002
1.	10.	11.	12.	13.	14.	15.	16.	17.	18.
River Indus									
<b>Tarbela</b>	4,20,000 24-7-94	4,80,000 26-7-95	4,02,000 14-8-96	4,00,000 17-8-97	3,65,000 13-7-98	3,82,000 4-9-99	1,99,200 1-7-2000	2,29,900 22-8-2001	
<b>Kalabagh</b>	5,03,946 13-7-94	5,51,553 27-7-95	4,75,000 17-8-96	6,60,590 8-8-97	4,80,700 15-7-98	4,63,700 10-8-99	2,61,100 2-8-2000	4,17,200 24-7-2017	
<b>Chashma</b>	5,46,636 11-8-94	5,76,709 28-7-95	4,98,875 17-8-96	6,37,636 28-8-97	5,10,200 14-7-98	5,48,300 11-8-99	2,54,800 2-8-2000	3,00,500 25-7-2017	
<b>Taunsa</b>	5,73,520 15-7-94	6,07,884 29-7-95	5,21,708 19-8-96	5,36,199 31-8-97	5,28,500 18-7-98	4,09,700 13-8-98	2,03,100 5-7-2000	2,81,900 27-7-2017	
<b>Guddu</b>	7,73,305 29-7-94	9,88,665 3-8-95	7,90,163 22-8-96	8,31,287 6-9-97	6,67,500 22-7-98	4,19,800 17-8-99	1,71,600 6-8-2000	2,30,100 30-7-2017	
<b>Sukkur</b>	7,57,350 2-8-94	9,58,929 7-8-95	7,57,390 24-8-96	8,01,170 8-9-97	6,28,700 23-7-98	3,90,000 19-8-99	1,17,700 8-8-2000	1,68,900 31-7-2017	
<b>Kotri</b>	8,26,369 25-8-94	7,99,447 18-8-95	4,15,000 29-8-96	3,21,180 13-9-97	2,95,900 1-8-98	2,20,700 23-8-99	47,800 12-8-2000	62,800 03-9-2017	
River Jhelum									
<b>Mangla</b>	2,91,550 4-8-94	3,02,322 27-7-95	2,14,700 20-6-96	5,48,670 27-8-97	1,20,600 16-7-98	1,23,900 7-8-99	42,200 22-9-2000	42,800 15-9-2017	
<b>Rasul</b>	1,48,135 28-7-94	2,86,076 28-7-95	1,36,712 27-6-96	5,49,598 27-8-97	75,500 24-7-98	22,800 15-9-99	37,800 22-7-2000	37,800 24-7-2017	
River Chenab									
<b>Marala</b>	4,12,520 20-9-94	4,39,970 27-7-95	7,66,860 23-8-96	7,75,525 28-8-97	1,48,200 13-7-98	1,90,300 7-8-99	2,23,400 22-7-2000	1,32,500 23-7-2017	
<b>Khanki</b>	4,25,160 20-7-94	6,30,517 28-7-95	8,51,269 24-8-96	8,47,650 28-8-97	1,32,700 17-7-98	1,60,200 7-8-99	3,03,300 23-7-2000	1,31,900 24-7-2017	
<b>Qadirabad</b>	4,37,067 21-7-94	6,44,697 29-7-95	8,53,231 24-8-96	8,37,442 28-8-97	1,56,500 11-7-98	1,42,400 8-8-99	2,91,300 23-7-2000	1,18,100 15-8-2017	
<b>Trimmu</b>	3,33,499 23-7-94	6,29,561 1-8-95	5,43,708 27-8-96	6,77,417 1-9-97	1,60,600 13-7-98	82,500 22-7-99	1,16,200 26-7-2000	72,400 18-8-2017	
<b>Panjnad</b>	2,66,949 25-7-94	6,05,523 5-9-95	5,71,746 31-8-96	5,27,662 4-9-97	1,58,400 21-7-98	47,800 17-8-99	63,400 7-8-2000	46,600 22-8-2017	
River Ravi									
<b>Madhopur</b>	1,75,000 7-7-94	3,32,000 5-9-95	1,32,000 23-8-96	1,21,000 28-8-97	-----	-----	-----	-----	
<b>Jassar</b>	1,73,000 21-7-94	2,20,000 5-9-95	1,51,080 23-8-96	1,57,600 28-8-97	34,500 23-9-98	20,400 7-8-99	34,500 28-7-2000	46,100 15-8-2001	
<b>RaviSyphon</b>	1,01,791 22-7-94	2,57,000 6-9-95	1,96,080 25-8-96	1,59,200 30-8-97	55,900 24-9-98	40,600 8-8-99	41,200 30-7-2000	44,100 15-8-2001	
<b>Shahdara</b>	54,101 22-7-94	1,71,520 7-9-95	1,82,340 25-8-96	1,23,080 30-8-97	58,200 24-9-98	45,500 11-8-99	51,800 29-7-2000	41,000 16-8-2001	
<b>Balloki</b>	1,15,635 12-8-94	2,22,800 8-9-95	2,35,000 26-8-96	1,76,950 31-8-97	90,500 25-9-98	74,800 22-8-99	46,500 30-7-2000	46,900 16-8-2017	
<b>Sidhnai</b>	1,06,321 28-8-94	2,12,340 12-9-95	1,95,362 30-8-96	1,33,237 3-9-97	59,200 27-9-98	38,900 24-8-99	37,200 2-8-2000	30,600 19-8-2017	
River Sutlej									
<b>Sulemanki</b>	1,37,854 27-8-94	3,01,865 10-9-95	77,559 27-8-96	55,501 31-8-97	91,100 26-9-98	38,600 16-8-99	16,000 22-7-2000	13,600 20-8-2017	
<b>Islam</b>	92,630 31-8-94	1,83,902 14-9-95	47,559 27-8-96	40,838 3-9-97	66,800 30-9-98	14,300 17-8-99	13,800 27-7-2000	3,500 23-8-2017	

Table continuing ahead on the subsequent page

**Table: 3.11: Historic Peak Discharges (Cusec) in Major Rivers (Continued)**

Site	Peak 2002	Peak 2003	Peak 2004	Peak 2005	Peak 2006	Peak 2007	Peak 2008	Peak 2009	Peak 2010	Peak 2011	Peak 2012
1.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.
River Indus											
<b>Tarbela</b>	2,90,900 14-8-02	3,50,000 21-7-03	2,69,900 16-7-04	3,72,900 16-7-05	3,71,800 5-8-06	2,92,600 03-8-07	2,58,500 12-8-08	3,06,000 16-8-09	6,04,000 30-7-10	2,68,500 16-9-11	
<b>Kalabagh</b>	3,79,600 14-8-02	3,99,400 03-8-03	2,45,100 10-7-04	5,15,100 02-7-05	4,89,600 6-8-06	3,59,900 16-8-07	3,36,500 5-8-08	3,48,300 17-8-09	9,36,453 30-7-10	2,68,400 26-7-11	
<b>Chashma</b>	3,48,800 15-8-02	4,63,800 05-8-20	2,20,300 11-7-04	5,33,200 20-7-05	5,84,700 06-8-06	4,03,400 15-8-07	3,21,300 21-7-08	3,80,800 19-8-09	1,036,673 2-8-10	3,49,700 28-7-11	
<b>Taunsa</b>	3,06,700 17-8-02	4,21,200 06-8-03	1,82,400 14-7-04	5,31,200 20-7-05	6,12,300 9-8-06	3,35,400 18-8-07	2,63,300 8-8-08	3,20,300 21-8-09	9,59,991 2-8-10	2,23,200 31-8-11	
<b>Guddu</b>	2,55,100 21-8-02	3,65,300 02-8-03	1,32,500 18-7-04	5,15,900 23-7-05	5,70,500 13-8-06	3,22,600 22-8-07	2,56,200 13-8-08	2,32,300 25-8-09	1,148,200 8-8-10	2,72,200 4-9-11	
<b>Sukkur</b>	1,81,100 23-8-02	2,97,700 07-8-03	64,800 20-7-04	4,47,400 25-7-05	5,14,000 16-8-06	2,58,700 24-8-07	1,91,700 15-8-08	1,34,600 26-8-09	1,108,795 10-8-10	2,60,800 6-9-11	
<b>Kotri</b>	84,300 11-9-02	2,31,400 11-8-03	9,000 5-7-04	2,74,300 12-8-05	3,56,500 25-8-06	1,28,400 28-8-07	2,00,000 20-8-08	1,15,800 31-8-09	9,39,442 27-8-10	2,60,400 16-9-11	
River Jhelum											
<b>Mangla</b>	66,900 22-8-2002	4,07,400 03-8-2003	47,600 18-8-2004	1,69,600 1-7-2005	1,62,100 5-8-2006	1,34,400 1-7-2007	94,200 7-8-2008	9,59,00 21-7-09	2,49,100 10-8-10	7,200 12-8-11	
<b>Rasul</b>	34,700 13-8-02	85,300 4-9-03	42,800 22-7-04	95,700 16-7-05	1,42,000 4-8-06	43,400 8-7-07	44,500 25-9-08	81,300 16-8-09	2,25,496 30-7-10	1,31,300 16-9-11	
River Chenab											
<b>Marala</b>	2,24,800 14-8-02	52,900 05-9-03	15,800 4-9-04	92,200 17-7-05	1,65,900 13-7-06	34,100 7-7-07	20,600 16-9-08	56,800 17-8-09	2,63,795 30-7-10	9,69,00 17-9-11	
<b>Khanki</b>	2,40,400 14-8-02	1,37,200 15-8-03	93,200 17-8-04	3,33,700 07-7-05	3,33,000 3-9-06	1,13,800 12-8-07	1,63,500 31-7-08	93,200 28-7-09	2,82,418 6-8-2010	1,42,500 16-9-11	
<b>Qadirabad</b>	2,26,400 14-8-02	1,72,600 05-8-03	1,06,900 17-8-04	3,68,100 08-7-05	4,18,700 4-9-06	1,41,100 14-8-07	1,93,400 31-7-08	97,100 29-7-09	3,27,637 7-8-10	1,42,500 17-9-11	
<b>Trimmu</b>	1,08,600 17-8-02	1,69,300 05-8-03	90,000 18-8-04	3,69,800 8-7-05	4,43,200 4-9-06	61,900 1-7-07	1,90,400 1-8-08	76,400 29-7-09	3,19,733 7-8-2010	1,66,400 17-9-11	
<b>Panjnad</b>	56,800 21-8-02	1,22,800 08-8-03	42,800 20-8-04	1,62,100 11-7-05	2,66,300 7-9-06	55,300 2-7-07	54,200 6-8-08	43,800 21-8-09	3,23,026 11-8-10	1,27,800 20-9-11	
River Ravi											
<b>Madhopur</b>	-	81,400 12-8-03	19,400 25-8-04	87,700 22-7-05	1,89,000 11-9-06	36,700 5-7-07	37,100 28-8-08	17,800 26-8-09	3,10,117 13-8-10	1,38,300 24-9-11	
<b>Jassar</b>	69,500 14-5-02	37,900 5-8-03	30,600 18-8-04	40,200 8-7-05	36,400 3-9-06	22,900 4-7-07	38,600 20-8-08	10,100 29-7-09	21,100 21-8-10	24,300 13-8-11	
<b>Ravi Syphon</b>	42,100 15-8-02	40,700 23-9-03	37,600 19-8-04	30,700 8-7-05	29,300 2-9-06	38,000 24-7-07	32,000 17-8-08	23,900 30-8-09	41,200 21-8-10	42,300 14-8-11	
<b>Shahdara</b>	37,000 15-8-02	38,800 5-8-03	51,900 2-8-04	30,200 17-8-05	23,600 28-7-06	30,600 1-7-07	32,000 18-8-08	22,200 13-8-09	41,900 21-8-10	43,000 14-8-11	
<b>Balloki</b>	28,100 15-8-02	44,700 06-8-03	40,400 20-8-04	25,200 8-7-05	41,300 3-9-06	37,900 1-7-07	67,200 18-8-08	14,000 31-7-09	41,200 23-8-10	44,000 15-8-11	
<b>Sidhnai</b>	16,100 18-8-02	25,500 09-8-03	12,800 23-8-04	6,200 17-8-05	10,700 1-8-06	14,700 19-8-07	38,700 24-8-08	8,500 24-8-09	16,800 28-7-10	2,39,00 2-9-11	
River Sutlej											
<b>Sulemanki</b>	8,500 3-9-02	7,000 09-9-03	4,200 10-8-04	18,000 13-8-05	9,100 10-9-06	9,100 8-8-07	90,100 18-8-08	3,400 3-8-09	44,300 30-9-10	76,200 29-8-11	
<b>Islam</b>	2,100 20-9-02	1,700 15-9-03	8,00 16-8-04	16,400 16-8-05	1,800 4-7-06	2,800 13-7-07	35,800 25-8-08	1,200 10-9-09	28,900 20-9-10	49,900 4-9-11	

Table continuing ahead on the subsequent page

**Table: 3.11: Historic Peak Discharges (Cusec) in Major Rivers (Continued)**

Site	Peak 2012	Peak 2013	Peak 2014	Peak 2015	Peak 2016	Peak 2017	Peak 2018	Peak 2019	Peak 2020	Peak 2021
1.	28.	29.	30.	31.	32.	33.	34.	35.	36.	37.
<b>River Indus</b>										
<b>Tarbela</b>	278000	338,100	240,100	486,900	3,02,900	3,36,000	242,300	311700	3,35,800	
	05-8-12	14-8-13	15-8-14	26-7	17-7	03-8	2-8	9-8	02-9	
<b>Kalabagh</b>	277000	472,303	249,992	528,698	3,51,490	419,460	311,154	354830	4,57,031	
	17-7-12	13-8-13	25-7-14	02-8	05-7	03-8	15-8	15-8	02-9	
<b>Chashma</b>	285500	620,672	257,632	636,512	3,73,659	446,361	319,912	370823	4,73,447	
	08-7-12	14-8-13	22-6-14	3-8	05-7	05-8	15-8	2-8	04-9	
<b>Taunsa</b>	235400	516,017	233,110	604714	3,43,024	423,861	276,215	378194	4,79,866	
	10-9-12	17-8-13	18-7-14	5-8	05-7	06-9	17-8	14-8	06-9	
<b>Guddu</b>	236100	542,100	34,0864	735,246	2,97,928	428,640	227,270	386041	5,40,750	
	10-9-12	20-8-13	18-9-14	3-8	11-7	09-8	20-8	21-8	09-09	
<b>Sukkur</b>	210000	454,995	26,8935	660216	2,25,205	333,108	156,025	303625	4,58,390	
	14-9-12	24-8-13	20-9-14	5-8	19-8	11-8	21-8	22-8	10-9	
<b>Kotri</b>	138800	344,866	11,0345	603084	1,38,455	210,923	60,740	198579	2,83,910	
	21-9-12	30-8-13	25-9-14	5-8	10-8	18-8	26-8	29-8	19-9	
<b>River Kabul</b>										
<b>Nowshera</b>	1,00,700	155,100	1,18,100	165800	80,700	87,000	1,05,300	1,05,000	1,51,000	
	8-7-12	15-6-13	4-7-14	NR	04-7	12-7	24-7	29-8	02-9	
<b>River Jhelum</b>										
<b>Mangla</b>	44700	45,214	500,000	109232	62,701	67,882	69,127	125171	1,25,803	
	05-8-12	13-8-13	5-9-14	26-7	07-8	22-9	7-7	17-6	28-8	
<b>Rasul</b>	31400	23,610	516,000	99100	46,562	39,230	39,230	90554	1,26,951	
	05-8-12	19-9-13		27-7	27-8	22-9	8-7	19-6	28-8	
<b>River Chenab</b>										
<b>Marala</b>	149200	369,690	858,000	153408	3,93,690	1,87,472	168,278	211000	2,98,884	
	04-8-12	15-8-13	6-9-14	12-7	07-8	19-7	13-8	31-7	27-8	
<b>Khanki</b>	186400	410,331	947,000	152000	4,18,736	1,70,021	182,025	181944	2,86,230	
	04-8-12	15-8-13		13-7	07-8	13-7	13-8	31-7	28-8	
<b>Qadirabad</b>	180800	403,403	904,000	161100	4,05,542	1,57,842	172,031	159544	2,67,540	
	05-8-12	15-8-13		13-7	08-8	19-7	14-8	1-8	28-8	
<b>Trimmu</b>	73700	267,609	626,000	135000	1,53,339	89,345	81,680	93021	1,96,077	
	07-8-12	20-8-13		13-7	10-8	05-8	16-8	22-8	01-9	
<b>Panjnad</b>	65600	3,17,261	45,3570	135866	116029	63488	87383	70556	133646	
	17-9-12	25-8-13	16-9-14	30-7	13-8	8-8	27-8	26-8	05-9	
<b>River Ravi</b>										
<b>Jassar</b>	30500	67,700	67,700	36100	38,400	46,439	66,641	51000	30690	
	26-8-12	16-8-13	7-9-14	15-8	08-8	10-8	25-9	18-8	28-8	
<b>Ravi Siphon</b>	39800	73,600	93,300	39200	45081	46100	37,936	37936	34,531	
	24-8-12	18-8	8-9-14	24-9	28-7	2-8	14-8	19-8	28-8	
<b>Shahdara</b>	40800	74,880	91,400	38400	44,595	39,313	37,587	37200	34,308	
	22-8-12	17-8-13	8-9-14	24-9	08-8	02-8	14-8	19-8	28-8	
<b>Baloki</b>	29300	97,970	118,000	57700	37,165	36,790	39,310	34900	37,250	
	23-8-12	18-8-13	9-9-14	24-9	09-8	11-8	16-8	19-8	29-8	
<b>Sidhnai</b>	24600	73,504	71,112	38500	12325	26954	8857	15384	28800	
	14-9-12	23-8-13	12-9-14	28-7	1-8	7-8	1-8	2-9	31-8	
<b>River Sutlej</b>										
<b>Sulemanki</b>	16900	78,846	21,383	49600	24,492	20,893	34772	66459	11897	
	9-9-12	22-8-13	7-9-14	17-8	31-8	15-8	19-8	24-8	24-7	
<b>Islam</b>	12700	70,932	17,807	43300	11145	14221	16460	52355	6609	
	13-9-12	25-8-13	8-9-14	21-3	31-8	16-8	3-10	31-8	26-8	

Table continuing ahead on the subsequent page

Source: FFC/PIDs/WAPDA/IRSA

**Table: 3.11: Historic Peak Discharges (Cusec) in Major Rivers (Continued)**

Site	Peak 2021	Peak 2022	Peak 2023
2.	37.	38.	39.
River Indus			
Tarbela	2,70,000 22-07	419600 26-8-22	319400 24-7-23
Kalabagh	2,91,309 01-08	423271 28-8-22	365549 25-7-23
Chashma	3,44,907 02-08	523937 28-8-22	415651 25-7-23
Taunsa	3,06,489 04-08	622095 30-8-22	539908 27-7-23
Guddu	2,66,344 07-08	576075 23-8-22	461353 30-7-23
Sukkur	19,3,045 07-08	579753 25-8-22	410860 31-7-23
Kotri	95,085 12-08	600018 10-9-22	220908 09-8-23
River Kabul			
Nowshera	87,400 22-07	336500 28-8-22	100600 24-7-23
River Jhelum			
Mangla	80,315 01-08	50171 11-10-22	35741 24-8-23
Rasul	43,135 15-06	23610 22-6-22	23,610 24-8-23
River Chenab			
Marala	1,71,150 29-07	211000 28-7-22	192960 19-7-23
Khanki	1,83,688 29-07	210945 12-8-22	204041 20-7-23
Qadirabad	1,67,812 29-07	202149 12-8-22	185749 20-7-23
Trimmu	1,06,967 31-07	122115 18-8-22	116786 25-7-23
Panjnad	59,725 03-08	112564 03-8-22	145404 05-8-23
River Ravi			
Jassar	20,200 27-08	63720 16-8-22	71010 20-7-23
Ravi Siphon	3722814-7		
Shahdara	36,477 14-07	31415 02-8-22	39780 24-7-23
Baloki	32,200 22-07	35235 03-8-22	58870 29-7-23
Sidhnai	11,215 25-08	22843 28-7-22	43758 02-8-23
River Sutlej			
Sulemanki	7,212 15-09	17876 20-7-22	191053 21-8-23
Islam	3,971 18-09	12501 23-7-22	151904 25-8-23



### 3.15 Country-Wide 2023 Flood Damages to Public & Private Infrastructure

As per information obtained from NDMA, the lives lost and damages caused to private as well as public infrastructure in Punjab, Sindh, Khyber Pakhtunkhwa, Balochistan, Gilgit-Baltistan & AJK due to torrential rains & flash floods during Monsoon Season 2023 are given in **Table 3.12** (source: NDMA sitrep dated 30<sup>th</sup> September 2023).

**Table 3.12: Country-Wide 2023 Flood Damages**

Province/ Region	Persons Died	Persons Injured	House Damaged	Roads (km)	Bridges	Livestock
Punjab (including ICT)	85	195	91	0	0	3
Sindh	27	10	342	0	0	213
Khyber Pakhtunkhwa (incl. Merged Areas)	68	95	598	0	0	285
Balochistan	21	27	4193	22	4	697
AJ&K	18	20	482	0	0	25
Gilgit Baltistan	7	2	107	1.92	1	37
<b>G. TOTAL</b>	<b>226</b>	<b>349</b>	<b>5,813</b>	<b>23.92</b>	<b>5</b>	<b>1,260</b>

### 3.16 Measures to avoid Floods/ reduce their Impacts in Future

The main causes of floods are (1) heavy rainfall caused by tropical weather (2) Deforestation (3) Inadequate/ inappropriate drainage systems designs and Poor Operation and Management of these systems (4) Encroachment and unauthorized settlement in flood plains.

Based on the assessment of causes of floods stated above, following are some of the important measures recommended to avoid wide-spread flood devastation in the country, in future: -

- Immediate implementation of Fourth/ 4<sup>th</sup> National Flood Protection Plan which is already too late and further delay will cause loss to exchequer.
- Construction of water storages, in particular for hill torrent regions. Early completion of under construction dams and immediate execution of already planned dams.
- Implementation of National Master Plan on Flood Telemetry Network

- d. Installation of Automatic weather stations across the country (especially in Balochistan).
- e. Establishment of Regional Flood Forecasting and warning Centers.
- f. Flood dispersal structures along major hill torrents
- g. Comprehensive study for remodeling of already constructed drainage channels (MNV, RBOD and LBOD system) to cater for storm water also in addition to irrigation effluents.
- h. Restoration and remodeling of natural waterways / drains in the light of lessons learnt from super floods of 2010 and 2022 - based on the review and revision of return period of design discharges by all relevant authorities in the light of Flood 2022.
- i. Urban Flood Management and preparation of SOP's by District Administration; SOPs also for managing torrential heavy flood flows w.r.t their containment in existing irrigation and drainage structures.
- j. Enhanced Flood Resilience of major cities through structural interventions (Additional flood bypass channels). Likewise, replication of Lai Nullah Flood Forecasting System of Rawalpindi & Islamabad in other major cities;
- k. Urban flood management should also be pondered by FFC in collaboration with provincial governments for implementable pragmatic solutions to save urban areas from havocs of urban flood ponding;
- l. Large scale forestation/watershed management in upper catchments of all the rivers for reducing flood intensity in upper reaches and support combating climate change impacts;
- m. Unplanned urban development without appropriate drainage system should not be allowed and that in future the normal and storm drainage must be separated to avoid this major issue;
- n. The rehabilitation and reconstruction of strategic damaged works i.e. Roads, Bridges, Dams and Flood Protection Bunds should be undertaken on priority, well before next monsoon season;
- o. All storms waterways, Rivers, Hill torrents should be cleared off of wood logs and other obstructions and steps be taken to remove/ prevent encroachments with zero tolerance;
- p. Increased allocation of funds/ improved yardstick for O&M for existing flood protection infrastructure;
- q. Review of existing design criteria and standards to ensure Reinforcing/Climate proofing of the flood protection, irrigation & drainage infrastructure and to also consider applying additional safety factors, if so required;
- r. Review the existing network/ assess capacities of the already determined breaching sections on Barrages/Bridges, increase their capacity where required and make additional interventions/ provide flood bypass channels, if so needed;
- s. Technical studies for preparation of Emergency Contingency Plans for Tarbela & Mangla – Existing Contingency Plans at major reservoirs (Tarbela & Mangla) do

not incorporate any contingency measures in case of their failure (God forbid) in future due to historical maximum floods and/or any other natural calamity like earthquake. Regarding preserving the long-term viability and sustainability of the irrigation, drainage, and flood control infrastructure, both the major reservoirs are crucial. In this context, technical studies should be conducted to prepare such Contingency Plans at priority for all major dams in Pakistan in particular for Tarbela & Mangla.

- t. Nature-based solutions (NbS) need to be promoted to ensure increased resilience to future floods and climate change impacts.
- u. Enactment of River Act in all provinces and strict implementation of existing land use regulations.
- v. Institutional Capacity Building and strengthening of Federal Flood Commission into vibrant Flood Management Authority with representation of all Provinces of Pakistan.

### 3.17 Future Vision and Technical Initiatives of FFC

#### Updation of National Flood Protection Plan (NFPP-IV)

The 4<sup>th</sup> National Flood Protection Plan (i.e. NFPP-IV) was approved by CCI in its 31<sup>st</sup> meeting held on May 02, 2017 based on which, an Umbrella PC-I of National Flood Protection Plan-IV (NFPP-IV) costing to Rs. 332.246 billion was prepared and submitted to MoWR on 16<sup>th</sup> November 2018 for the approval of PD&SI Division. The same was consistently pursued since 2019 in the light of instructions issued by PD&SI Division. However, it could not be implemented for want of funds. Meanwhile, country faced devastating 2022-rains/floods last year that prompted updation of NFPP-IV based on lessons learnt during 2022 floods as per directions of the Prime Minister. M/s Deltares of the Netherlands is doing the updation work.

#### Flood Protection Sector Project-III (FPSP-III) Updated

The investment plan of FPSP-III carries the priority sub-projects reflected under CCI approved National Flood Protection (NFPP-IV) besides those identified in post NFPP-IV approval period by the PID/ FLAs. FPSP-III aims to reduce flood damages to public & private infrastructure, future threats and mitigate residual hazards. Specific objectives are given as under:

- i) Reduction of flood losses.
- ii) Protection of cities & vital assets/infrastructure and agricultural lands etc.
- iii) Strengthening of flood forecasting & warning systems.
- iv) Integrated flood management for riverine & flash.
- v) Wetland managements for flood control etc.

CCP of FPSP-III has been approved by CDWP on 3.3.2020. Based on this, umbrella PC-I at estimated cost of Rs 332.246 million was prepared by FFC and processed for approval by the competent forums, however, it could not be implemented for want of funds. On the directions of PD&SI Division issued in the aftermath of 2022 floods, Umbrella PC-I of Flood Protection Sector Project-III (FPSP-III) costing Rs 194.625 billion has been updated in

consultation with all stakeholders which was processed enroute MoWR for approval of competent forum (CDWP/ECNEC) on December 16, 2022.

In view of scale and severity of devastating flooding of 2022 and emerging flood management issues related to climate change, the situation direly requires that updated FPSP-III is approved at priority & subsequently implemented on ground in order to augment existing structural and non-structural flood protection/ management works. The important structural and non-structural interventions proposed for implementation under FPSP-III (Refer again **Table 3.5**), include the following: -

- a) Flood protection works along the major/ tributary rivers, storage dams and flood diversion/ dispersal structures along the hill torrents, including rehabilitation/ restoration and strengthening/ remodeling of flood embankments/dikes etc. (151 Sub-Projects Costing Rs 159.182 Billion proposed in the four Provinces, G-B and AJ&K (Punjab 12 No., Sindh 40 No., Khyber Pakhtunkhwa with Merged Areas 56 No., Balochistan 29 No., Gilgit-Baltistan 10 No. and AJ&K 4 No.);
- b) Improvement of Flood Forecasting & Early Warning System of PMD by installation of AWS and establishment of six (06) new Regional FF&EW Centres (2 No. Sub-projects costing Rs. 5.025 Billion);
- c) Expansion/ Strengthening of existing Flood Telemetry, Glacial Monitoring, Surface Water Hydrology & HF Radio Network by WAPDA including formulation of National Watershed Management Plan (5 No. Sub-projects costing Rs. 15.319 Billion);
- d) Ecosystem-based adaptation to floods contributes towards better climate resilience, water and food security and sustainable livelihood - Recharge Pakistan Project costing Rs. 6.000 Billion
- e) LiDAR Survey for Analysis of Flood Plains of Rivers Indus, Chenab, Jhelum & Kabul, costing Rs. 0.780 Billion
- f) Establishment of Project Coordination & Management Unit, Hiring of the Project Supervisory Consultants, including urban flood management & rainwater harvesting projects etc. including technical studies proposed by FFC as well as PCRWR. costing Rs. 8.318 Billion

Implementation depends on approval and identification of donor besides other formalities including establishment of PCMU and hiring of Consultants etc.

### **National Master Plan for Flood Telemetry – Included in FPSP-III**

WAPDA under the overall coordination of FFC and with the Technical Assistance of ADB in the form of Technical Experts has prepared National Master Plan for Flood Telemetry for improvement in the Flood Early Warning System on country-wide basis including four provinces, GB, AJ&K and Federal Capital area.

The scope of work envisaged under the Master Plan is as under;

- i) Review the status of Hydrological Gauging Network (telemetry/manual) installed by various government departments and agencies, their condition, and their data sharing mechanism as required for an assessment.
- ii) Establish the requirement for installation of telemetry system across the country based on gaps in existing system, hydrological condition of respective

- catchments/ sub-catchments fulfilling International Data Standards / requirements to ensure registering of flow in all main rivers, secondary and tertiary rivers, small nullahs and streams, so that exact/ real-time estimate of flood discharges entering into main Indus & its tributary rivers (Jhelum, Chenab, Ravi, Sutlej and Kabul Rivers) is available to be ultimately used in precise flood flows forecast generation.
- iii) Prepare National Master Plan including all necessary details along with GIS Maps prepared for identified location for telemetry stations in Pakistan. PC-I of the Plan is covered under FPSP-III and shall be taken-up for implementation subject to realization of funds for FPSP-III.

### **Recharge Pakistan Project: Building Pakistan's Resilience to Climate Change through Ecosystem-based Adaptation for Integrated Flood Risk Management (MOCC, WWF & FFC)**

Following the devastating 2010 Super Floods in Pakistan, the Ramsar Advisory Mission (RAM) advised the government on floodplain management strategies. Subsequently, the Ministry of Climate Change collaborated with various entities to incorporate RAM's recommendations into the National Flood Protection Plan-IV (NFPP-IV). This led to the inception of a 30-year project aimed at addressing environmental challenges such as floods, droughts, and heavy rains in the Indus Basin region, benefiting millions of people directly and indirectly.

The project "Recharge Pakistan Project", divided into three phases, focuses on ecosystem-based adaptation to enhance climate resilience and water and food security by 2050. It targets selected sites along the 1,300 km stretch of the Indus River in KP, Punjab, Sindh, and Balochistan, considering factors like flood risks, climate projections, and community needs. With a vision of better climate resilience and sustainable livelihoods, the project aligns with national policies and goals, contributing to additional water reservoir capacity and promoting local rainwater harvesting.

Currently in the preparation phase, the project has achieved significant milestones, including approval from the Green Climate Fund (GCF) and funding for feasibility studies. Actions taken include stakeholder consultations, feasibility studies, and the completion of environmental and social assessments. The latest development includes GCF's approval of the project, signing of an MoU between WWF-Pakistan and EAD, and pending contracts and interviews for Project Management.



# POWER WING

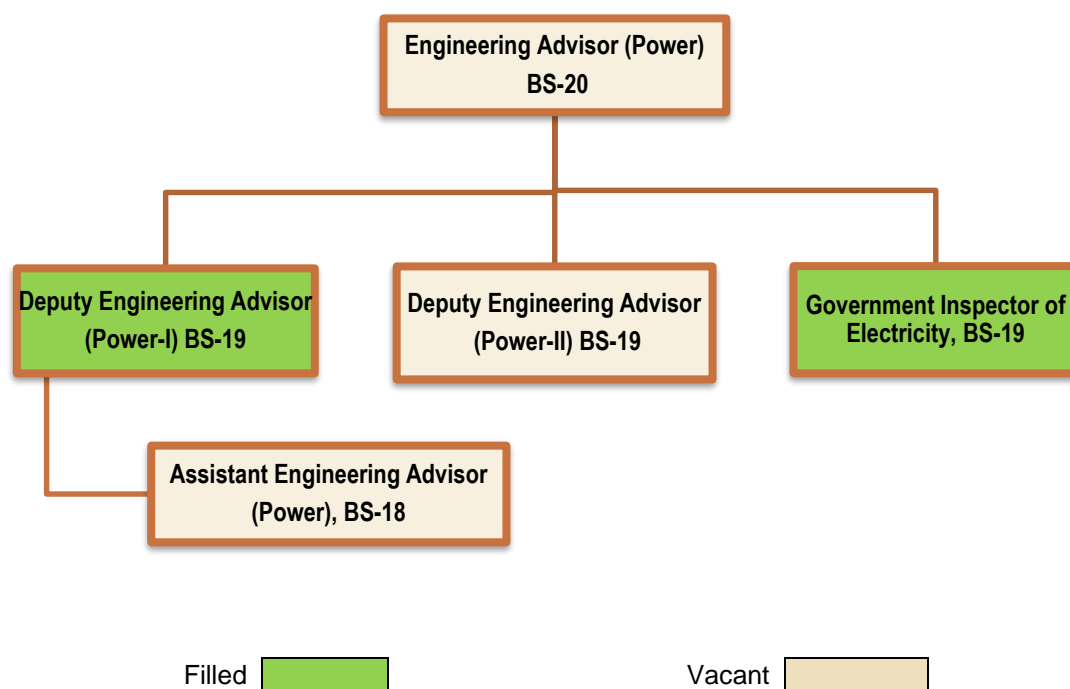


## 4 POWER WING

### 4.1 Organogram

The Wing is headed by Engineering Advisor (Power), who is assisted by three BS-19 officers, Government Inspector of Electricity (GIE) & two Deputy Engineering Advisor (Power). Deputy Engineering Advisor (Power) is assisted by Assistant Engineering Advisor (Power). The one sanctioned post of BS-19 remained vacant.

The assignments during 2022 were completed by Assistant Engineering Adviser (Power) in time. It is recommended to fill the vacant posts as soon as possible through Federal Public Service Commission (FPSC). Suitable candidates from WAPDA or other related entities on deputation / attachment need to be acquired till availability of FPSC nominees.



**Figure 4.1: Organogram of the Power Wing**

### 4.2 Main Functions

Power Wing of the Office of Chief Engineering Adviser/ Chairman, Federal Flood Commission (CEA/CFFC) offers advice on power engineering matters referred by the Ministry of Energy (Power Division) & Ministry of Water Resources such as hydropower schemes of WAPDA and their power dispersal besides dealing with other relevant assignments including investigations/ inquiries related to WAPDA as well as transmission and distribution schemes and other technical matters as and when referred. The main work areas include the following:

#### Generation, Transmission and Distributions Projects

Technical and professionally viable opinion/ advice on various feasibility reports/ studies and power project related schemes (including hydropower), PC-IIs, PC-Is related to

generation, transmission and distribution projects including hydropower schemes of WAPDA and other relevant entities as and when referred.

### Policy and Regulatory Matters

The Comments/advice on policy and regulatory related matters

### Inquiries/ Investigations

Inquiries / investigations on operational and technical matters of WAPDA including Audit Para inquiries referred to the office of CEA/CFFC by the Ministry of Water Resources.

### Power Dispersal from Hydropower Projects

Evaluation and examination of PC-IIs, PC-Is for power dispersal from upcoming hydropower projects. The broader aim of expert technical advice is to help the Ministry in taking better decisions by improving in technical deficiencies of project PC-Is, PC-IIs etc. thus leading to their optimal implementation and better operation after commissioning.

### 4.3 Functions Performed during the year 2023

The summary of annual performance of Power Wing for the year 2023 is summarized in **Table 4.1** below: -

**Table 4.1: Summary of Annual Activities performed by Power Wing**

Sr. No.	Description of Project/Work	No. of Cases	Activities carried out
1.	Hydropower Projects	07	The project proposals (PC-Is & PC-IIs) were evaluated and technical advice on hydropower projects was offered. The comments were submitted to the Ministry of Water Resources. In the light of our comments the project proposals were substantially improved. Detail of the projects is given in <b>Table 4.2</b> .
2.	WAPDA Inquiries	04	WAPDA Inquires involving technical and contractual matters were conducted. Detail is given in <b>Table 4.3</b> .
3.	Power Transmission & Distribution Projects and Technical Matters.	32	The project proposals (PC-Is & PC-IIs) were examined and technical advice/comments were submitted to Ministry of Water Resources and Ministry of Energy (Power Division). The replies of concerned organizations were further analyzed for final advice. In the light of our advice the project proposals were substantially improved. DDWP meetings were also attended in Power Division to assist the approving authority. Detail of projects is given in <b>Table 4.4</b> .
4.	Miscellaneous Matters	15	Comments on certain miscellaneous matters were forwarded. Details are given in <b>Table 4.5</b> .
TOTAL		58	

**Table 4.2: Project PC-Is & PC-IIs related to Hydropower Projects**

Sr. No.	Name of the Project
1.	Patan Hydropower Project – Project readiness Financing (PRF) from Asian Development Bank (ADB)
2.	Installation of Rooftop net metering based Solar PV System / Authorization to WAPDA for Competitive Bidding.
3.	Review of Draft Tender Document for the Implementation of Water Conservation Approaches in the Ministry of Water Resources.
4.	Provincialization of Distribution Companies (DISCOs).
5.	Engagement of NESPAK for Third - Party Validation of Net-Metering based Solar PV System for Solarization of Public Sector Buildings.
6.	PC-I for Rehabilitation and Capacity Enhancement of Kurram Garhi Hydel Power Station from 4 to 5.16 MW.
7.	Replies - Rehabilitation and Capacity Enhancement of Kurram Garhi Hydel Power Station from 4MW to 5.16MW.

Table 4.3: WAPDA Inquiries Conducted

Sr. No.	Name of the Inquiry
1.	1 <sup>st</sup> meeting of Inquiry Committee on Golen Gol Hydropower Project.
2.	2 <sup>nd</sup> meeting of Inquiry Committee on Golen Gol Hydropower Project.
3.	3 <sup>rd</sup> meeting of Inquiry Committee on Golen Gol Hydropower Project.
4.	Inquiry Report on Golen Gol Hydropower Project.

Table 4.4: Project PC-Is &amp; PC-IIs related to Power Transmission &amp; Distribution

Sr. No.	Name of the Project
1.	PC-I for Provision of Funds of Village Electrification under SDGS NA-35.
2.	Submission of PC-I regarding Provision of Funds of Village Electrification.
3.	PC-I for Provision for Funds of Village Electrification under SDGs for MEPCO (NA-151-Khanewal).
4.	PC-I for Provision for Funds of Village Electrification under SDGs for MEPCO (NA-154 for four Districts i.e. Multan, RahimYar Khan, Vehari and Khanewal).
5.	PC-I for Provision for Funds of Village Electrification under SDGs for MEPCO (NA-162).

Sr. No.	Name of the Project
6.	PC-I for Provision for Funds of Village Electrification under SDGs for MEPCO (NA-163).
7.	PC-I for Provision for Funds of Village Electrification under SDGs for MEPCO (NA-182).
8.	PC-I for Provision for Funds of Village Electrification under SDGs for MEPCO (NA-195).
9.	Submission of PC-I for Electrification of Development Schemes under Sustainable Development Goals Achievement Programme (SAP), Merged Tribal Sub-Division Peshawar, Kohat, Bannu, Tank and Dera Ismail Khan (NA-51).
10	PC-I for Provision for Funds of Village Electrification under SDGs for QESCO.
11.	PC-I for Provision for Funds of Village Electrification under SDGs for MEPCO (NA-173 i.e. 132kV Grid Stations Samma Satta, Mubarak Pur, Cantt, Mari Shaikh, Jalal PurPirWala, APE and Uch Sharif.
12.	PC-I for Provision for Funds of Village Electrification under SDGs for MEPCO (NA-173 i.e. 132kV Grid Stations Khanewal, Kacha Khoo, Jahanian and Garha Mor.
13.	PC-Is for Provision for Funds of Village Electrification under SDGs for GEPCO.
14.	PC-I for Provision for Funds of Village Electrification under SDGs for GEPCO (NA-82 i.e. Tehsil and District Gujranwala under SAP).
15.	PC-I for Provision for Funds of Village Electrification under SDGs for GEPCO (NA-84 i.e. Tehsil Nowshera Virkan, District Gujranwala under SAP).
16.	PC-I for Provision for Funds of Village Electrification under SDGs for GEPCO (NA-74 i.e. Tehsil Pasrur District Sialkot under SAP).
17.	PC-I for Provision for Funds of Village Electrification under SDGs for GEPCO (NA-71 under SAP).
18.	PC-I for Provision for Funds of Village Electrification under SDGs for GEPCO (NA-75 under SAP).
19.	PC-Is for Provision for Funds of Village Electrification under SDGs for FESCO.
20.	PC-I for Provision for Funds of Village Electrification under SDGs for GEPCO NA-74).
21.	PC-I for Provision for Funds of Village Electrification under SDGs for GEPCO NA-82).
22.	PC-I for Provision for Funds of Village Electrification under SDGs for GEPCO NA-84).
23.	PC-I for Provision for Funds of Village Electrification under SDGs for GEPCO NA-88).

Sr. No.	Name of the Project
24.	PC-I for Provision for Funds of Village Electrification under SDGs for LESCO and FESCO (NA-118).
25.	PC-I for Provision for Funds of Village Electrification under SDGs for LESCO and FESCO (NA-119).
26.	PC-I for Provision for Funds of Village Electrification under SDGs for LESCO and FESCO (NA-120).
27.	PC-I for Provision for Funds of Village Electrification under SDGs for LESCO and FESCO (NA-123).
28.	PC-I for Provision for Funds of Village Electrification under SDGs for LESCO and FESCO (NA-125).
29.	PC-I for Provision for Funds of Village Electrification under SAP (SDGs) for FESCO (NA-91).
30.	PC-I for Provision for Funds of Village Electrification under SAP (SDGs) for FESCO (NA-111).
31.	PC-I for Provision of Funds under PSDP 2023-24 for QESCO regarding village electrification of 88 villages District Quetta, Chaghi, Kharan, Noushki, Mastung, Kachi, Gawadar, Washuk Baseema, Khuzdar, Kalat, Panjgoor and Turbat.
32.	PC-I for Provision of Funds under PSDP 2023-24 for QESCO regarding village electrification in Tehsil & District Chaghi and in District Panjgoor.

Table 4.5: Miscellaneous Matters dealt by Power Wing

Sr. No.	Miscellaneous Matters
1.	Addition of fresh contract Agreement into the Scope of Activities of Branch Office in Pakistan by M/s GE Hydro France.
2.	Request for Digging of Saim Canal (SAIMNALA in our area, or Provision of Heavy Water Pumping Machines for Draining out Flood Water along with Electric Transformer & Crane for Building Routes & Blocking Flood Water around the village.
3.	Notice of meeting for Evaluation of Financial Bid Procurement of Consultancy Services for Provision/Supply & Installation of necessary IT Equipments and Training on Flood Modeling.
4.	Providing of New Electricity Connections of Tube wells and Restoration of 11kV Line of Moro Khan (zero) and Mira Khan (RTD) Pumping Stations and various Tube wells.
5.	Memorandum of Understanding between Government of the Islamic Republic of Pakistan and the various other Governments on Cooperation in the Field of Disaster Management European Union on Cooperation in the Field of Disaster Management.
6.	Performance Monitoring – Year 2021-22.

Sr. No.	Miscellaneous Matters
7.	Approval of Tender Bid for Award of Work Implementation of Water Conservation Approaches in the Building of Ministry of Water Resources, Islamabad.
8.	Monthly Progress Report for the Month of October, 2023.
9.	Project of RDPI Cell of MoWR (Progress Reports).
10.	Draft Bill on Federal Flood Commission.
11.	Payment of Voucher – Research Studies of PCRWR.
12.	Bid Evaluation Report – PCRWR.
13.	Request for Provision of Services of Pak PWD for Extension / Renovation in Existing Building of O/O CEA/CFFC, (Federal Flood Commission), Islamabad.
14.	Payment against Invoice for Execution of Civil Works (1 <sup>st</sup> Running Bill).
15.	Pak-Swiss Action Plan on Collaboration in the Field of Disaster Management.



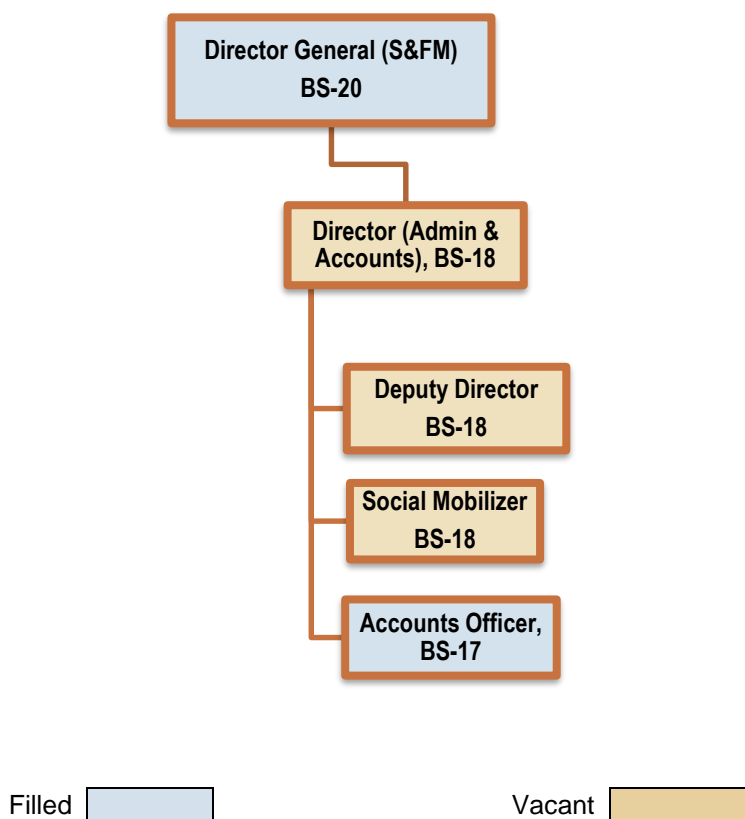


# ADMIN AND ACCOUNTS WING

## 5 ADMINISTRATION & ACCOUNTS WING

### 5.1 Organogram

The Admin and Accounts Wing is headed by Director General (Services and Financial Monitoring) who is assisted by Director (Admin & Accounts), Deputy Director (Admin & Accounts) and Administrative Officer.



**Figure 5.1: Organogram of Admin & Accounts Wing**

### 5.2 Main Functions

Administration and Accounts Wing of office of CEA & CFFC performs following main functions:

- i. General services management;
- ii. Administrative coordination of trainings relating to the organization;
- iii. Annual budgeting of office and development projects, utilization, control and audit;
- iv. Maintenance of project accounts, processing of consultancy services bills, internal inspection of accounts and financial monitoring of development projects.
- v. Keeping liaison with Ministry of Water Resources in accounting and administrative matters and performing its role in the following domains:

- a. Financial Management
- b. Human Resource Management
- c. Procurement Management
- d. Stocks & Inventory Management
- e. Other functions

### 5.3 Activities Completed during 2023

#### 5.3.1 Payment of Pension & other dues to Pensioner

Pension cases including all other dues whatsoever were admissible to the following pensioners have been made successfully during the year 2023. Out of which some of them are in process and will be completed shortly.

**Table 5.1: Miscellaneous Payment of Pension & other dues to Pensioners**

Sr.#	Name	Designation
1	Mr. Ashok Kumar	Chief Engineer(Floods), BS-20
2	Mr. Muhammad Munir	DD(Admin & Accounts), BS-18
3	Mr. Abdul Rashid	Sub Engineer( BS-17)
4	Mr. Muhammad Iqbal	Assistant(BS-16)
5	Mr. Ehsan Ellahi	Daftri (BS-05)

#### 5.3.2 Recruitment Process

The following three posts of different cadres have been filled through the process of FPSC. The officers after completing all codal formalities have joined their duties in the office of CEA/CFFC as detailed below.

**Table 5.2: Recruitment of Officers through FPSC**

Sr.#	Name	Designation
1	Mr. Sheroz Khan	DEA(P)/GIE, BS-19
2	Mr. Rehan Jamil	Accounts Officer, BS-17
3	Mr. Rashid Zawar	Sub Engineer, BS-16

#### 5.3.3 Promotion of officers of (BS-18 to BS-19 & BS-19 to BS-20):

The following two (02) officers, one of BS-18 of engineering cadre have been promoted to the post of BS-19 through the Departmental Selection Board (DSB) and one officer of BS-19 to BS-20, through the Central Selection Board (CSB). Their detail is as under:

**Table 5.3: Recruitment of Officers by Promotion**

Sr.#	Name & Designation	Promoted as
1.	Mr. Muhammad Omer Rafique Malik, Director (A & A), BS-19	DG (S&FM), BS-20
2.	Mr. Muhammad Amir Akram Rao, Assistant Engineering Adviser(Power), BS-18	DEA(Power), BS-19

**5.3.4 Grant of One Time Special Dispensation (108 -Officials of BS-01 to BS-15):**

As per policy of the Federal Government, One Time Special Dispensation to **108** officials of different cadres in the Office of CEA/CFFC have been made after completing all codal formalities likewise their necessary entries in their Service Books, its verification from the AGPR, etc.

**5.3.5 Leave Encashment Cases of officers/officials:**

The officers/officials of Office of CEA/CFFC, likely to be retired this year and opted leave encashment in lieu of LPR have been scrutinized and allowed them leave encashment in lieu of LPR, as per detailed given below:-

**Table 5.4: Leave Encashment Cases of officers/officials**

Sr.#	Name & Designation
1.	Mr. Ahmed Kamal, CEA/CFFC, BS-21
2.	Mr. Ashfaq Ahmed Farooqi, Private Secretary, BS-17
3.	Mr. Muhammad Afzal, Assistant, BS-16

**5.3.6 Budget and Accounts:**

- i) Clearance of the pending claims from office of the AGPR, Islamabad.
- ii) Enhancement of 10% (approximately) in the budget allocation from Rs. 155.000 million (Financial Year 2021-22) to Rs. 170.000 million (Financial Year 2022-23).
- iii) Audit conducted upto the financial year 2020-2021.

## **LIST OF APPENDICES**

**Appendix-I:** Major Rivers Flow Data of Monsoon Season 2023

**Appendix-II:** Monthly Rainfall Data (July-September 2023)

**Appendix-III:** Escapages below Kotri Barrage

**SCHEMES PROPOSED TO BE EXECUTED  
UNDER FLOOD PROTECTION SECTOR  
PROJECT-III (FPSP-III)**



## Schemes Proposed for Execution under Flood Protection Sector Project-III

(Rs. Million)

Sr. No.	Name of Scheme	Estimated Cost
<b>I-WAPDA</b>		
1.	National Master Plan for Flood Telemetry Network (Phase-I)	15,496.00
2.	PC-I for Strengthening and O&M of Glacier Monitoring Research Centre	350.00
3.	PC-I for Strengthening and O&M of SWHP Network.	380.31
4.	PC-I for Strengthening and O&M of High Frequency (HF) Radio Network	884.46
<b>Sub-Total (WAPDA)</b>		<b>17,110.77</b>
<b>II-Sindh</b>		
5.	Construction of T-Spur and stone apron at Mile 135/5 along S.M Bund (Bhanoth) in Saeedabad, District Matiari, Hala Bund Sub Division	874.082
6.	Rehabilitation of Qadirpur Shank & Construction of Stone Studs and T-Head, District Ghotki	3,404.763
7.	Restoration/ Rehabilitation of Malir Weirs-I, II, III & Thado Dam	13,950.451
<b>Sub-Total (Sindh)</b>		<b>18,229.296</b>
<b>III-PCRWR</b>		
8.	Hydrological Assessment of Hill Torrent Potential and Strategies for Efficient Utilization to Mitigate Flooding in Southern Punjab, Upper Sindh and Northern Balochistan Regions <b>(PC-II)</b>	63.160
9.	Improving Climate Resilience in Gilgit Baltistan through Headwater Management, Geochemical Assessment and Risks Characterization of Rivers, Springs & Lakes (PC-II)	118.383
10.	Integrated Water Resources Development and Management through Rainwater Harvesting, Bio-Saline Agriculture and Aquaculture in the Thar Desert <b>(PC-II)</b>	110.590
<b>Sub-Total (PCRWR):</b>		<b>292.133</b>
<b>IV-PMD</b>		
11.	PC-I of Expansion of Meteorological Network by Installation of Automatic Weather Stations in Pakistan under FPSP-III; and Establishment of Regional Flood Forecasting and Early Warning System of PMD under FPSP-III	5,025.392
<b>Sub-Total (PMD)</b>		<b>5,025.392</b>
<b>VI-AJ&amp;K</b>		
12.	Construction of flood protection walls at Qadirabad, Chahtr, Rehra, Dhuli Bridge, Huda Bridge, Manjari and DholQazian in District Bagh.	147.602
13.	Construction of flood protection infrastructure on right & left bank of River Neelum at Makri and Chella Bandi, District Muzaffarabad.	162.098
<b>Sub-Total (AJ&amp;K)</b>		<b>309.70</b>
<b>Grand Total</b>		<b>40,967.291</b>

**Appendix-II**  
*(25-Pages)*

**MAJOR RIVERS FLOW DATA OF  
MONSOON SEASON 2023  
(JULY-OCTOBER 2023)**

## RIVERS FLOW DATA FOR JULY 2023

Date	Time	Indus			Kabul	Indus						
		Tarbela Reservoir			Nowshera	Kalabagh		Chashma Reservoir			Taunsa	
		Level	U/S	D/S	Flow	U/S	D/S	Level	U/S	D/S	U/S	D/S
1-Jul-23	0600	1506.99	235700	110600	70900	209400	201900	647.90	233600	210000	234800	212600
2-Jul-23	0600	1511.27	218200	110000	62100	143600	136100	647.60	208500	210000	234400	211800
3-Jul-23	0600	1512.06	201200	180100	61900	199500	192000	643.80	163700	215000	208500	187600
4-Jul-23	0600	1512.00	188600	189300	60200	205600	198100	643.10	217800	215000	20200	181900
5-Jul-23	0600	1512.00	191500	190700	57100	221500	214000	644.30	239500	215000	202200	181800
6-Jul-23	0600	1513.50	219300	180000	59700	242800	235300	645.90	247100	215000	207900	187500
7-Jul-23	0600	1515.24	215500	170000	59200	212100	204600	647.00	242200	215000	208500	184200
8-Jul-23	0600	1517.19	220400	170000	69000	251700	244200	646.70	229800	225000	211400	186800
9-Jul-23	0600	1517.66	173500	161000	61100	232800	225300	646.90	242500	225000	212000	189000
10-Jul-23	0600	1517.21	153400	164200	58700	210100	202600	647.00	239300	225000	226100	201100
11-Jul-23	0600	1517.21	143200	140000	42800	181300	173800	646.80	219700	215000	222000	196100
12-Jul-23	0600	1517.21	143200	140000	42800	181300	173800	646.80	219700	215000	222000	196100
13-Jul-23	0600	1517.31	140800	140000	37800	167200	159700	646.30	196300	200000	216200	196300
14-Jul-23	0600	1517.02	143300	150000	38000	178100	170600	644.70	171900	190000	211200	191700
15-Jul-23	0600	1515.79	149100	180000	39000	197900	190400	644.00	186200	190000	203900	184500
16-Jul-23	0600	1514.93	158700	180000	48100	209700	201700	644.70	213500	200000	190000	172000
17-Jul-23	0600	1514.77	176700	180000	48900	223200	215200	645.70	228500	210000	184400	166400
18-Jul-23	0600	1515.67	193900	170000	50800	226000	218000	646.50	227400	210000	190100	172100
19-Jul-23	0600	1517.87	217300	160000	50000	208100	200000	647.40	231400	210000	195800	177800
20-Jul-23	0600	1520.47	260100	192100	52000	201400	194400	647.00	221500	224900	200800	182800
21-Jul-23	0600	1521.73	285300	251000	62100	279800	272300	645.20	223800	246900	200800	182800
22-Jul-23	0600	1523.89	297300	239000	67400	296700	289200	643.10	299700	320100	221700	203700
23-Jul-23	0600	1525.89	311400	257400	65400	310000	302500	640.00	348900	352900	283000	271000
24-Jul-23	0600	1528.74	370900	294200	100600	309100	301600	640.00	348900	352900	374500	362800
25-Jul-23	0600	1530.00	335600	301300	70500	367800	360000	639.50	361000	361200	395100	395100
26-Jul-23	0600	1531.00	307200	278700	79000	332300	324500	639.50	401800	397800	372000	372000
27-Jul-23	0600	1531.90	287100	261300	64900	315500	307700	638.50	377500	380000	387500	387500
28-Jul-23	0600	1532.68	280900	258500	60100	298200	290200	638.50	344900	340900	419800	419800
29-Jul-23	0600	1533.65	283200	255500	73000	323300	315300	638.50	331400	327400	397100	397100
30-Jul-23	0600	1534.61	283700	256300	73000	322700	314700	638.50	351700	347700	368200	368200
31-Jul-23	0600	1536.15	252100	208600	57000	296200	288200	639.30	350400	340900	363400	363400

## RIVERS FLOW DATA FOR JULY 2023

Date	Indus						Jhelum				
	Guddu		Sukkur		Kotri		Mangla Reservoir			Rasul	
	U/S	D/S	U/S	D/S	U/S	D/S	Level (Ft)	U/S	D/S	U/S	D/S
1-Jul-23	160000	126700	120700	66800	25300	-	1178.85	60100	10000	3000	-
2-Jul-23	164200	128000	116300	62300	26600	-	1180.70	59200	10000	3200	-
3-Jul-23	168500	130300	118700	61100	32300	-	1182.80	68800	10000	3400	-
4-Jul-23	204500	167100	127400	72500	38900	1000	1184.50	57600	10000	3400	-
5-Jul-23	189800	151400	144600	89700	43100	3200	1186.30	60400	10000	6400	-
6-Jul-23	186200	146100	140200	85300	46100	3200	1188.00	57600	10000	7100	-
7-Jul-23	184300	146100	135000	80000	49900	9800	1189.50	52000	10000	5600	-
8-Jul-23	184400	147800	136900	82000	58400	31200	1191.40	66300	10000	2600	-
9-Jul-23	188400	152400	139300	84700	59600	29500	1194.30	97700	10000	8600	-
10-Jul-23	188600	150100	144600	90000	65100	29500	1195.85	56800	10000	3100	-
11-Jul-23	188600	148800	144500	89700	73000	33100	1197.30	53800	10000	3300	-
12-Jul-23	188300	147900	140600	85500	70800	29500	1198.60	49300	10000	3300	-
13-Jul-23	189900	149200	141000	85600	67500	25900	1200.10	55600	10000	3300	-
14-Jul-23	197400	157300	143100	87700	65900	24200	1201.60	59500	10000	8600	5300
15-Jul-23	193600	153600	143200	87700	69100	27600	1203.00	56200	10000	3300	-
16-Jul-23	185700	146400	137700	76300	33800	33800	1204.40	56200	10000	3600	5300
17-Jul-23	179000	139000	133000	77300	76300	33800	1205.65	51200	10000	3300	-
18-Jul-23	183800	143700	129700	74000	70500	28000	1206.95	52900	10000	3300	-
19-Jul-23	184700	144600	131000	75300	70500	28200	1208.50	61100	10000	3300	-
20-Jul-23	188200	148400	137500	82900	70500	28200	1210.20	66500	10000	8500	5300
21-Jul-23	181900	152000	142200	88800	73000	33600	1211.85	67900	10000	8500	5300
22-Jul-23	181900	152000	142200	88800	73000	33600	1211.85	57400	10000	7400	5300
23-Jul-23	192300	161300	147000	98300	63000	26100	1214.95	71400	10000	18200	15800
24-Jul-23	194800	167700	160100	129400	62700	33700	1216.95	80200	10000	2300	-
25-Jul-23	237300	228700	185200	181000	63700	39900	1218.70	71400	10000	7800	5300
26-Jul-23	295600	295600	222400	218200	72000	47500	1220.25	64900	10000	7800	5300
27-Jul-23	358500	349700	281800	260500	118100	86900	1222.20	82400	10000	7800	5300
28-Jul-23	378700	368500	325200	290400	120300	86900	1223.65	63800	10000	7700	5300
29-Jul-23	410800	396600	360000	322600	122800	90700	1225.20	67500	10000	7800	5300
30-Jul-23	467400	450200	391400	360000	143500	108900	1227.00	76800	10000	7800	5300
31-Jul-23	481900	461300	434900	400500	168800	132600	1228.20	54500	10000	2500	-

## RIVERS FLOW DATA FOR JULY 2023

Date	Chenab								Ravi			
	Marala		Khanki		Qadirabad		Trimmu		Panjnad		Balloki	
	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S
1-Jul-23	75100	48900	61800	54300	57400	35400	44600	29000	17600	4000	37800	10500
2-Jul-23	70000	48900	51100	43600	45800	23800	42800	27200	22100	8500	37400	10000
3-Jul-23	71300	43600	47200	39700	47200	39700	42300	26700	22100	8500	37400	10000
4-Jul-23	76700	49000	51100	43600	43200	21100	35800	20200	33200	18700	34200	6300
5-Jul-23	92100	66900	66200	58700	52400	30400	30800	14200	32200	17300	34300	6300
6-Jul-23	78800	54300	62900	55700	67300	45300	28700	12300	26300	11400	36600	9000
7-Jul-23	59400	38300	50800	43600	49800	49800	27800	32100	24700	10200	41200	14200
8-Jul-23	64700	43600	45100	37900	45800	23800	45600	30200	24800	10200	41100	14200
9-Jul-23	92800	77000	73500	66400	53900	31900	45700	32200	21900	7700	40300	13300
10-Jul-23	184300	168300	193800	186800	174900	159900	33000	19600	22100	7700	41100	14200
11-Jul-23	100900	84400	93500	86200	128800	113800	31900	18400	21600	7700	35300	8200
12-Jul-23	66700	43600	73700	66400	70700	60700	91100	77600	25500	11600	43200	25100
13-Jul-23	71700	43600	62600	55300	49400	39400	103600	90100	29500	15100	45200	27700
14-Jul-23	66400	38200	55000	47800	49300	39300	70600	57300	30100	15500	43000	25500
15-Jul-23	77200	48900	57000	49700	42400	32400	49400	36100	36200	21300	43300	25500
16-Jul-23	77200	48900	58600	51200	49300	39300	37800	24500	55000	39900	43300	25500
17-Jul-23	95400	67100	66300	58900	52800	42800	34400	21000	55100	39900	43300	26600
18-Jul-23	95100	66900	71300	63800	63000	53000	34500	21000	42800	28300	45400	27700
19-Jul-23	106600	78300	70100	62600	53800	39300	36700	23200	33000	18200	46400	22100
20-Jul-23	138200	120200	204600	197100	202900	184900	42100	28600	31500	17000	49800	22100
21-Jul-23	112100	93900	104600	97200	106700	96300	55400	43900	30500	19000	57700	30000
22-Jul-23	112100	93900	104600	97200	106700	96300	103100	92600	30500	19000	57700	30000
23-Jul-23	137600	127600	131300	124600	106300	96300	115500	105000	40200	30500	71400	46100
24-Jul-23	108600	94800	100200	93200	102100	92100	107200	96700	49200	39900	67800	42500
25-Jul-23	93700	78700	87800	80800	82700	72700	113600	105100	63800	54700	65900	41400
26-Jul-23	111600	94600	83800	76800	73100	63100	125100	116700	77800	70800	62900	38400
27-Jul-23	92700	75700	85000	77900	83000	72700	95900	87500	96600	89500	58800	42000
28-Jul-23	126700	110400	95800	88600	76800	66800	83100	74700	106400	97200	60000	47200
29-Jul-23	121600	104600	100700	93600	92800	82800	86600	78100	106400	97200	64500	51500
30-Jul-23	96400	79400	79600	84600	77600	82700	86600	78100	104400	93600	74200	58800
31-Jul-23	69400	54200	73200	66300	69600	59600	90200	84700	105000	93600	71100	50100

## RIVERS FLOW DATA FOR JULY 2023

Date	Sutlej						Links/ Canal				Skardu	
	Sidhnai		Sulemanki		Islam		C.J	CRBC	Q.B	T.P	Temperature °C	
	U/S	D/S	U/S	D/S	U/S	D/S	Flow	Flow	Flow	Flow	Max	Min
1-Jul-23	20300	8400	15000	4000	2100	1200	2000	3000	22000	7700	30.0	19.4
2-Jul-23	19600	5600	16900	5400	1000	-	2000	2700	22000	8100	29.4	18.9
3-Jul-23	19600	4600	17800	6300	3000	2300	3800	2700	22000	5400	32.2	20.0
4-Jul-23	20200	4300	17300	5300	3900	2900	8000	2700	22200	4800	32.2	20.0
5-Jul-23	18900	3000	15100	2900	3300	2300	8000	2700	22000	5400	31.1	18.3
6-Jul-23	17900	2000	15300	3200	3300	2300	8000	2700	22000	4400	28.9	17.2
7-Jul-23	18100	2300	15300	3200	3300	2300	6600	2500	22000	11300	26.7	17.8
8-Jul-23	21100	5200	15300	3200	2700	1700	7600	2200	22000	11600	25.0	15.6
9-Jul-23	21400	7500	20400	10400	1100	400	12000	2200	22000	12000	21.1	14.4
10-Jul-23	21800	6500	22200	11400	1600	800	10500	2200	22000	12000	22.8	17.2
11-Jul-23	22600	6900	23600	11800	4500	3500	5600	2300	22000	9500	23.9	15.4
12-Jul-23	22300	7200	31000	19000	5200	4200	2100	2600	10000	9900	25.0	15.6
13-Jul-23	19800	4600	62100	62100	9200	8300	2000	2700	10000	3900	27.8	18.3
14-Jul-23	23400	8000	58100	58100	13000	12100	2000	2800	10000	3400	30.0	18.9
15-Jul-23	24200	8900	73400	73400	14200	14200	2000	2900	10000	3300	31.1	18.8
16-Jul-23	24200	8800	83500	83500	15300	15300	2000	2900	10000	2000	32.2	17.2
17-Jul-23	25600	10200	65400	65400	17500	17500	2000	2900	10000	2000	29.4	17.8
18-Jul-23	26900	11500	45300	45300	18600	18600	2000	2900	10000	2000	30.6	18.3
19-Jul-23	27800	12200	34400	25600	19600	19600	2000	2900	14400	2000	32.2	21.1
20-Jul-23	29500	15900	37600	26800	19800	18900	2000	2900	18000	2000	33.3	20.8
21-Jul-23	30800	18100	44300	33600	26800	26100	2000	2900	10400	2000	31.1	19.4
22-Jul-23	30800	18100	44300	33600	26800	26100	2000	2900	10400	2000	26.7	19.4
23-Jul-23	27400	16400	57100	46100	28000	27400	2000	2500	10000	2000	23.3	18.9
24-Jul-23	29600	18200	63000	51400	28000	27400	2000	1300	10000	2000	21.1	15.6
25-Jul-23	32400	21500	71600	62600	27900	26100	2000	1300	10000	2000	21.7	16.1
26-Jul-23	31300	20600	84400	84400	38300	37900	2000	2000	10000	-	23.9	16.7
27-Jul-23	36600	28600	84400	84400	37900	37900	2000	2000	10000	-	26.7	18.3
28-Jul-23	41100	32500	84400	84400	38700	38700	2000	2000	10000	-	25.6	20.2
29-Jul-23	41300	31800	82700	82700	40900	40200	2000	2000	10000	-	23.3	18.3
30-Jul-23	46500	35600	72000	72000	47900	47900	2000	2000	10000	-	21.1	15.6
31-Jul-23	48300	36900	71400	66000	49600	49600	2000	2000	10000	-	23.9	16.7



## RIVERS FLOW DATA FOR AUGUST 2023

Date	Time	Indus			Kabul	Indus						
		Tarbela Reservoir			Nowshera	Kalabagh		Chashma Reservoir			Taunsa	
		Level (Ft)	U/S	D/S	Flow	U/S	D/S	Level (Ft)	U/S	D/S	U/S	D/S
1-Aug-23	0600	1537.79	218600	172300	48000	206700	198700	638.50	302300	302500	357400	357400
2-Aug-23	0600	1539.79	201800	145500	45700	195500	187500	641.80	232900	209700	319900	319900
3-Aug-23	0600	1541.29	199300	155300	42700	158400	150400	642.80	192900	170600	270800	257300
4-Aug-23	0600	1542.29	217500	187700	50400	216700	208700	644.90	185000	155600	181600	168600
5-Aug-23	0600	1543.50	221100	185200	46500	196100	188100	644.00	212500	218400	162900	148400
6-Aug-23	0600	1545.00	231200	186900	48900	210500	202500	643.00	237400	241600	195700	180500
7-Aug-23	0600	1546.00	239800	210000	50300	223256	215256	643.00	246711	233451	239587	224087
8-Aug-23	0600	1547.00	251000	221600	53700	277400	269400	643.00	266700	251500	245300	229000
9-Aug-23	0600	1548.00	255700	226300	50300	284300	276300	643.00	300800	285600	236600	219800
10-Aug-23	0600	1549.00	228100	198700	45400	191100	183100	644.00	307600	280800	252100	235300
11-Aug-23	0600	1550.00	209000	155000	39700	225200	217200	644.00	228500	210400	310800	293000
12-Aug-23	0600	1549.22	226400	248500	41700	236300	228300	646.00	248000	197900	242900	223900
13-Aug-23	0600	1549.09	226800	230100	39200	250600	242600	647.00	250000	209300	204900	186800
14-Aug-23	0600	1549.05	227800	228500	38000	256700	248700	647.00	297600	276400	179000	160900
15-Aug-23	0600	1549.04	235600	235400	41400	254800	246800	647.00	273400	252200	235300	217200
16-Aug-23	0600	1549.28	232600	225100	41500	275200	267200	647.00	277300	256100	236200	217200
17-Aug-23	0600	1550.00	221000	199600	37000	272700	264700	649.00	310400	243000	232900	213900
18-Aug-23	0600	1549.60	212100	223200	34700	256700	248700	649.00	281000	259800	239900	220900
19-Aug-23	0600	1549.42	206600	211300	33000	218600	210600	649.00	267300	246100	227700	208700
20-Aug-23	0600	1549.59	205700	200300	32900	204900	196900	649.00	246900	225700	227700	208700
21-Aug-23	0600	1549.10	208400	222100	32500	206800	198800	649.00	245000	223800	227600	208600
22-Aug-23	0600	1549.30	210800	204500	39500	205900	197900	649.00	241000	219800	212200	193200
23-Aug-23	0600	1549.32	223300	222200	34200	256700	248700	649.00	244000	222800	204400	185400
24-Aug-23	0600	1548.92	243700	254800	37800	236300	228300	648.60	251900	240900	213300	191300
25-Aug-23	0600	1548.70	252800	258700	42600	285000	277000	648.80	274400	246300	231100	208600
26-Aug-23	0600	1549.25	239500	223100	40800	283100	275100	648.80	307700	286700	241200	218700
27-Aug-23	0600	1549.70	211300	197800	33700	256700	248700	648.80	311300	293500	265200	245700
28-Aug-23	0600	1550.00	187400	178200	29700	192100	184100	648.80	263400	245700	282300	258800
29-Aug-23	0600	1550.00	158400	158000	27500	200200	192200	648.00	211900	214600	260000	236500
30-Aug-23	0600	1550.00	135000	135300	25400	168811	160811	647.00	214192	217182	213917	190417
31-Aug-23	0600	1550.00	125000	117100	24100	148869	140869	647.20	173882	152131	148869	140869

## RIVERS FLOW DATA FOR AUGUST 2023

DATE	Indus						Jhelum				
	Guddu		Sukkur		Kotri		Mangla Reservoir			Rasul	
	U/S	D/S	U/S	D/S	U/S	D/S	Level (Ft)	U/S	D/S	U/S	D/S
1-Aug-23	469800	443300	444000	405700	181900	144800	1229.35	52700	10000	8100	5300
2-Aug-23	451700	422400	443000	400500	192500	154700	1230.30	45800	10000	2900	-
3-Aug-23	433900	400300	430200	384800	211100	172200	1231.90	72500	10000	2900	-
4-Aug-23	399700	369900	411000	364500	211600	172200	1232.90	49000	10000	2900	-
5-Aug-23	326900	297700	388000	339500	228500	189200	1233.65	39300	10000	3100	-
6-Aug-23	248600	219800	305500	253900	229100	189200	1234.50	43200	10000	3100	-
7-Aug-23	222767	191294	211540	157860	242150	203365	1235.40	45185	10000	3150	-
8-Aug-23	265400	233300	184700	130100	249900	211900	1236.25	43200	10000	8400	5300
9-Aug-23	290000	259100	221100	166800	258100	220900	1236.95	37300	10000	3100	-
10-Aug-23	278200	246200	243500	189100	253500	215400	1237.60	35400	10000	3100	-
11-Aug-23	277500	244400	233900	179500	246800	207500	1238.15	31500	10000	3100	-
12-Aug-23	283200	251200	236900	182500	225600	186200	1238.75	33400	10000	3100	-
13-Aug-23	282900	251200	204700	186600	183500	143300	1239.25	29500	10000	3100	-
14-Aug-23	282700	251800	244700	190200	183500	143300	1239.75	29500	10000	3100	-
15-Aug-23	234500	203400	237700	182600	180300	140000	1240.60	44300	10000	8400	-
16-Aug-23	214800	183200	186500	131400	173300	132900	1241.30	38700	10000	2900	-
17-Aug-23	214000	183200	182100	126900	173300	132900	1241.75	28400	10000	8200	5300
18-Aug-23	254800	225900	186000	133400	168000	127800	1242.00	28600	18400	3000	-
19-Aug-23	257500	225900	215100	161100	168000	127800	1242.00	24300	24300	18800	15800
20-Aug-23	257000	224400	216000	161100	162000	121800	1242.00	23200	23200	15000	11800
21-Aug-23	257600	225100	215900	161800	162000	121800	1242.00	22500	22500	15000	11800
22-Aug-23	255300	225900	210200	155800	153900	113000	1241.90	21200	25100	22600	19700
23-Aug-23	255100	224400	210700	159400	153900	113000	1241.80	20900	25000	18700	15800
24-Aug-23	259700	228500	210000	155800	154100	113000	1241.85	26700	24600	22600	19700
25-Aug-23	249900	218800	210100	155800	153700	113000	1241.70	23500	29700	22600	19700
26-Aug-23	241500	210300	205000	151500	153400	113000	1241.70	20300	20300	10700	7900
27-Aug-23	242000	210300	205100	151500	113000	113000	1241.80	18500	14700	2800	-
28-Aug-23	266500	235000	205200	151500	153700	113000	1241.95	21700	15500	11000	7900
29-Aug-23	276300	247000	224400	170500	148400	113000	1242.00	20300	18300	10800	7900
30-Aug-23	303490	273918	238080	184350	148570	107665	1242.00	18253	18253	13391	5341
31-Aug-23	317310	286578	262860	209050	148670	107665	1242.00	15600	15500	8050	-

## RIVERS FLOW DATA FOR AUGUST 2023

Date	Chenab								Ravi			
	Marala		Khanki		Qadirabad		Trimmu		Panjnad		Baloki	
	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S
1-Aug-23	75600	54300	65900	58700	61000	51000	101000	95500	110900	99000	56400	34600
2-Aug-23	81200	54300	61100	53600	56600	46500	93000	87500	120700	107500	48400	26000
3-Aug-23	87400	59600	59400	51900	52000	42000	73900	68400	124600	110900	45900	22900
4-Aug-23	82200	54300	66200	58700	59400	49400	66000	60500	142500	128400	42800	20300
5-Aug-23	82200	54300	69900	62100	56500	46500	52000	46500	148600	134500	43800	26100
6-Aug-23	82200	54300	65100	57600	59400	49400	56000	47400	145900	131800	49400	31700
7-Aug-23	82236	54336	56461	48793	43571	33571	63692	55092	141189	125989	48360	30610
8-Aug-23	77600	48900	65800	58200	54800	44800	63600	59000	75800	60400	44700	28000
9-Aug-23	72400	43600	53400	46300	48000	38000	67600	59000	76400	61000	41200	21200
10-Aug-23	77800	48900	50600	43000	43200	33200	66300	57700	69600	54200	37600	14800
11-Aug-23	83200	54300	54700	46900	43200	33200	70800	62200	69600	54200	38800	15900
12-Aug-23	73300	43600	49800	41900	43200	33200	63100	52500	76500	61000	39900	17000
13-Aug-23	78800	48900	50000	41900	43200	33200	57600	44000	76600	61000	42100	19300
14-Aug-23	78800	48900	57700	49500	48900	38900	61400	47800	76600	61000	42100	19300
15-Aug-23	94900	65000	66300	58200	51900	41900	61400	47800	76600	61000	42300	19300
16-Aug-23	74300	54300	69200	61100	64100	54100	55200	41600	70300	54700	44100	23700
17-Aug-23	69200	48900	61000	52800	51900	41900	60100	46500	70500	54700	47400	27400
18-Aug-23	64000	43600	57000	48700	45600	35600	73400	59800	70500	54700	46500	28500
19-Aug-23	67000	43600	50300	42100	41500	31500	81200	67600	70500	54700	38500	30700
20-Aug-23	64900	38200	48600	40400	39900	29900	69500	55900	70800	54700	38000	30200
21-Aug-23	61100	32900	47500	39300	39900	29900	66800	56200	70900	54700	36800	29000
22-Aug-23	77200	48900	48600	40400	38900	28900	57800	47200	77300	61100	37000	29000
23-Aug-23	77200	48900	59800	51500	46000	36000	61600	53000	78900	62500	34200	26200
24-Aug-23	77200	48900	50100	41900	48500	38500	62900	54300	81300	64800	34200	26200
25-Aug-23	78700	48900	59800	51500	51200	41200	62900	54300	80600	64100	41000	23000
26-Aug-23	68500	38200	51800	43500	39900	29900	71400	62800	80600	64100	41600	19600
27-Aug-23	45500	22200	33200	24900	36800	26800	77500	68900	80600	64100	39800	17100
28-Aug-23	45500	22200	33200	24900	25000	15000	83000	74400	85100	68500	37100	14100
29-Aug-23	45500	22200	29000	20600	22500	12500	79200	68600	93500	76900	31200	8200
30-Aug-23	38467	11512	29000	15000	28900	15049	65700	52000	101037	84387	29345	6345
31-Aug-23	40812	11512	15600	7500	18000	NIL	52200	36600	109384	92734	32155	9155

## RIVERS FLOW DATA FOR AUGUST 2023

DATE	Sutlej						Links Canal				Skardu	
	Sidhnai		Sulemanki		Islam		C.J	CRBC	Q.B	T.P	Temperature °C	
	U/S	D/S	U/S	D/S	U/S	D/S	Flow	Flow	Flow	Flow	Max	Min
1-Aug-23	52800	40800	70900	63000	54300	53700	2000	2900	10000	-	26.7	18.3
2-Aug-23	56500	43200	71900	63000	58500	57900	2000	3000	10000	-	30.0	18.9
3-Aug-23	58500	43700	72900	63100	64500	63900	2000	3000	10000	1000	30.0	19.4
4-Aug-23	49800	34600	76000	65800	66600	63900	2000	3000	10000	1000	30.0	18.3
5-Aug-23	37800	21700	74700	64200	66600	65700	2000	3100	10000	1000	30.6	18.9
6-Aug-23	30500	13900	69600	57900	65300	63900	2800	3200	10000	1000	29.4	19.4
7-Aug-23	32236	15636	59436	47473	62751	61351	10000	3200	10000	1000	30.0	19.4
8-Aug-23	36800	20100	57100	44700	44700	62800	12000	3200	10000	1000	27.6	15.4
9-Aug-23	39100	22400	57500	44700	57900	56200	12000	3200	10000	1000	29.2	14.3
10-Aug-23	37300	20700	57600	44700	54600	52300	12300	3200	10000	1000	32.6	14.0
11-Aug-23	33400	16500	59300	46800	51500	49600	18000	3200	10000	2000	32.6	15.4
12-Aug-23	24900	8000	59500	46700	43700	41700	22000	3200	10000	2000	33.7	17.4
13-Aug-23	25400	8000	56200	43000	37800	35700	2000	3200	10000	2000	32.6	14.2
14-Aug-23	27300	9600	51400	38000	36500	34300	19000	3200	10000	2000	34.1	15.4
15-Aug-23	28500	10800	45300	32100	36500	34300	18000	3200	10000	2000	32.7	14.3
16-Aug-23	30000	12100	45500	32100	33600	31500	18000	3200	10000	2500	29.6	14.1
17-Aug-23	31200	13300	51100	37400	33200	32200	18000	3200	10000	2500	31.6	18.4
18-Aug-23	31600	13700	63600	49900	31800	30100	18000	3200	10000	2500	32.7	17.3
19-Aug-23	37200	19300	80100	66400	32000	30100	18000	3200	10000	2500	33.6	16.2
20-Aug-23	38000	20100	113400	113400	31800	30100	18000	3200	10000	2500	34.1	16.4
21-Aug-23	38900	21000	146200	146200	31600	30100	18000	3200	10000	2500	34.3	16.3
22-Aug-23	35300	17400	191000	191000	51100	49600	18000	3200	10000	2500	34.2	16.1
23-Aug-23	35300	17400	155300	155300	57700	56200	18000	3200	10000	2500	34.7	19.3
24-Aug-23	35300	17400	136600	136600	94200	93100	18000	3200	10000	5500	33.6	17.3
25-Aug-23	36500	18600	105900	95300	136800	135700	19700	3200	10000	6000	25.0	14.2
26-Aug-23	35300	17400	96600	83700	151900	151900	17200	3200	10000	6000	24.5	12.4
27-Aug-23	32900	15100	102600	89600	135700	134700	15000	2800	10000	6500	24.1	12.2
28-Aug-23	28100	10200	108100	94500	94200	94200	15000	2700	10000	7000	25.0	12.2
29-Aug-23	25000	7100	98800	85000	82900	81300	15000	2700	10000	7000	24.7	14.8
30-Aug-23	23188	5288	95196	81173	82916	81366	15000	2700	14000	7500	25.6	10.2
31-Aug-23	23188	5288	95238	81173	77022	75172	15000	2600	10000	8000	28.7	10.2

## RIVERS FLOW DATA FOR SEPTEMBER 2023

Date	Time	Indus			Kabul	Indus						
		Tarbela			Nowshera	Kalabagh		Chashma			Taunsa	
		Reservoir Level (Ft)	U/S	D/S	Flow	U/S	D/S	Reservoir Level (Ft)	U/S	D/S	U/S	D/S
1-Sep-23	0600	1550.00	123400	122600	24100	136900	128900	647.70	157700	130000	158500	134000
2-Sep-23	0600	1550.00	124000	123200	23500	126200	118200	648.00	143600	120000	143800	119300
3-Sep-23	0600	1550.00	134400	133400	22900	138800	130800	648.10	139900	120000	114800	94200
4-Sep-23	0600	1550.00	141500	140700	24400	152600	144600	648.50	147500	120000	106000	87200
5-Sep-23	0600	1550.00	136200	135400	24500	168200	160200	649.00	172800	142400	111700	92800
6-Sep-23	0600	1550.00	133600	132800	25100	170100	162100	649.00	157200	139500	113500	94200
7-Sep-23	0600	1550.00	121700	120900	24800	155500	147500	649.00	167700	150000	134400	113100
8-Sep-23	0600	1550.00	114000	113200	23900	129500	121500	648.00	142200	150000	127100	107600
9-Sep-23	0600	1549.21	102900	125000	23100	117900	109900	646.20	131400	150000	139000	112800
10-Sep-23	0600	1547.90	102800	140000	23700	151618	144278	644.20	135318	150000	140715	115388
11-Sep-23	0600	1546.65	104600	140000	23100	152200	144200	644.20	160900	150000	141500	117700
12-Sep-23	0600	1545.62	110900	140000	22900	153200	145200	644.30	157600	150000	141500	118000
13-Sep-23	0600	1545.10	115700	130000	23000	128500	120500	644.50	157200	150000	142000	118800
14-Sep-23	0600	1545.04	124000	114800	22300	130500	122500	644.80	155100	150300	141300	121600
15-Sep-23	0600	1545.43	132100	120000	20700	129500	121500	644.10	141100	145000	141600	124000
16-Sep-23	0600	1546.18	142500	120000	21200	128600	120600	644.10	149500	145000	141600	124000
17-Sep-23	0600	1547.05	146000	120000	28200	142400	134400	642.20	128400	145000	137100	120000
18-Sep-23	0600	1547.59	146500	130000	26800	140500	132500	642.45	151000	145000	132900	115300
19-Sep-23	0600	1548.02	143300	130000	34200	153200	145200	643.10	156600	145000	137100	118900
20-Sep-23	0600	1548.35	135400	125000	25400	150700	142700	644.30	163500	145000	137000	118200
21-Sep-23	0600	1548.47	124300	120000	22700	144300	136300	644.90	157100	145000	137100	117400
22-Sep-23	0600	1548.33	116700	120000	21300	103200	95200	644.90	149700	145000	136800	116400
23-Sep-23	0600	1547.82	106000	120000	21200	142400	134400	644.10	139800	145000	137900	116900
24-Sep-23	0600	1547.36	96700	110000	19700	125700	117700	644.60	145900	135000	138000	117500
25-Sep-23	0600	1546.63	88800	110000	21100	103200	95200	645.00	144400	135000	138000	117500
26-Sep-23	0600	1546.90	79100	100000	19700	128600	120600	644.90	123200	120200	131000	110600
27-Sep-23	0600	1544.91	72000	100000	19800	116300	108300	646.00	139600	120000	122800	103500
28-Sep-23	0600	1543.98	63700	90000	19200	120200	121200	645.90	122700	120000	109100	109100
29-Sep-23	0600	1542.82	57100	90000	19300	92900	84900	645.50	118400	120000	109100	88300
30-Sep-23	0600	1541.68	64400	90000	17800	107000	99000	643.80	102400	120000	109100	88300

## RIVERS FLOW DATA FOR SEPTEMBER 2023

Date	Indus						Jhelum				
	Guddu		Sukkur		Kotri		Mangla			Rasul	
	U/S	D/S	U/S	D/S	U/S	D/S	Reservoir Level (Ft)	U/S	D/S	U/S	D/S
1-Sep-23	296200	265100	275100	221200	148600	107600	1242.00	16200	16200	13400	5300
2-Sep-23	280700	250500	262900	209000	148800	107600	1242.00	15400	15400	8100	-
3-Sep-23	245000	213300	238000	184200	148800	107600	1242.00	14100	14100	8100	-
4-Sep-23	166100	133100	197000	143000	158900	117800	1242.00	16500	16500	13400	5300
5-Sep-23	141900	108500	122100	68100	169700	128400	1242.00	13300	13300	8100	-
6-Sep-23	135100	102800	100300	47100	174000	132700	1241.90	13800	18000	12600	-
7-Sep-23	134200	103800	98300	45800	159600	118300	1241.75	11800	18000	13100	-
8-Sep-23	139700	110700	98300	45800	134700	93400	1241.10	13300	40000	23000	7900
9-Sep-23	147900	120900	104100	50700	78200	36900	1240.35	9200	40000	33900	15800
10-Sep-23	153234	125760	114030	59250	74670	33385	1239.40	13912	40000	34900	15800
11-Sep-23	145000	116100	114000	59200	73000	62500	1239.05	14500	40000	34900	15800
12-Sep-23	145000	115400	109900	55100	66100	62300	1238.30	15600	45000	35400	15800
13-Sep-23	137800	106400	108900	54800	42900	19900	1237.50	13700	45000	35400	15800
14-Sep-23	134900	103400	99700	46700	42000	800	1236.70	13700	45000	35500	15800
15-Sep-23	131700	100600	98200	46300	42000	800	1236.05	14600	40000	35500	15800
16-Sep-23	127800	98500	95000	44200	47800	6600	1235.70	16400	30000	35400	15800
17-Sep-23	120200	91800	92200	42200	47800	6600	1235.40	18300	30000	27700	8000
18-Sep-23	122100	95400	87800	38400	44900	4400	1234.80	16500	40000	27700	8000
19-Sep-23	123200	98300	87700	38400	43800	14600	1193.00	12600	40000	35500	15800
20-Sep-23	118400	93700	93600	43400	40900	20400	1233.50	16500	40000	27700	8000
21-Sep-23	115100	91400	90100	41000	40300	20400	1232.90	16500	40000	31600	11900
22-Sep-23	116000	89900	89100	39700	38200	13000	1232.15	10700	40000	25000	5300
23-Sep-23	126200	97200	88100	38300	36000	7400	1231.55	14500	38000	31500	11900
24-Sep-23	130500	99900	94000	43300	35500	5400	1230.85	10600	38000	32400	11900
25-Sep-23	130000	99100	96700	44900	35500	400	1230.10	8700	38000	28400	8000
26-Sep-23	133700	104600	99100	46800	39800	2400	1229.35	9900	38000	32100	11900
27-Sep-23	133200	104600	100100	48100	38900	800	1228.70	13900	38000	28500	28500
28-Sep-23	132000	102900	101500	49900	38200	400	1228.10	15700	38000	28500	8000
29-Sep-23	127300	100300	100400	49900	38200	400	1227.30	15300	45000	28500	8000
30-Sep-23	125700	100300	98100	47800	38900	2400	1226.40	11600	45000	32400	11900



## RIVERS FLOW DATA FOR SEPTEMBER 2023

Date	Chenab								Ravi			
	Marala		Khanki		Qadirabad		Trimmu		Panjnad		Baloki	
	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S
1-Sep-23	45500	15200	15700	7400	13900	-	38700	23100	102700	86000	32100	9100
2- Sep -23	52800	22400	15700	7400	15800	-	39500	22600	102700	86000	31300	8300
3- Sep-23	47600	16800	17600	9300	22700	2700	27100	11500	89000	72300	33800	10800
4- Sep -21	47600	16800	19400	11100	22700	2700	23500	7900	81200	64500	36300	13300
5- Sep-23	53000	22200	26400	18200	25400	5400	21500	5900	76900	60200	37200	14200
6- Sep-23	53000	22100	17500	9300	22000	-	21500	5900	78500	61700	38500	12500
7- Sep-23	38500	7700	17500	9300	24700	2700	21500	5900	76700	59900	36800	10800
8- Sep-23	36700	5900	11900	3700	19000	-	21500	5900	67000	50000	36800	10800
9- Sep-23	36700	5900	11900	3700	17000	-	20400	6800	67000	50000	35100	9100
10- Sep-23	42135	11512	13885	5598	18000	-	20497	6897	50834	33955	32870	6870
11- Sep-23	42100	11500	15700	7400	24700	2700	16700	1000	39600	22700	32800	6800
12- Sep-23	52800	22200	15800	7400	24700	2700	18800	3200	37400	20400	38600	10500
13- Sep-23	58100	27500	37300	28900	39400	17400	20800	5200	34800	17800	38700	10500
14- Sep-23	68900	38300	46500	38200	44700	22700	20900	5300	34200	17300	38800	10600
15- Sep-23	63500	32900	47700	39500	47000	25000	20900	5300	18100	800	40000	11700
16- Sep-23	74300	43600	64700	56500	66500	44500	25200	9600	18100	800	41400	15100
17-Aug 23	52800	22200	26500	18300	52200	30200	55800	23200	18100	800	43100	16800
18-Aug 23	52700	22200	19400	11200	36800	14800	44200	31600	18100	800	41400	15100
19-Sep-23	52300	22200	38100	29900	49900	27900	51500	38900	18100	800	41100	15100
20-Sep-23	46600	16900	19100	11200	38100	16100	38200	25600	22500	5200	44300	18000
21-Sep-23	37600	7700	15300	7500	32800	10800	27400	14800	29200	12000	47400	19100
22-Sep-23	37600	7700	11600	3700	27500	5500	30600	18000	35200	18000	46300	18000
23-Sep-23	33800	4000	9700	1900	23500	1500	30600	18000	38700	21400	44800	22000
24-Sep-23	30900	4000	10500	2800	2800	18000	27400	14800	34800	17600	46000	20900
25-Sep-23	30600	4000	9300	1900	2800	18000	25700	13100	34800	17600	46000	20900
26-Sep-23	27500	4000	9300	1900	19500	1500	25700	13100	40700	23500	42600	14600
27-Sep-23	26500	4000	7500	-	18000	NIL	23900	11300	40700	23500	40700	12400
28-Sep-23	17800	4000	7500	-	19200	1200	23900	11300	40700	23500	38400	10100
29-Sep-23	18600	4000	7500	-	19200	1200	22500	10000	37400	20100	34700	6300
30-Sep-23	18700	4000	7500	-	19200	1200	20800	5300	37400	20100	28400	-

## RIVERS FLOW DATA FOR SEPTEMBER 2023

Date	Sutlej						Links/canal				Skardu	
	Sidhnai		Sulemanki		Islam		C.J	CRBC	Q.B	T.P	Temperature °C	
	U/S	D/S	U/S	D/S	U/S	D/S	Flow	Flow	Flow	Flow	Max	Min
1-Sep-23	20500	2600	81700	67800	77300	75100	15000	2700	13900	8500	30.6	12.4
2-Sep-23	22400	5000	67100	53100	74300	72100	15000	2400	15800	8500	31.7	15.3
3-Sep-23	23800	5900	40300	26400	66500	64300	15000	2400	20000	4500	31.2	15.4
4-Sep-23	23400	5500	38300	24200	57800	55600	15000	2400	20000	2800	20.7	9.3
5-Sep-23	24900	7000	23400	9200	37200	35200	15000	2600	20000	2900	24.6	13.4
6-Sep-23	25500	7600	20800	6400	24500	22500	15000	2700	20000	3200	24.7	12.2
7-Sep-23	26000	8500	26000	11500	19200	17200	15000	2700	22000	5200	23.6	8.4
8-Sep-23	26200	8300	21600	6900	15400	13300	15000	2700	19000	3500	26.2	9.4
9-Sep-23	22100	4200	19200	4300	10000	7900	12700	2700	17000	10200	28.7	11.3
10-Sep-23	21431	3531	18912	3997	8399	6269	10000	2700	18000	9327	29.2	9.3
11-Sep-23	21400	3500	16700	1700	5100	3000	8200	2700	22000	7800	30.6	10.4
12-Sep-23	21400	3500	16400	1300	2700	600	3600	2700	22000	7200	32.7	9.3
13-Sep-23	21200	3300	18700	3600	2700	600	3400	2000	22000	6900	32.7	10.4
14-Sep-23	22200	4300	18800	3600	2900	1500	2000	2800	22000	1500	31.6	12.2
15-Sep-23	23000	5000	18800	3600	2700	1500	2000	2800	22000	1500	32.4	14.6
16-Sep-23	23000	5000	18300	3600	2700	1500	2000	2500	22000	2200	32.4	14.2
17-Sep-23	23600	5600	18500	3600	2500	1100	2000	2000	22000	1600	31.6	16.3
21-Sep-23	24400	6200	20400	8300	1300	-	2000	2000	22000	2200	30.6	16.4
21-Sep-23	27500	9300	21300	7700	1700	-	2000	2400	22000	2700	28.4	13.2
21-Sep-23	26300	8700	23000	10200	3400	-	2000	2700	22000	3300	28.2	14.3
21-Sep-23	26800	8700	23200	18000	4500	2800	2000	2700	22000	4700	29.6	14.3
22-Sep-23	26800	8700	31300	17300	7100	5400	2000	2700	22000	5400	27.4	11.4
23-Sep-23	31800	13700	33900	19900	8000	6200	2000	2700	22000	6000	26.6	11.2
24-Sep-23	28600	10500	23000	9100	10200	8500	2000	2700	18000	5500	22.6	11.2
25-Sep-23	28600	10500	19800	6100	15500	14000	2000	2500	18000	5500	16.3	10.0
26-Sep-23	31400	13300	24400	10900	15500	14000	2000	2400	18000	5400	17.3	8.3
27-Sep-23	31400	13300	27100	13500	13400	12300	2000	2200	18000	4600	20.2	6.8
28-Sep-23	25200	7300	26400	12500	9800	8500	2000	2100	18000	8700	22.0	5.4
29-Sep-23	21900	4000	21000	7200	10000	8500	2000	2100	18000	6600	23.2	8.3
30-Sep-23	20500	2600	21100	7200	10200	8500	2000	2100	18000	6600	23.2	7.4

## RIVERS FLOW DATA FOR OCTOBER 2023

Date	Time	Indus			Kabul	Indus						
		Tarbela Reservoir			Nowshera	Kalabagh		Chashma Reservoir			Taunsa	
		Level (Ft)	U/S	D/S	Flow	U/S	D/S	Level (Ft)	U/S	D/S	U/S	D/S
1-Oct-23	0600	1540.43	52000	76400	16200	106077	98077	644.30	104423	100323	110528	90040
2-Oct-23	0600	1539.13	47000	87800	16200	98598	90598	644.00	109168	105068	110528	90040
3-Oct-23	0600	1537.77	47000	56800	13400	99666	91666	643.00	108343	105363	96494	80196
4-Oct-23	0600	1536.36	44000	59800	12500	91784	83784	642.90	96689	91570	99351	83474
5-Oct-23	0600	1535.24	46000	58300	11400	97756	89756	643.40	97952	93852	99351	83981
6-Oct-23	0600	1534.00	42000	55500	12000	78700	70700	644.50	79522	75422	96640	82310
7-Oct-23	0600	1532.88	43000	55000	10800	79997	71997	643.90	83121	79021	88178	82799
8-Oct-23	0600	1531.63	40000	47300	10900	75767	67767	644.00	82935	78835	73674	68075
9-Oct-23	0600	1530.41	42000	56200	11000	87774	79774	644.40	83292	78792	77742	71834
10-Oct-23	0600	1529.85	40000	36400	9300	87281	79281	644.30	84220	79720	77742	71834
11-Oct-23	0600	1529.65	41000	25300	9400	67727	60727	645.40	59224	54724	77742	71834
12-Oct-23	0600	1529.45	40000	37500	9000	54301	47301	645.00	62408	58008	75393	64663
13-Oct-23	0600	1529.20	38000	31000	9500	51436	44438	643.80	61084	56984	55312	55312
14-Oct-23	0600	1529.09	37000	25000	9700	58998	51998	642.80	58447	54547	57920	57920
15-Oct-23	0600	1528.98	38000	29100	10400	60907	53907	641.60	57405	56419	57920	57920
16-Oct-23	0600	1528.93	39300	40000	9700	67400	60400	641.90	47600	43000	57900	57900
17-Oct-23	0600	1528.86	38700	40000	12500	61900	54900	642.90	55000	43000	57900	57900
21-Oct-23	0600	1528.92	37200	35000	15800	61900	54900	643.90	55800	43000	48800	48800
21-Oct-23	0600	1528.98	37200	35000	16200	60000	53000	644.40	50700	43000	46000	46000
21-Oct-23	0600	1528.98	35600	35000	14700	56000	49000	644.50	45800	43000	46000	46000
21-Oct-23	0600	1528.94	34500	35000	11900	54500	48000	644.40	43400	43000	46000	46000
22-Oct-23	0600	1528.85	33100	35000	11600	55400	48900	644.30	43400	43000	46000	46000
23-Oct-23	0600	1528.76	33100	35000	11300	56400	49900	644.10	42100	43000	46000	46000
24-Oct-23	0600	1528.61	31500	35000	10500	57300	50800	644.00	43400	43000	57300	50800
25-Oct-23	0600	1528.29	32000	40000	10500	44900	38400	643.80	42400	43000	45000	45000
26-Oct-23	0600	1527.91	30400	40000	10400	56400	49900	643.20	40900	46000	45000	45000
27-Oct-23	0600	1527.54	30700	40000	8900	55400	48900	643.10	46500	46000	45000	45000
28-Oct-23	0600	1527.12	29500	40000	9900	54500	48000	643.00	44500	44000	48300	45300
29-Oct-23	0600	1526.30	31000	52000	9000	55300	48800	642.80	43600	44000	48000	44000
30-Oct-23	0600	1525.40	28500	52000	9300	61900	55400	642.00	45500	52000	47200	42700
31-Oct-23	0600	1524.52	29100	52000	9000	69500	63000	642.60	58800	51000	46300	41300

Discharge in Cusec

## RIVERS FLOW DATA FOR OCTOBER 2023

Date	Indus						Jhelum				
	Guddu		Sukkur		Kotri		Mangla Reservoir			Rasul	
	U/S	D/S	U/S	D/S	U/S	D/S	Level (ft)	U/S	D/S	U/S	D/S
1-Oct-23	119222	98895	96960	47830	40465	5470	1225.65	12000	31715	32445	11895
2-Oct-23	111167	94103	95010	47070	41720	8405	1224.85	11000	31715	28540	7990
3-Oct-23	109013	92192	90447	44247	42645	11320	1224.05	10000	31715	28590	7990
4-Oct-23	105881	90255	88615	43850	43346	13901	1223.30	12000	31715	29090	7990
5-Oct-23	101329	81456	85731	42466	43346	13901	1222.55	12000	28115	29090	7990
6-Oct-23	86215	65250	80335	37815	41526	13901	1221.70	8000	31715	29590	7990
7-Oct-23	84478	65250	63412	23203	41226	13901	1220.70	2000	28015	29590	7990
8-Oct-23	83386	67765	63413	23203	39531	13901	1219.90	7000	31915	29590	7990
9-Oct-23	78036	60368	63550	23550	38201	13901	1218.95	7000	32115	29590	7990
10-Oct-23	77043	60368	60315	20350	36396	13901	1218.05	8000	32115	29590	7990
11-Oct-23	71650	58377	58525	19675	32075	11320	1217.15	8000	32115	29590	7990
12-Oct-23	69019	58377	57475	19675	28075	9370	1216.30	10000	32715	29540	7990
13-Oct-23	68214	58377	57445	19675	19550	2395	1215.45	10000	32315	33445	11895
14-Oct-23	66913	58377	57010	20890	19480	2395	1214.60	10000	32315	33395	11895
15-Oct-23	65262	56955	56475	20890	19480	2395	1213.75	10000	32715	37300	15800
16-Oct-23	59100	50900	52900	20200	17800	1600	1212.90	8100	38000	32400	11900
17-Oct-23	56400	48800	51100	18300	16700	1600	1212.15	11700	38000	36400	15800
21-Oct-23	56400	48800	48900	16000	16600	1600	1211.50	11700	38000	36400	15800
21-Oct-23	56400	48800	48900	16000	16600	1600	1211.10	15900	30000	28500	8000
21-Oct-23	56300	48800	48200	15200	16900	2400	1210.50	8900	30000	28500	8000
21-Oct-23	50600	42700	46100	13600	14500	800	1209.85	7500	30000	30400	11900
22-Oct-23	46400	37900	44600	12200	14400	800	1209.20	8500	30000	30400	11900
23-Oct-23	44400	36400	42000	10400	14400	800	1208.55	8500	30000	30400	11900
24-Oct-23	45000	37900	38400	10300	12900	800	1208.05	8500	25000	23800	5300
25-Oct-23	45000	37900	38400	10300	12900	800	1207.55	8500	25000	26500	8000
26-Oct-23	48900	41800	39700	11000	12300	800	1206.90	8500	30000	23800	5300
27-Oct-23	49600	41800	39800	11000	11800	800	1206.25	8500	30000	30400	11900
28-Oct-23	53200	45100	41600	12700	11000	800	1205.65	10200	30000	30400	11900
29-Oct-23	54000	45900	43000	14400	10000	800	1205.00	8500	30000	30400	11900
30-Oct-23	53700	45900	43100	14400	9500	800	1204.35	8500	30000	30400	11900
31-Oct-23	52300	44100	42600	13500	9500	800	1203.55	8600	30000	26500	8000

Discharge in Cusec

## RIVERS FLOW DATA FOR OCTOBER 2023

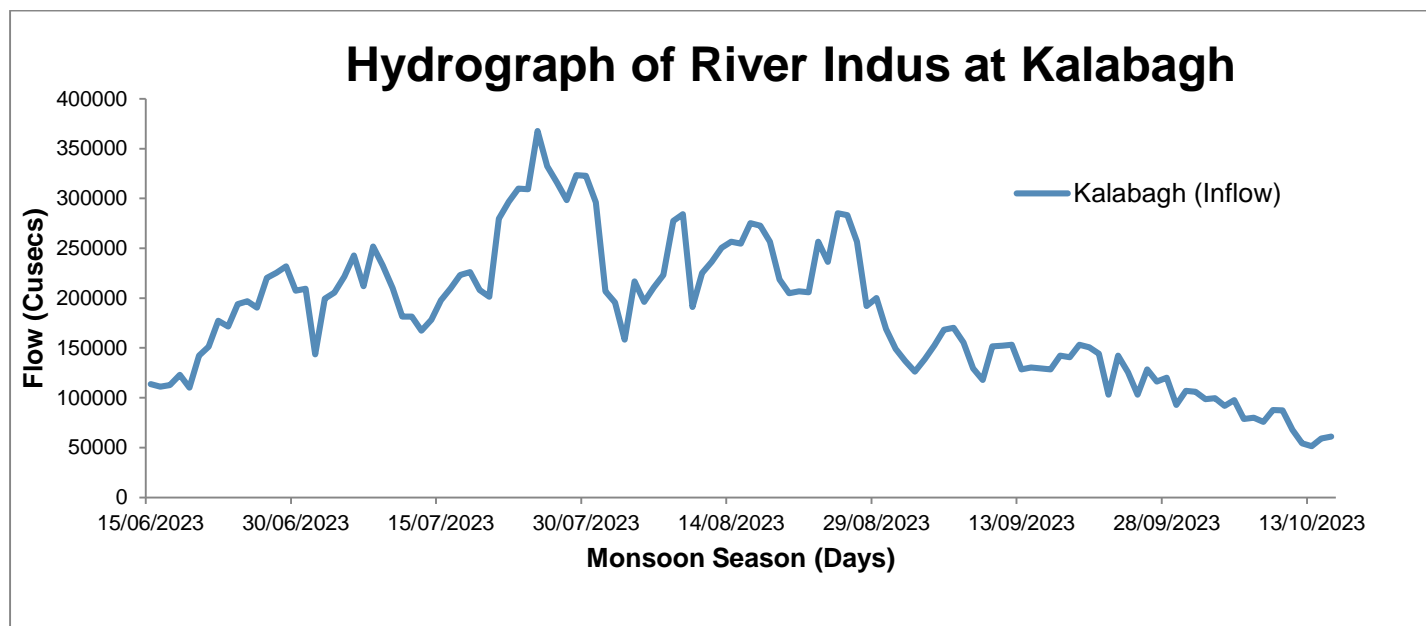
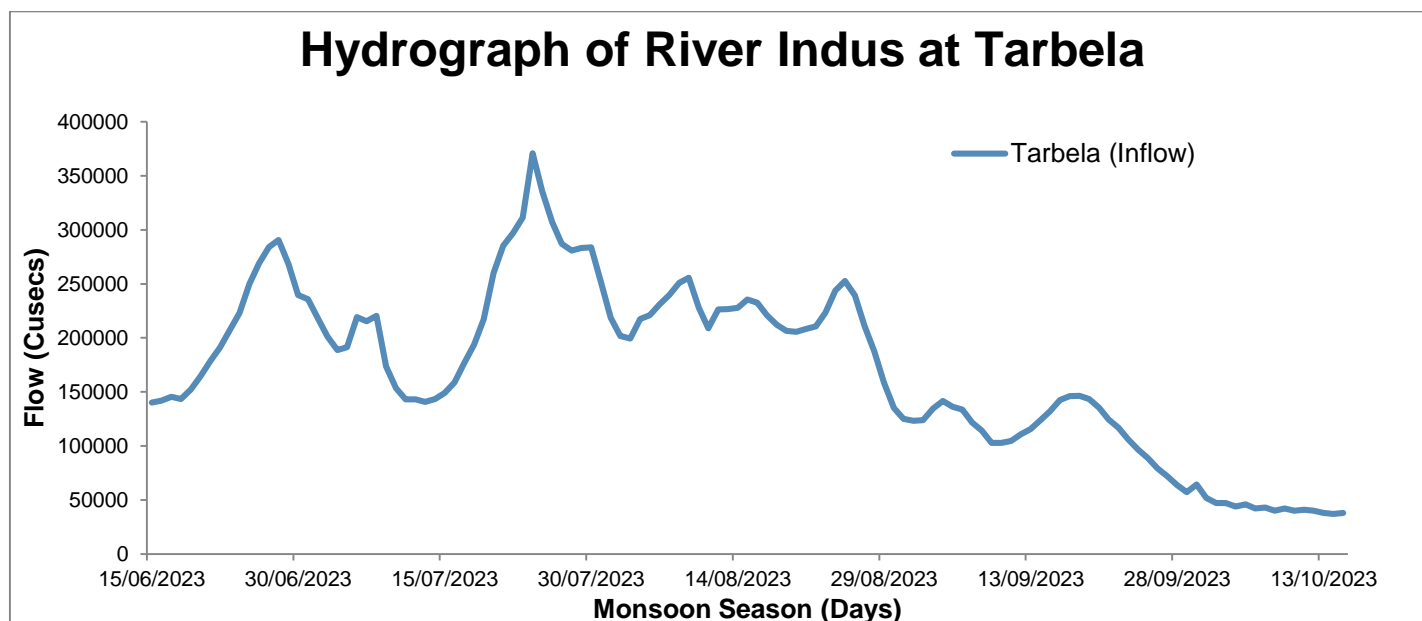
DATE	Chenab								Ravi			
	Marala		Khanki		Qadirabad		Trimmu		Panjnad		Baloki	
	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S
1-Oct-23	17921	5946	8417	955	18900	-	19735	3235	34007	16727	28400	NIL
2-Oct-23	18021	5946	9522	1866	18900	-	18624	1124	34007	16727	28400	NIL
3-Oct-23	16114	3964	11400	3732	22000	-	18624	1124	25934	8654	27500	NIL
4-Oct-23	18096	5946	9546	1866	22000	-	21813	4313	25934	8654	27500	NIL
5-Oct-23	16250	4000	9534	1866	21000	-	22868	5368	20173	3773	27000	NIL
6-Oct-23	16117	4000	7680	-	21000	-	19703	2203	16400	NIL	26000	NIL
7-Oct-23	15047	4000	9521	4000	18000	-	19603	2203	16120	NIL	25500	NIL
8-Oct-23	15047	4000	7802	-	18900	-	19603	2203	16120	NIL	24500	NIL
9-Oct-23	15315	4000	7839	-	18000	-	17400	-	14241	NIL	23000	NIL
10-Oct-23	15040	4000	7522	-	19575	-	18524	1124	12705	NIL	22500	NIL
11-Oct-23	14914	4000	8213	955	20000	-	18524	1124	12705	NIL	23500	NIL
12-Oct-23	16276	5376	10990	3732	20125	-	18524	1124	12097	NIL	25000	NIL
13-Oct-23	14700	4000	10187	2821	24795	2795	18524	1124	11755	NIL	25500	NIL
14-Oct-23	12509	4000	10127	2821	20795	2795	17467	2203	11755	NIL	25500	NIL
15-Oct-23	11841	4000	8736	1866	20345	2345	17467	2203	11322	NIL	24500	NIL
16-Oct-23	11400	3000	6000	-	20300	2300	17000	8300	10200	-	24000	-
17-Oct-23	15100	7000	13500	7500	20300	2300	20600	11900	7400	-	23700	-
21-Oct-23	15100	7000	13500	7500	26700	8700	20600	11900	7400	-	27900	900
21-Oct-23	25200	17100	36600	30600	44900	26900	21400	12700	8900	-	26000	-
21-Oct-23	11100	3000	16900	10900	37000	19000	21300	12700	9100	-	26000	-
21-Oct-23	15100	7000	13300	7300	27900	9900	21700	12700	10100	-	26800	-
22-Oct-23	15100	7000	13500	7500	27900	9900	28100	19100	9000	-	26000	-
23-Oct-23	15100	7000	9600	3600	22800	4800	23000	14000	8900	-	25200	-
24-Oct-23	15100	7000	8800	2800	10400	5200	20200	10700	10400	5200	25000	-
25-Oct-23	13500	5400	7800	1800	21600	3600	20200	10700	10400	5200	24000	-
26-Oct-23	11100	3000	8000	2000	21600	3600	19400	9900	16600	11400	23500	-
27-Oct-23	11100	3000	8000	2000	21600	3600	19400	9900	16600	11400	24000	-
28-Oct-23	11100	3000	7800	1800	21600	3600	15700	6200	16600	11400	23500	-
29-Oct-23	12800	4700	6900	900	19200	1200	13800	4300	14600	9400	23000	-
30-Oct-23	10200	3000	8700	2800	20300	2300	15700	6200	14600	9400	22700	-
31-Oct-23	14000	9000	7800	1800	22300	2300	15700	6200	13800	8600	22000	

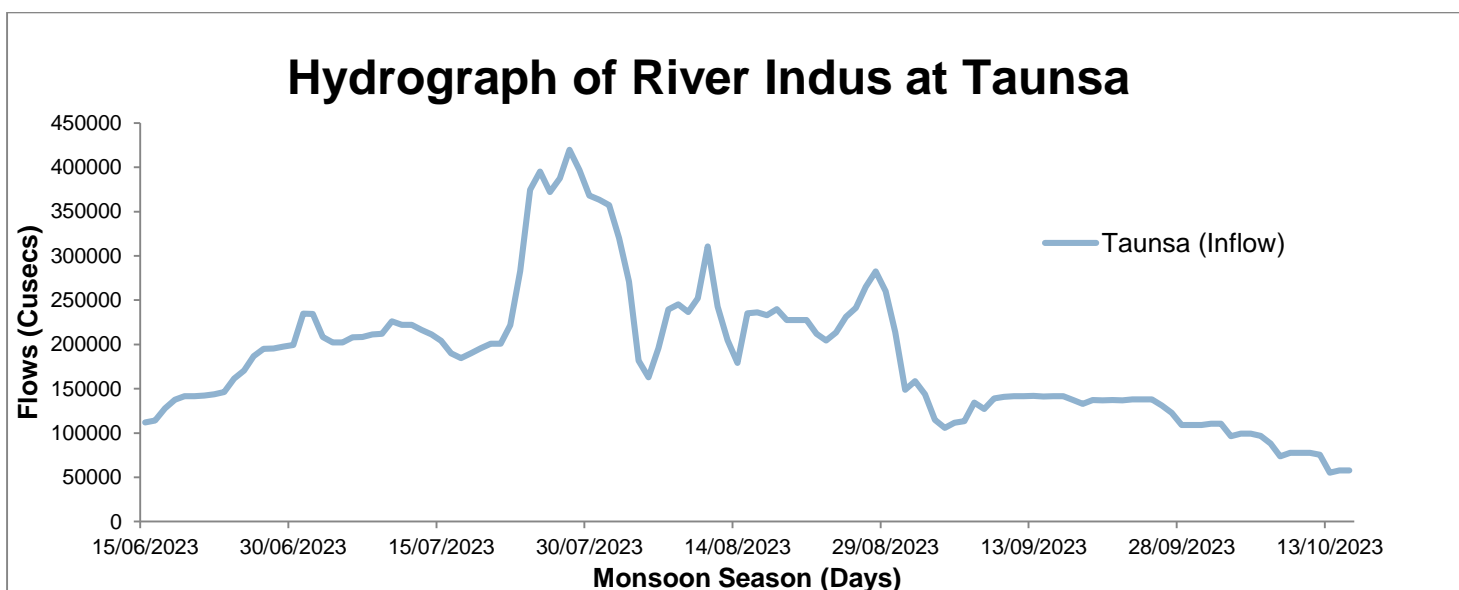
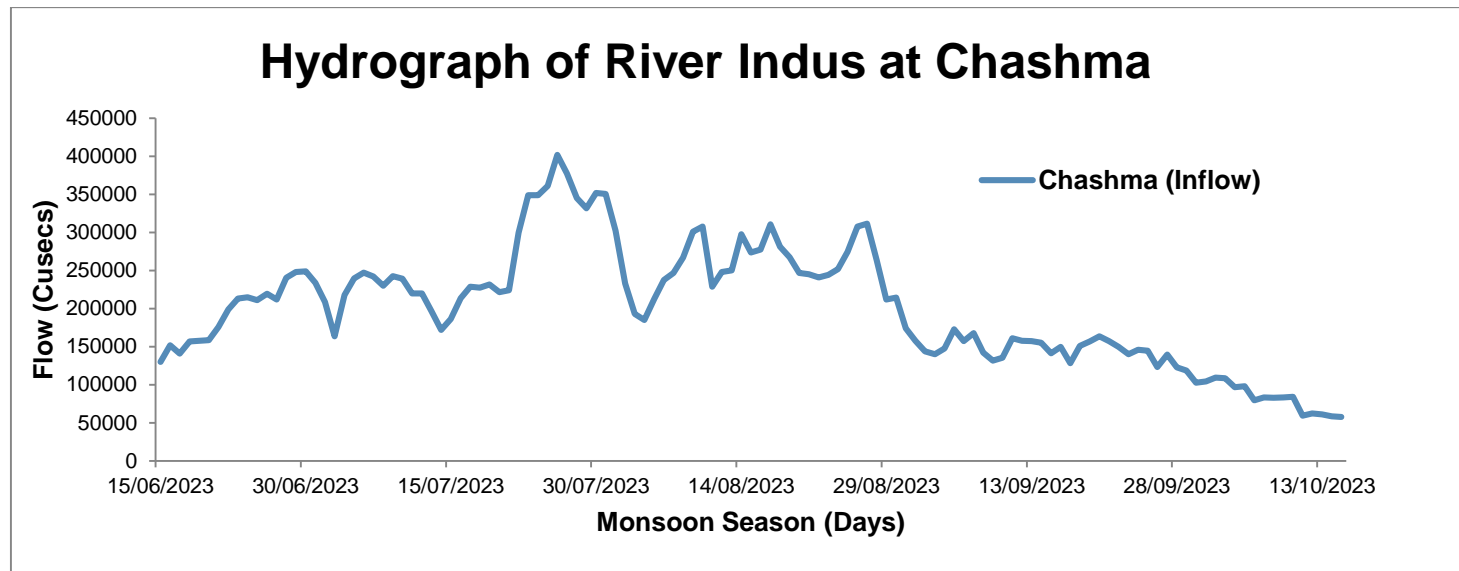
Discharge in Cusec

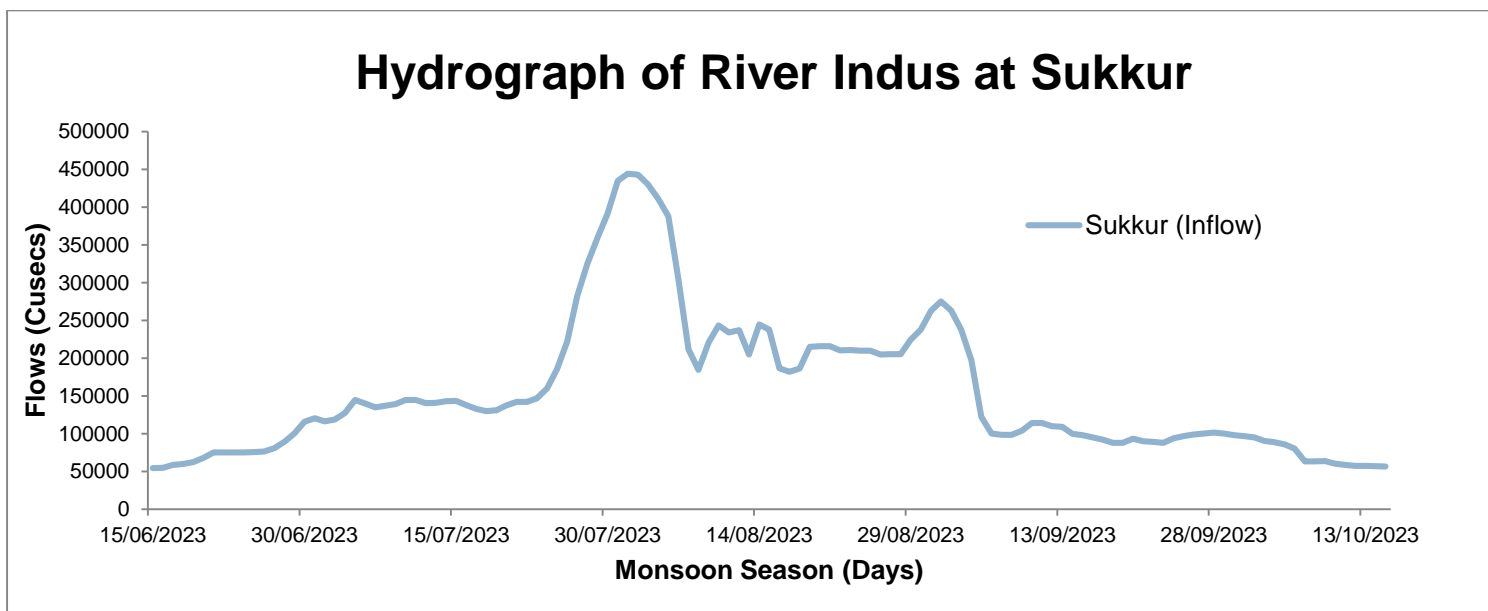
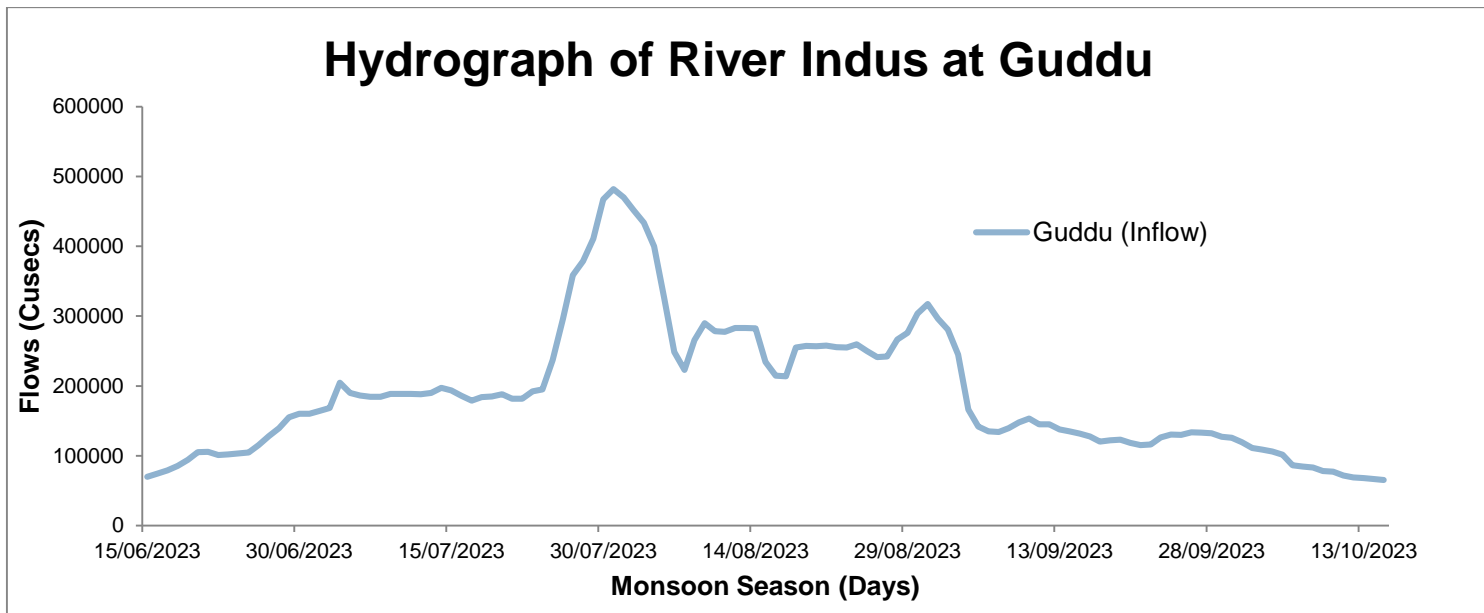
## RIVERS FLOW DATA FOR OCTOBER 2023

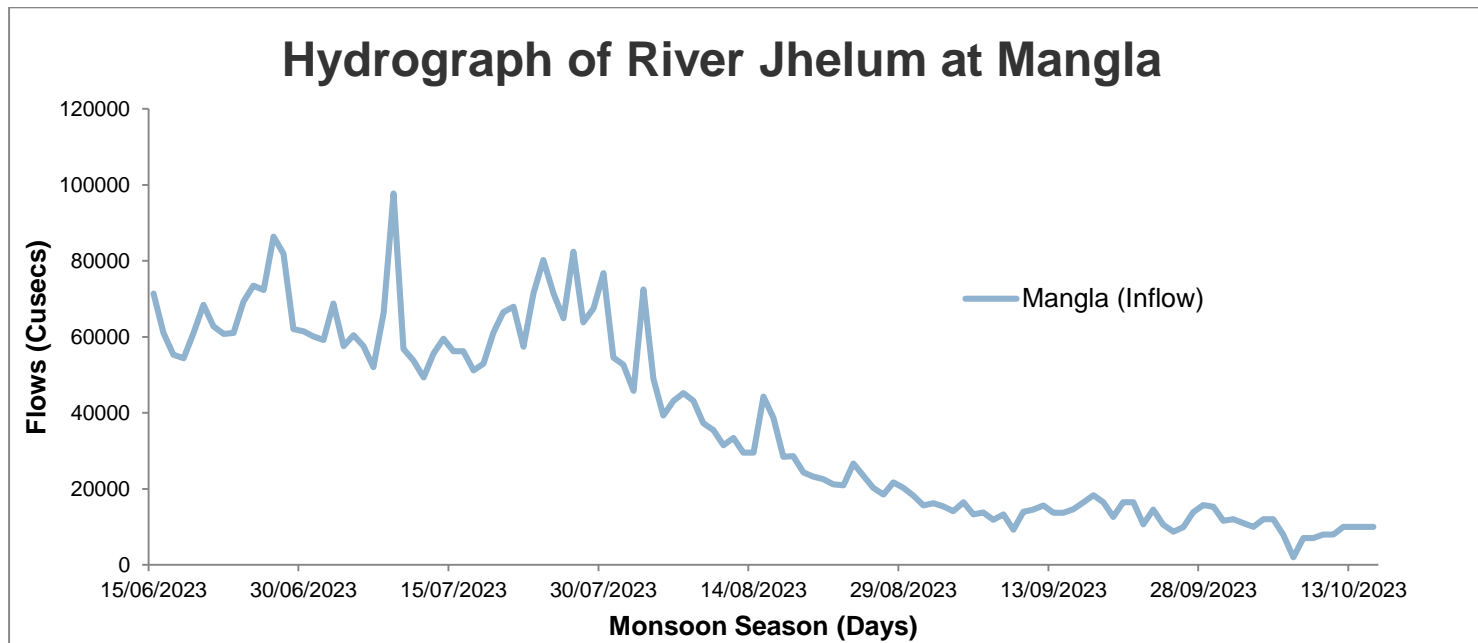
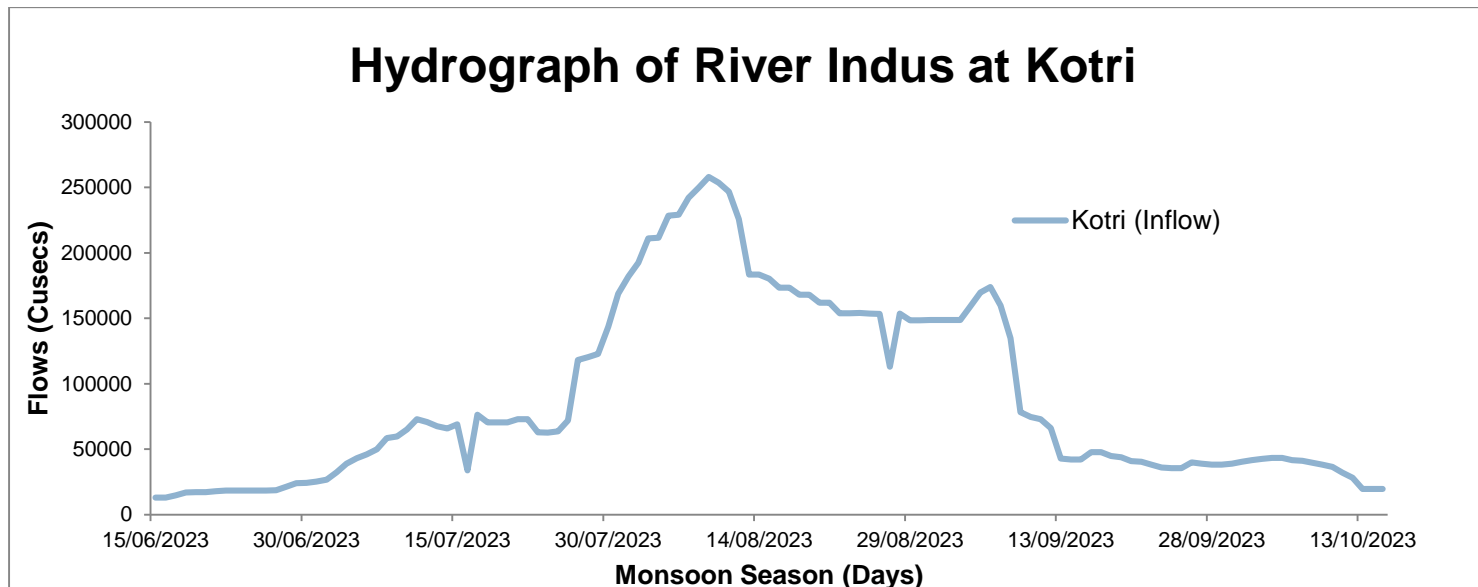
Date	Sutlej						Links Canal				Skardu	
	Sidhnai		Sulemanki		Islam		C.J	CRBC	Q.B	T.P	Temperature °C	
	U/S	D/S	U/S	D/S	U/S	D/S	Flow	Flow	Flow	Flow	Max	Min
1-Oct-23	20278	2978	20922	6772	7909	6179	2000	2100	18900	6600	23	7
2-Oct-23	17300	NIL	19568	5418	6241	4561	2000	2100	19100	6600	23	8
3-Oct-23	16000	NIL	18075	3827	4529	2849	2000	2100	21000	3400	15	7
4-Oct-23	15800	NIL	16026	1823	4529	2849	2000	2100	22000	3000	20	6
5-Oct-23	15200	NIL	16439	2286	3261	1231	2000	2100	21000	2400	21	5
6-Oct-23	14700	NIL	16291	2286	3261	1231	2000	2100	21000	5400	22	5
7-Oct-23	14350	NIL	16148	2286	2829	799	2000	2100	18000	5400	23	10
8-Oct-23	14350	NIL	14578	618	2230	-	2000	2100	18900	5600	23	8
9-Oct-23	14350	NIL	14628	618	2230	-	2000	2300	18000	5900	19	7
10-Oct-23	13800	NIL	14010	-	2230	-	2000	2500	19800	5900	20	7
11-Oct-23	14000	NIL	13904	-	1230	-	2000	2500	20000	5900	17	5
12-Oct-23	14000	NIL	16273	2774	1230	-	2000	2900	20100	5700	19	3
13-Oct-23	14000	NIL	17004	3658	1145	-	2000	2200	22000	-	20	3
14-Oct-23	14000	NIL	17131	3785	1100	-	2000	2000	18000	-	21	8
15-Oct-23	8500	NIL	18580	5234	1023	-	300	1900	18000	-	24	1
16-Oct-23	7200	-	14200	6200	1000	-	-	1900	18000	-	16	8
17-Oct-23	7200	-					-	1700	18000	-	14	8
21-Oct-23	7200	-	18600	10700	1700	-	-	1600	18000	-	13	8
21-Oct-23	7200	-	23100	15200	6400	4300	-	1600	18000	-	14	7
21-Oct-23	7200	-	23700	15500	8100	5900	-	1600	18000	-	16	7
21-Oct-23	7200	-	22900	14900	10800	8500	-	1600	18000	-	17	6
22-Oct-23	6500	-	22100	13700	11900	10100	-	1600	18000	-	17	6
23-Oct-23	6900	-	18200	9800	12300	10100	-	1600	18000	-	17	4
24-Oct-23	6900	-	18200	9800	10800	10800	-	1600	18000	-	17	5
25-Oct-23	7200	-	16400	8000	7300	6800	-	1600	18000	-	16	4
26-Oct-23	7200	-	17300	8900	6300	4600	-	1600	18000	-	17	4
27-Oct-23	7100	-	17300	8900	7300	5600	-	1600	18000	-	17	4
28-Oct-23	7100	-	17300	8900	7500	5600	-	1600	18000	-	17	4
29-Oct-23	7100	-	17400	8900	7400	600	-	1600	18000	-	18	3
30-Oct-23	7100	-	16300	7800	7400	6000	-	1600	18000	-	17	4
31-Oct-23	7100		15300	6800	7200	6000	-	1600	18000	-	18	3

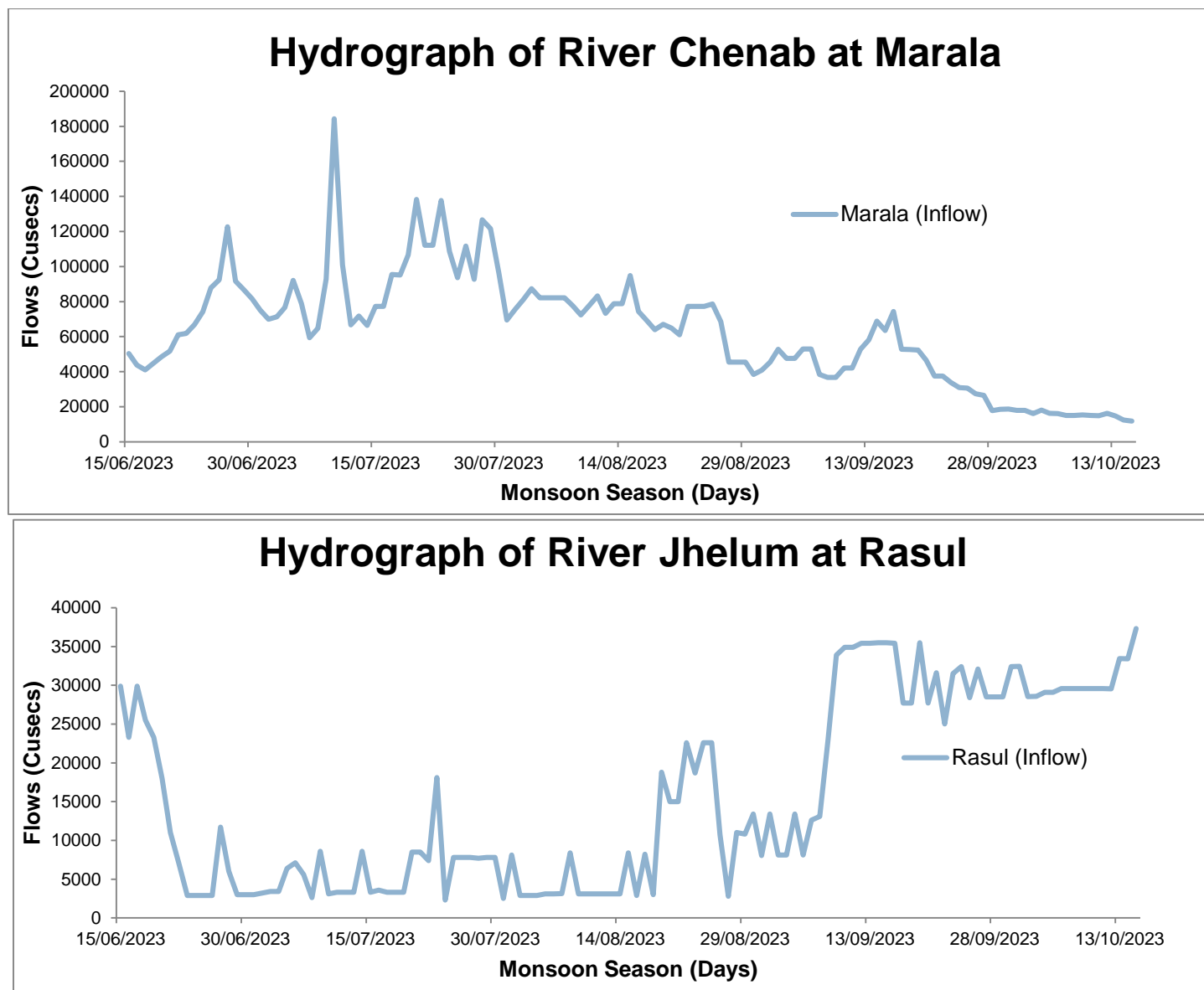




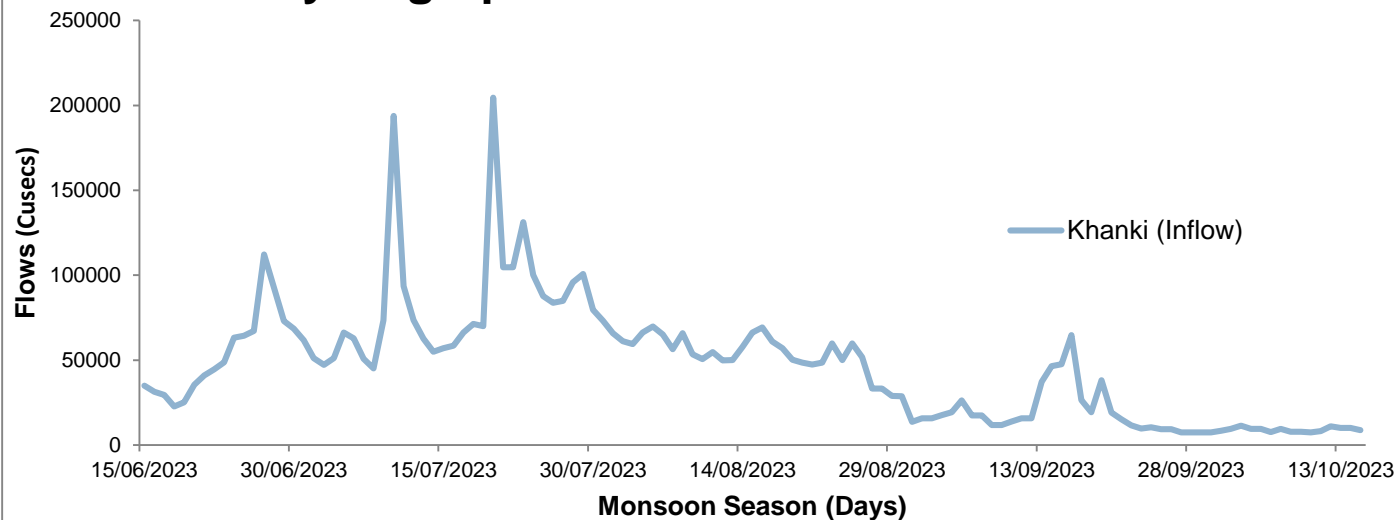




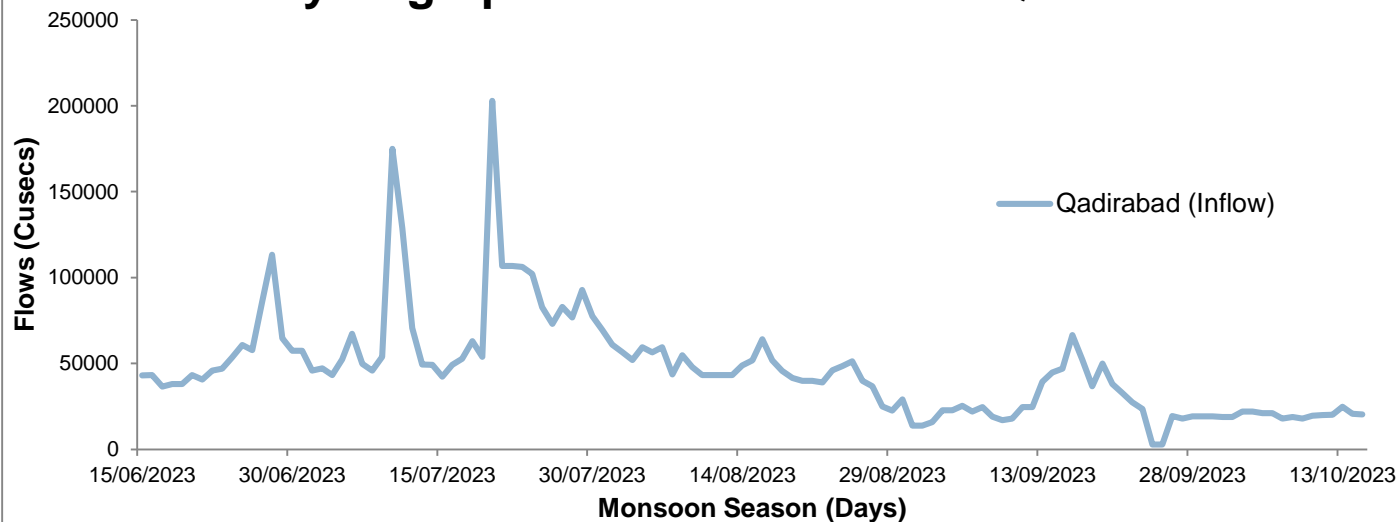




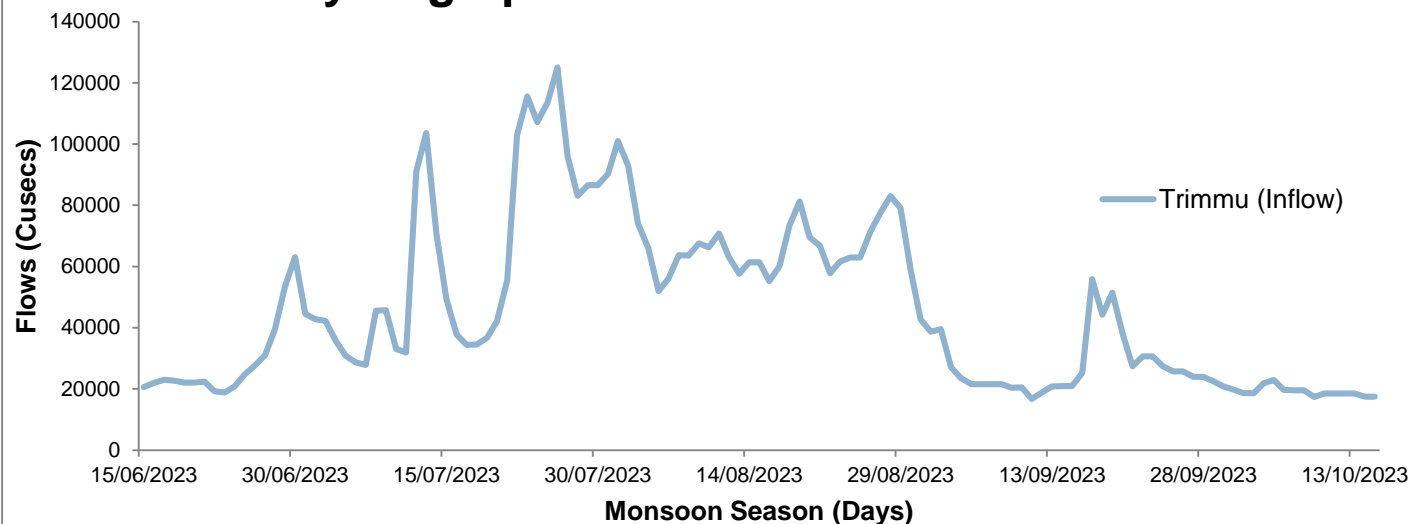
### Hydrograph of River Chenab at Khanki



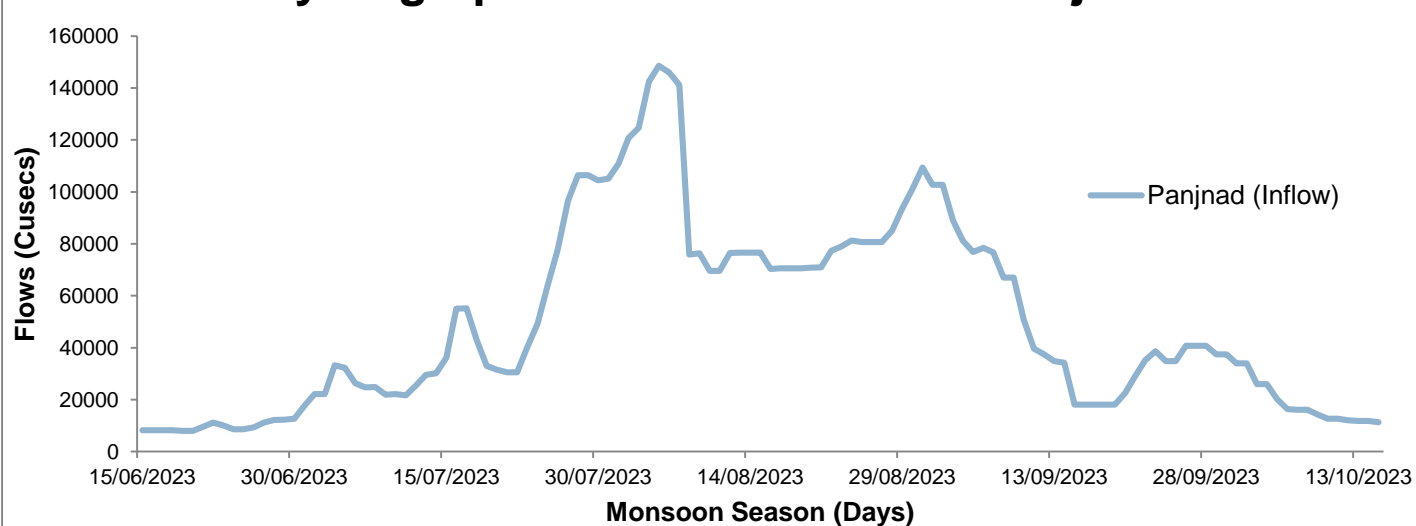
### Hydrograph of River Chenab at Qadirabad



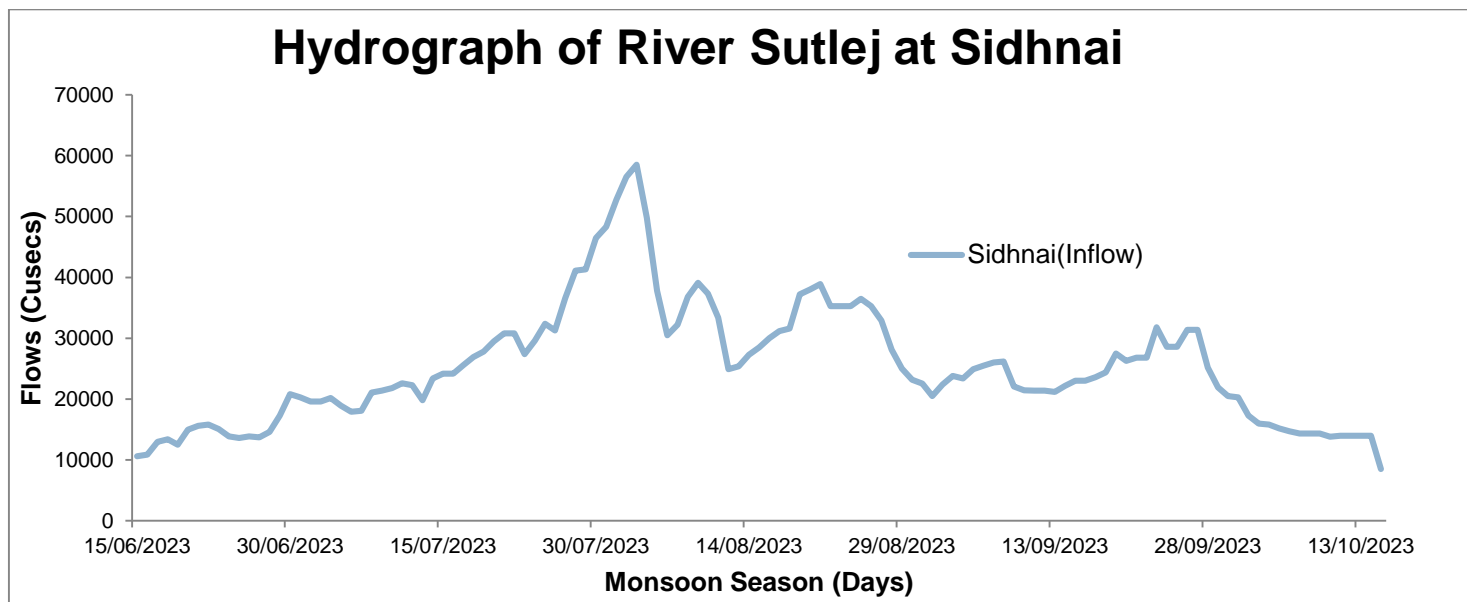
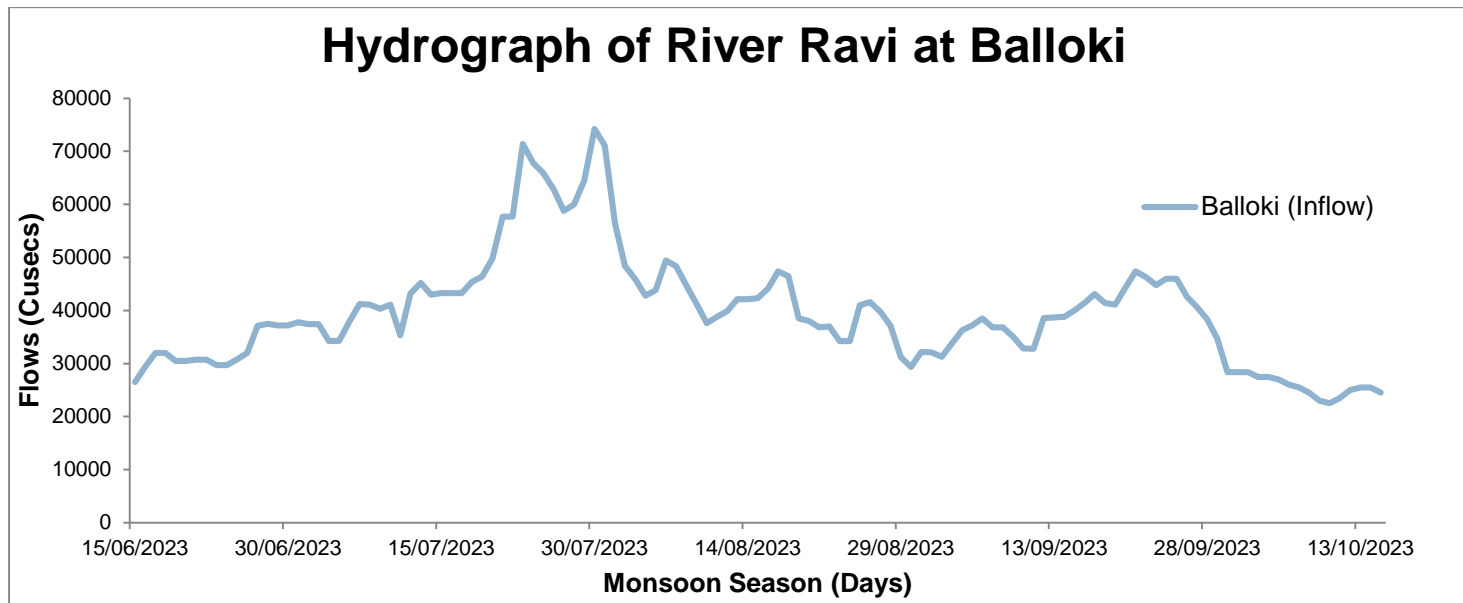
### Hydrograph of River Chenab at Trimmu



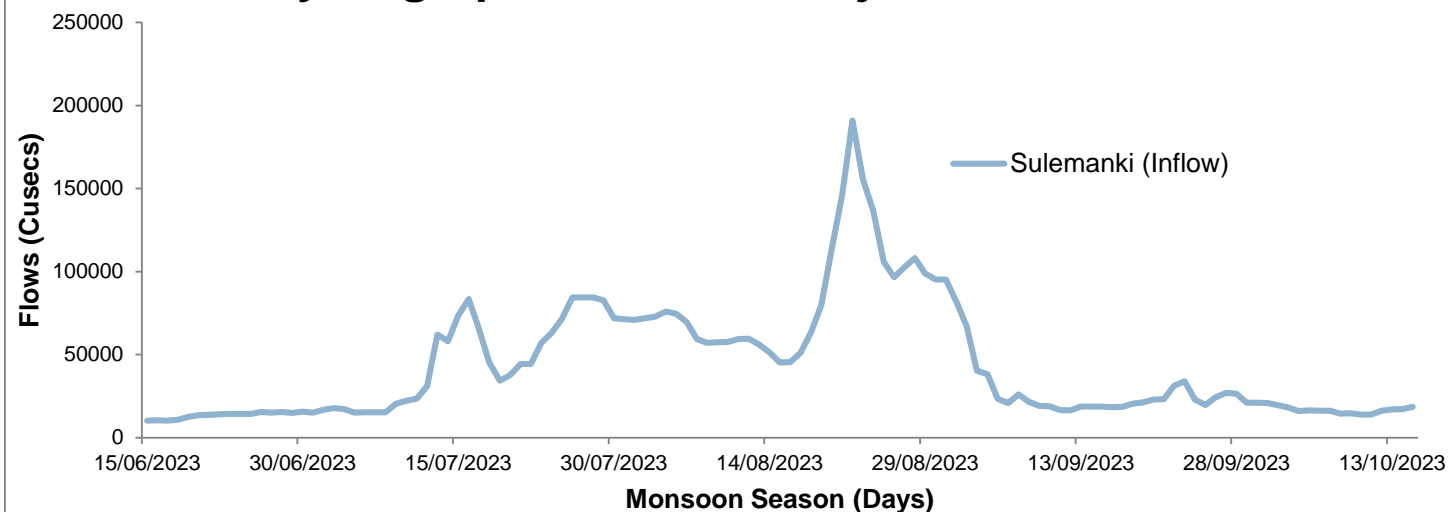
### Hydrograph of River Chenab at Panjnad



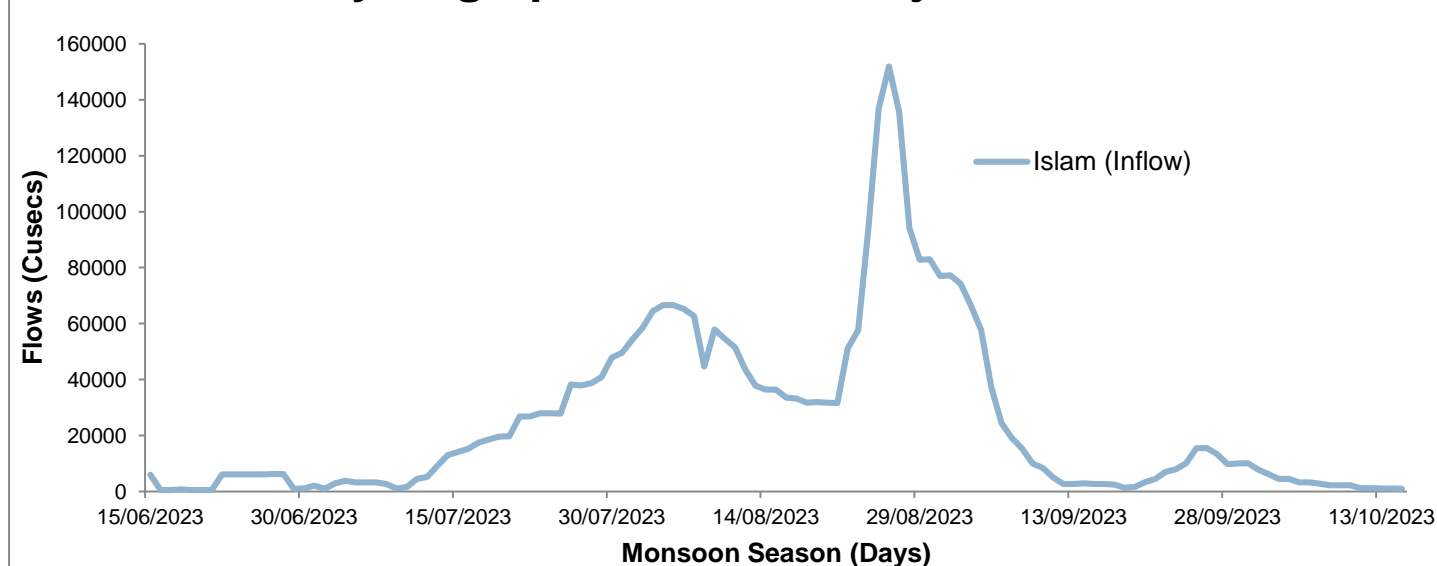




## Hydrograph of River Sutlej at Sulemanki



## Hydrograph of River Sutlej at Islam



# **MONTHLY RAINFALL DATA**

**(Monsoon Season 2023)**

**(Source: PMD)**

## MONTHLY RAINFALL DATA (Monsoon Season 2023)

STATIONS	July	August	September
<b>Punjab (&gt; 200 mm)</b>			
Lahore (Airport)	668.72	125.07	307.00
Lahore (City)	468.03	77.64	174.82
Islamabad (Zero Point)	453.91	216.82	233.52
Sialkot (Cantt)	422.42	166.76	32.52
Kasur	442.03	35.01	52.04
Murree	415.51	111.51	100.51
Chaklala (Airbase)	408.03	214.01	179.3
Gujranwala	386.5	203.32	51.81
Chakwal	365.93	140.70	37.51
Jhelum	346.40	102.71	130.01
Sialkot (Airport)	285.11	93.62	53.71
Narowal	272.41	153.61	121.90
MandiBahauddin	296.02	112.01	33.54
Mangla	248.52	145.61	108.00
Okara	248.12	36.90	50.12
Gujrat	222.00	65.52	45.00
Sahiwal	212.65	0.03	17.01
<b>Gilgit Baltistan/AJ&amp;K (&gt; 90 mm)</b>			
Rawalakot	400.90	63.10	29.30
Muzaffarabad (Airport)	392.10	51.40	34.40
Muzaffarabad (City)	379.02	64.41	42.01
GarhiDopatta	256.20	82.50	45.20
Kotli	202.00	124.00	88.01
Bagrote	107.61	71.62	25.03
Astore	95.63	45.02	13.81
<b>Khyber Pakhtunkhwa (&gt; 100 mm)</b>			
Balakot	477.00	89.00	72.00
Kakul	427.00	141.01	94.81
MalamJabba	319.00	133.00	87.00
Takhtbai	237.52	93.50	42.41
Saidusharif	204.00	110.00	48.00
Dir	164.50	122.01	44.01
Cherat	161.00	64.00	58.00
Bannu	145.00	25.02	85.00
Pattan	115.00	49.00	28.00
Lower Dir	107.00	231.00	80.00
Risalpur	105.03	91.03	25.01
Kalam	103.50	56.40	23.50
<b>Sindh (&gt; 100 mm)</b>			
Padidan	327.61	0.00	0.01
Chhor	195.50	0.00	32.00
Badin	186.22	0.01	102.21
Mithi	162.00	0.00	64.01

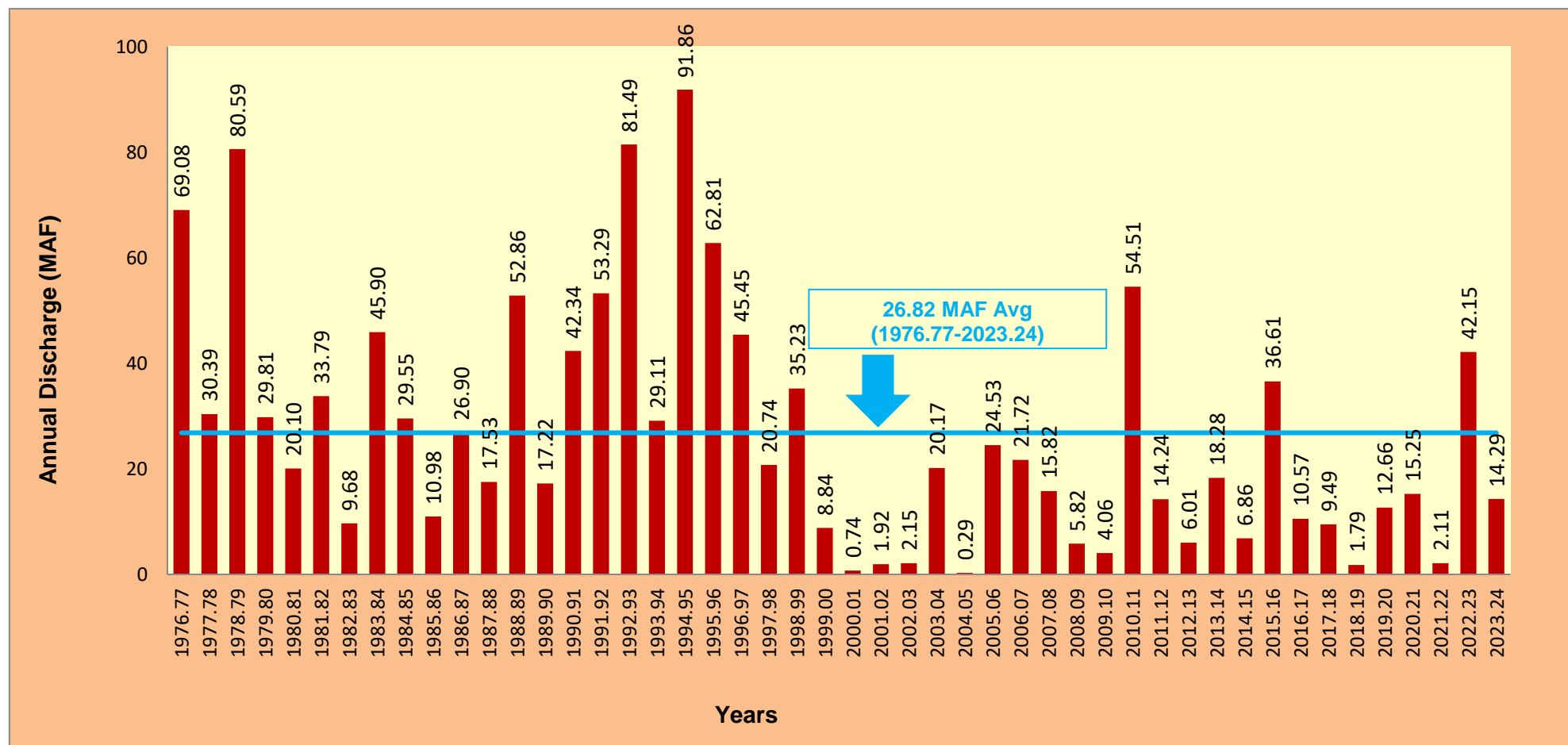
STATIONS	July	August	September
Sukkur	160.02	0.01	0.00
Larkana	159.03	0.01	0.00
Jacobabad	145.03	0.00	0.00
Mirpurkhas	133.00	0.00	38.00
Rohri	133.00	3.01	0.00
Dadu	130.01	15.00	4.00
M.Jo.Daro	127.72	0.00	0.00
Khairpur	126.00	0.00	0.00
Thatta	125.00	0.00	47.00
Tandojam	124.72	0.01	0.01
Sh.b.abad	120.01	0.00	12.00
Hyderabad	113.00	0.00	0.00
Sakrand	112.01	0.00	24.00
<b>Balochistan (&gt; 20 mm)</b>			
Sibbi	241.01	0.00	0.01
Barkhan	171.02	27.01	2.00
Zhob	97.00	8.00	0.00
Khuzdar	62.01	3.40	36.50
Kalat	52.00	0.00	0.00
Lasbela	40.52	0.00	0.50
Panigur	23.00	0.00	0.00
Turbat	22.40	0.00	0.90

**Appendix-III**  
(1-Page)

**ESCAPAGES BELOW  
KOTRIBARRAGE**

(Source: IRSA)

### ESCAPAGES BELOW KOTRI (1976-77 to 2023-24)



Source: IRSA



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