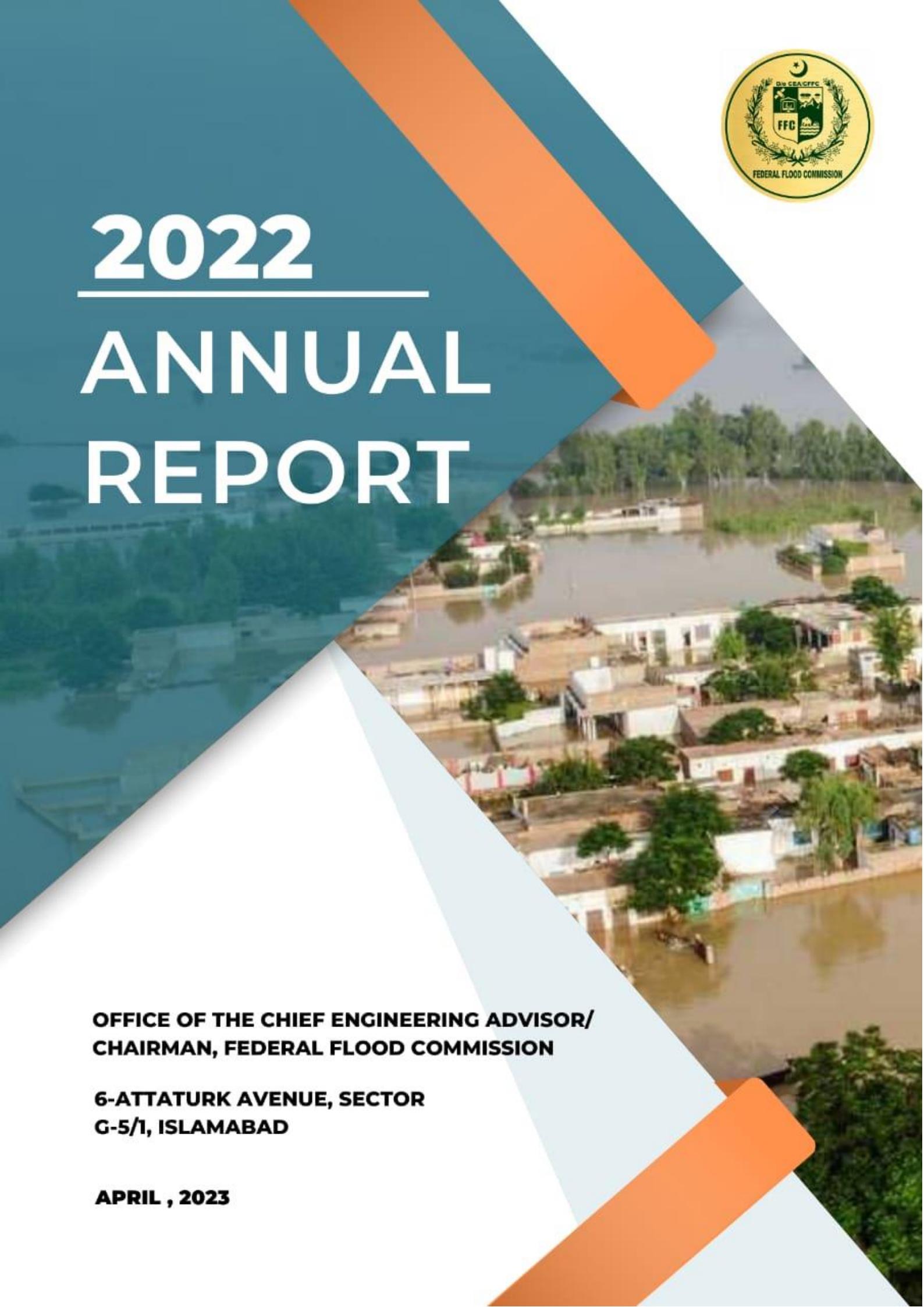
2022 ANNUAL REPORT



**OFFICE OF THE CHIEF ENGINEERING ADVISOR/
CHAIRMAN, FEDERAL FLOOD COMMISSION**

**6-ATTATURK AVENUE, SECTOR
G-5/1, ISLAMABAD**

APRIL , 2023

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

ANNUAL REPORT 2022

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

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FORWARD

Flooding have become a recurring phenomenon in Pakistan. In the last 80 years, the frequency of disastrous flood events in the region has been more than one in four years. In future, country's exposure to devastating floods is predicted to rise due to climate change. Rapidly expanding population in cities and villages remain highly vulnerable to the flood threat. The country experienced around 200% above Normal rainfall in 2022 Monsoon Season with 1,739 precious human lives lost, besides, economic loss and damage estimated to around US dollar 30 billion.

The 2022 floods were triggered by record rainfall events observed across the country. The rain-caused pluvial, torrential flash floods and the riverine flooding simultaneously observed during the monsoon season 2022 was quite unexpected and far-above what was predicted by PMD. This resulted into unimaginable loss & damage ever faced during a single flood year/ monsoon season. It was a stark reminder of the long journey ahead for a flood resilient future.

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 various flood protection sector projects (FPSPs) and programs. The latest National Flood Protection Plan is 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 Prime Minister dated August 29, 2023, original NFPP-IV (2017 version) is being updated in view of lessons learnt from 2022 floods.

The updated NFPP-IV would be based on Integrated Flood Risk Management (IFRM) approach and it would have diverse scope and cross cutting institutional responsibilities to implement structural and non-structural measures including Nature-Based Solutions (NbS). The updated NFPP-IV has been recommended for implementation under 4RF (Resilience, Recovery, Rehabilitation and Reconstruction Framework) prepared by PD&SI Division to build back better from 2022 floods. One of the key lessons learnt from flood experience of 2022 was to ensure flood-proof land-use and water management in future through sustainable spatial planning. This can be achieved by tapping storage potential of hill torrents, expansion of the flood telemetry system and comprehensive remodeling of already constructed drains, in particular of Sindh province, for water conservation and safe passage of torrential flood flows from the Kirther range in Balochistan. Besides, the institutional capacity building & strengthening is also required at all levels.

Further details related to 2022 floods have been provided in this Annual Report of O/o CEA/CFFC prepared for Calendar Year 2022. The report provides a complete and consistent picture of the organization’s performance and prospects along with details related to performance of different Wings of O/o CEA/CFFC. The entire team especially the Professional Engineers working in O/o CEA/CFFC provided their dedicated support towards formulation of this report, which is greatly acknowledged.

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EXECUTIVE SUMMARY

The Government of Pakistan established the Central Engineering Authority under the Chief Engineering Adviser, as the leading engineering agency as soon as the nation (Pakistan) was founded. 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 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** 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 DSO WAPDA. **Administration and Accounts Wing** of O/o CEA/CFFC provides logistic support to 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 Commissioner for Indus Water Treaty. Besides conducting a study on Indus River Regime, O/o CEA & CFFC also conducted three seminal studies on 'Environmental Flows and Sea-Water Intrusion', known as **'Kotri Barrage Studies'**, which offered crucial input that went into drafting of Indus River System Authority (IRSA) Act and the Water Apportionment Accord (WAA) of 1992.

The office has the following core wings: -

(i) Civil Engineering Wing, rendering its services since late fifties i.e. 1959.
(ii) Federal Flood Commission (FFC)- added to the Office of CEA in 1977.
(iii) Power Wing – added to the office of CEA/ CFFC in late fifties.
(iv) Dam Safety Council – added to the office of CEA in 1981 (DSC-Wing)
(v) Admin & Finance Wing.

Civil Engineering Wing

This wing mainly deals with the matters pertaining to water, power and allied engineering issues at national level. The prime function of the Civil Engineering Wing is to assist CEA/CFFC in performing his lead role as Head of the Organization. The Wing has played a pivotal and key role in the formulation and approval of country's first ever National Water Policy (NWP) approved from the CCI in 2018 besides signing of a landmark Pakistan Water Charter.

FFC/ Flood Management Wing

FFC/ Flood Management Wing 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 Water Treaty.

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 and warning system and ensured implementation of 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 under the umbrella of 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 both at technical and political levels. NFPP-IV 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 CDWP's approval in April 2019. In response, FFC was advised to curtail its cost owing to tight financial position, by only keeping the top priority structural interventions besides non-structural interventions.

Based on NFPP-IV, Flood Protection Sector Project –III (FPSP-III), comprising only of priority projects recommended under NFPP-IV was developed by FFC for which CCP was approved by the CDWP on **3rd March 2020**. Based on CCP's approval, umbrella PC-I of FPSP-III costing **Rs. 95.980 billion** was prepared for execution of flood protection schemes, improvement in Early Warning System on country-wide basis and capacity building of flood management organizations during the next 5 years' time frame. CDWP approved Umbrella PC-I at an estimated cost of Rs. 95.980 billion and recommended it for ECNEC's approval in its meeting held on **12th October 2020** with a condition to confirm financing from donors before consideration of the project by ECNEC. In this regard, EAD, through MoWR was requested for arranging external financing for FPSP-III implementation. However, till June 2022, no external financing arrangements for FPSP-III were available/ forthcoming through EAD, which is a main condition of CDWP for Project consideration by ECNEC.

In view of devastating rains/ floods experienced by the country during 2022, the Prime Minister of Pakistan on **29th August 2022** directed PDSI 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, NFPP-IV is being updated by M/o PD&SI through ADB financing in consultation with all stakeholders in particular the FFC. M/s Deltares of the Netherlands is doing the updation work. The updated Plan is expected to be ready by the May 2023.

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 **14th 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. Accordingly, updated Umbrella PC-I costing **Rs. 194,625 million** was submitted to PD&SI Division enroute MoWR on **27th January 2023** for the approval

of CDWP & ECNEC. The PC-I was discussed during the Pre-CDWP meeting held on **16th March 2023**, and subsequently replies to the recommendations/ observations made by the forum are being prepared for onward submission to PD&SI Division.

FFC is also 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 and approval of DDWP/CDWP. The award of contract, execution and disbursement is the exclusive responsibility of Provincial Irrigation Departments and Federal Line Agencies. The flood protection schemes are processed for approval and implementation before 30th June each year subject to in-time approval and release of funds by Planning Commission/ Finance Division to the Line Agencies. **Rs 1,500.00 million** were kept allocated under PSDP (2021-22) for Normal/ Emergent Flood Programme while under the PSDP (2022-23) it has been halved i.e. Rs.750.00 million against the demand of **Rs. 10,000 million**.

Power Wing

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, PPIB & 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.

Dams Safety Council

DSC mainly 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 render expert technical advice/comments besides matters pertaining to various dam projects and allied engineering issues at national level. Dams Safety Council of O/o CEA & CFFC also acts as Secretariat of Pakistan National Committee on Large Dams (PANCOLD).

Administration & Finance Wing

Administration & Finance Wing deals with the matters like General Services management, annual budgeting of office and development projects, utilization, control and audit. It also coordinates matters related to trainings (in-country & abroad) of officers/officials, maintenance of project accounts, internal inspection of accounts, financial monitoring of development projects, processing of consultancy services bills (if any) and similarly matters relating to DAC/PAC w.r.t appropriation accounts and audit reports. The organogram of the O/o CEA/CFFC, showing the gazette staff strength, has been shown on the succeeding page.

Flood Experience of Monsoon 2022

Pakistan Meteorological Department (PMD) issued Seasonal Outlook for Summer Monsoon (July-September 2022) for Pakistan on **7th June 2022**. The Outlook for Monsoon Season 2022 is as under:

- Overall, a tendency for **nearly Normal** precipitation is predicted over most parts of the country during forecast season (May-July 2022) with mostly below normal during May while normal to **slightly above normal** during June and July.
- The Northern Punjab, Kashmir and the adjoining areas of Khyber Pakhtunkhwa and Gilgit Baltistan may get **slightly above normal** precipitation.
- Nearly normal precipitation is expected over rest of the country.

Keeping in view the atmospheric conditions observed in June 2022, PMD updated the above stated seasonal forecast on **4th July 2022**. Detail is as under: -

- Overall, a tendency for **above normal precipitation** is likely over the country during forecast season (July-August-September).
- First half of the monsoon from 1st July to Mid-August is likely to be wetter than last half (mid-August to end of September).
- Monsoon rainfall is expected to be **above normal over Punjab and Sindh** whereas **slightly above normal rainfall** is expected **over remaining parts** of the country. Temperature would be above-normal during the monsoon season.

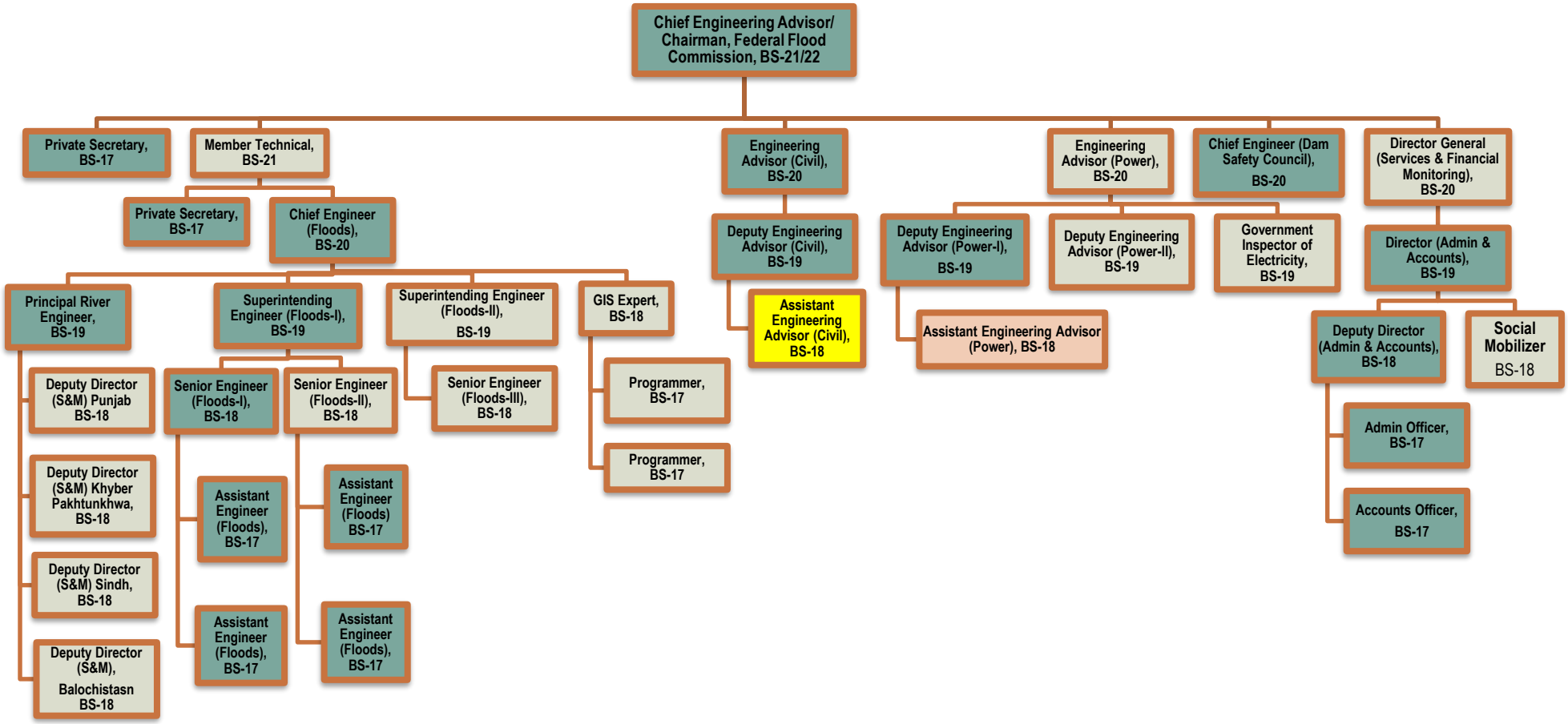
Based on above, forecasted impacts were as under: -

- Potential for Riverine Floods - Possibility of extreme hydro-meteorological events over catchment areas cannot be ruled out, that may generate riverine floods in the major rivers.
- High probability of urban flooding in metropolis cities and flash flooding in hilly areas - Heavy rainfall events may trigger flash flooding in hilly areas and urban flooding in plain areas i.e. major cities of Sindh, Punjab, AJ&K and Khyber Pakhtunkhwa during the season.
- Above-normal temperatures in high altitudes are likely to increase rate of snowmelt in the Northern Areas subsequently increasing the chances of base flow in the Upper Indus basin.
- Sufficient water availability for irrigation and power sectors will be a good impact.

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) generating flash floods in hill torrents areas of Punjab (D.G. Khan), Balochistan (Lasbela, Barkhan), Khyber Pakhtunkhwa, and Azad Jammu & Kashmir and urban flooding was observed in major cities of the country especially the Sindh province.

Tarbela Dam attained its Maximum Conservation level (MCL) of 1550 feet on **20th August 2022**. Through adjustments in water levels at Tarbela, outflows at Tarbela were regulated/ reduced during monsoon 2022 with a view to avoid peak at Khairabad (junction point of rivers Indus & Kabul).

ORGANOGRAM - OFFICE OF THE CEA/CFFC



Filled Vacant Taken over by MoWR

Also, around 57,000 cusecs were discharged into the Ghazi Barotha Power Channel. helped in reducing/ limiting discharge at Khairabad to 600,000 cusecs; otherwise Khairabad could have received upto 700,000 cusecs or even more discharge. However, Mangla Dam was short of water due to less rainfall in its catchment upstream. Mangla Dam Authorities managed to reach the reservoir at El: 1193.10 feet against its MCL of 1242.00 feet on **16th August 2022** at 1800 hours.

Recommendations for better Flood Preparedness in Future

Provincial Irrigation Departments and Federal Line Agencies (PIDs & FLAs) need to carry out all urgent nature rehabilitation and O&M works of flood protection infrastructure (civil works) and Flood Forecasting & Warning System improvements including Radars and Flood Telemetry Networks well in time so as be fully prepared well before the start of Monsoon Season 2023. The encroachments in the flood plains and waterways should be removed by PIDs & FLAs so as to avoid loss of human lives and damages to the property in future floods.

As per annual practice, FFC organized Post Monsoon 2022 Meeting on **22nd November 2022** to review lessons learnt from devastating floods of 2022 and accordingly recommended futuristic preventive measures in order to prepare better for the next Monsoon Season 2023. The important directions/ decisions taken during FFC's Post Monsoon 2022 meeting are described below:

(i) For future meetings of FFC, **all the members of FFC** including MoWR to ensure their participation, particularly NDMA, PID Sindh and Khyber Pakhtunkhwa.

(ii) **Provincial Irrigation Departments & Federal Line Agencies (PIDs & FLAs)** to ensure completion of all approved and ongoing flood protection schemes taken up under Provincial ADP and Normal/ Emergent Flood Programme, besides, Rehabilitation and Flood Damages Restoration Works including O&M works related to Barrages/Head Works/Bridges, Irrigation, Drainage and Flood Protection Infrastructure well before the start of 2023 Monsoon Season.

(iii) **PIDs & FLAs** to ensure removal of encroachments from flood plains/ High Risk Zones, waterways of major and other rivers including Hill Torrents/ Flood Flow generating nullahs, which are under the threat of flood waters and also causing hindrance in flood flows. The progress on the job would be submitted to FFC on monthly basis till completion of the task. The entire exercise be completed well before the start of Monsoon Season 2023.

(iv) **PIDs** to expedite efforts with respect to Revision in Flood Limits of their respective Barrages/ Head Works/ Bridges falling in their jurisdictions in view of changing ground realities. The exercise may be completed before **30th June 2023.**

(v) **PIDs & FLAs** to ensure rehabilitations of breaches and damaged flood protection infrastructure well before the next year Monsoon-2023.

(vi) **PID, Punjab** to conduct study on need of existing as well as additional needed (at critical locations) Breaching Sections in Punjab on fast track basis. The exercise may be completed before **30th June 2023.**

(vii) **PMD** to ensure procurement & installation of the Weather Radars at Sialkot and Sukkur as per approved Implementation Plan.

(viii) **Deputy Commissioner, Rawalpindi** to ensure removal of encroachments from the banks/ bed of Lai Nullah at the earliest.

(ix) **RDA, Rawalpindi** to expedite work on Lai Expressway project to resolve the flooding problem in Rawalpindi city. The progress on Lai Expressway project may also be shared with FFC on regular basis.

(x) **Pak Railways** to ensure the execution of Left Guide Bund of Shershah Railway Bridge across River Chenab in District Multan at the earliest.

(xi) **Provincial Governments** to provide list of encroachments removed alongwith proper coordinates to SUPARCO for analysis & verification of encroachments removed from the waterways & flood plains of rivers.

(xii) **PCIW** to ensure to make necessary alternate arrangements for obtaining reservoirs/ rivers flows data and other information of Chenab and Eastern Rivers, in case ICIW does not agree to provide the same during Monsoon Season 2023.

(xiii) **PID Balochistan** to share the details of seven indicative sites in Quetta Valley with PMD for installation of rain gauges there.

(xiv) **WAPDA** would prepare initial draft working paper for flood management SOPs for Tarbela Dam and share the same with the stakeholders for further deliberations.

In wake of devastating 2022-floods, Chinese Governmental Flood Control Expert Group and Dutch DRR Mission visited Pakistan respectively in October 2022 & December 2022 and had in-person meetings with the stakeholder departments besides field visit to flood affected areas in Sindh province. With a view to ensure enhanced protection against future floods, International Experts of both countries made certain recommendations which have been submitted by FFC to ADB/ ADB's Consultants working on NFPP-IV updation.

Key recommendations made by the **Chinese Governmental Flood Control Expert Group** are given below:

- Construction Management of River-Related projects of Provinces to incorporate flood governance i.e. providing outlets for flood flows and space for flood storage;
- Reinforcement of major Flood Protection Bunds/Dikes;
- Construction of River Regime Control & Deflection Structures for major river reaches of Lower Indus;
- Flood Control through linking/ connecting rivers, drains/ canals etc.;

- Dredging of Drains and improve Drainage Capacity of Farmlands in areas prone to torrential and pluvial flash floods;
- Flood control required for managing floods exceeding design standards;
- Development of rainstorm & flash flood analysis models for small watersheds/ catchments of hill torrents;
- Forecasting Technology for Snow and Glacial Lakes Outburst (GLOFs);
- Measures for improving transmission of flood early warnings at communities' level;
- Build a National High-Resolution Comprehensive Database containing all elements of hydro metrology/ climatology;
- Formulation of an authoritative and binding Flood Prevention Plan and subsequent Flood Control Regulation scheme for Indus River Basin, by the Federal Government.

Likewise, **Dutch Experts** made following key recommendations: -

- Thorough analysis of 2022 floods based on hydrodynamic and 2-dimentional modeling with LiDAR data (with overarching focus on Sindh province);
- Assessment of various flood generation processes and regional climate change analysis (PMD/GCISC etc.);
- Re-assessment of flow capacity and velocity of rivers (Through a separate study);
- Study on watershed management of dry land hill torrents;
- Analysis of existing Flood Management SOPs of important irrigation and drainage structures;
- Review of NFPP-IV and past flood events to formulate a proper NFPP-V including appropriate enhancement of drainage systems and measures for hill torrents flows;
- A planning study on operational requirements and potential of existing and under construction vis-à-vis new feasibility studies on multipurpose dams;
- Linking all the ongoing and upcoming projects with cross cutting issues of flood risk;
- Strengthening water governance at 'sub-basin' and 'basin' scale (through IRSA);
- Providing flood shelters in low lying areas of Sindh province and improving drainage;
- Introduce Nature based solutions through spatial catchment planning in hill torrent areas and land-use rights for community-based rainwater harvesting, improved vegetation/grazing and flood dispersion structures for water use and flood control;
- Updating of existing flood forecasting systems to incorporate the impact of newly introduced major infrastructure works (bridges, dikes etc.);
- Extension of present flood forecasting system to cover pluvial flooding; &

- An audit of legal frameworks and mandates to clarify the mandate of different organizations to eliminate overlaps in national and provincial strategic control.

In wake of 2022 floods, **JICA Experts** also visited Pakistan and recommended that disaster risk reduction should be considered as a development issue through the Sendai Framework. They emphasized the necessity of understanding the significance of intensive development on the Indus River Flood DRR to safeguard flood plains with concentrated populations and resources. As a result, the Japanese Government, through JICA, has expressed to interest to assist Pakistan side for conducting river dikes diagnostic survey, install additional 45 Flood Telemetry Stations, and rehabilitate river dikes/ embankments that have been damaged by the past major floods.

A post 2022 floods visit of US Delegation was hosted by NDMA. US Delegates also visited the FFC and proposed bilateral cooperation in the field of hydrological and hydraulic modelling for flood forecasting in the Upper Indus Basin using some existing HEC-HMS Rainfall/Snowpack/Snowmelt/Runoff models, primarily upstream Tarbela Reservoir and also for modeling the watershed above Mangla Reservoir. In order to facilitate future cooperation, Pakistan's side suggested a long-term Capacity Building Program for Pakistan's Flood Managers and Modelers through the US Army Core of Engineers.

ABBREVIATIONS

ADB	Asian Development Bank
AJ&K	Azad Jammu & Kashmir
Cusec	Cubic Feet per Second
CEA	Chief Engineering Advisor
CFFC	Chairman Federal Flood Commission
DEM	Digital Elevation Model
DMPs	Drought Management Plans
FFC	Federal Flood Commission
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^2	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
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

OFFICE OF THE CHIEF ENGINEERING ADVISOR & CHAIRMAN
FEDERAL FLOOD COMMISSION, ISLAMABAD

1. CIVIL ENGINEERING WING

1.1. 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/CFFC.

1.2. 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.

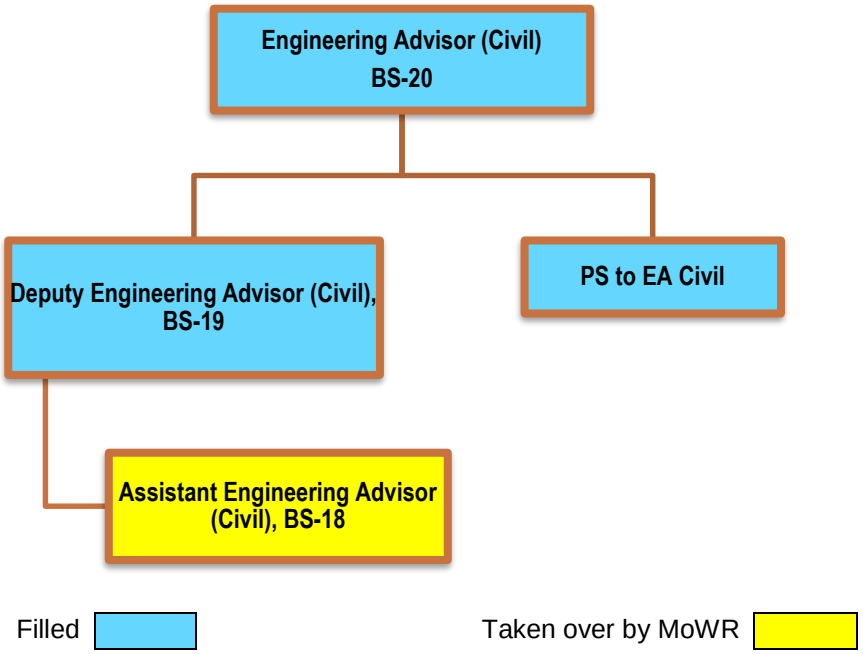


Figure 1.1: Organogram of Civil Engineering Wing

The post of Assistant Engineering Advisor (Civil) has been taken over by Ministry of Water Resources. One Engineer from other technical wing of Office of CEA/CFFC is assisting the core team of Civil Engineering Wing.

1.3. 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/CFFC in performing his lead role as Head of the Organization. The main functions of the Wing are enlisted below:

i. Technical scrutiny & evaluation of Water Sector Projects relating to Canals, Irrigation System rehabilitation, irrigation efficiency, new irrigation

technologies, 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 PCIW on International water issues, project/ Program 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. The Civil Engineering Wing of O/o CEA/CFFC also acts as the Secretariat of Pakistan National Committee on Irrigation & Drainage (PANCID). Pakistan is a member of the International Commission on Irrigation & Drainage (ICID) since 1953. 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.

The ICID is an international engineering body, which was constituted in 1950 to bring improvement in irrigation, drainage and flood control sectors. The mission of ICID is to stimulate and promote development of sciences and techniques of engineering, agriculture, economics, ecology and social sciences in managing water and land resources for irrigation development, drainage, flood control and river training applications including research, development and capacity building by adopting comprehensive approaches and modern techniques for sustainable agriculture in the world. An (IEC) is vested with the management of the affairs of the International Commission on Irrigation and Drainage (ICID). All matters affecting the executive or administrative function and financial liabilities of ICID come up before the Council and its decision shall be conclusive. The IEC consists of the Office Bearers and representative from each National Committee and meets annually.

1.4. Activities Performed during 2022

During the calendar year 2022, Civil Engineering Wing of O/o CEA/CFFC performed following functions related to its charter of duties given in the preceding segment.

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

The following project documents (PC-Is/PC-IIs/PC-IVs) were examined and technical comments were forwarded to Ministry of Water Resources, Provincial Governments & other Stakeholder organizations; a single project, sometimes, gets reviewed/evaluated twice/ thrice or even more, till satisfactory compliance to the observations raised by O/o CEA/CFFC is made by the project executing agency: -

Table-1.1: PC-Is/PC-IIs Technically Examined by Civil Engineering Wing

Sr. No.	Name of the Project Scrutinized/ Action taken	Date of Submission to MoWR
1.	PC-I for Sindh Water and Agriculture Transformation (SWAT) Project	4th January 2022 & 26th October 2022
2.	PC-I for Chashma Right Bank Canal (Lift-Cum-Gravity Project). Est. Cost Rs. 244,232.46 Million	2nd , 11th & 15th March 2022
3.	PC-I of "Rehabilitation and Improvement of CRBC and Paharpur Canal System in District D.I Khan Estimated Cost Rs. 3,000.00 Million".	3rd, 11th , 18th & 25th March 2022
4.	PC-I of "Improvement of Kalri Baghar Feeder and Keenjhar Lake, PCC Lining of Kalri Baghar Feeder upper Project (Phase-I), Estimated Cost Rs. 35,536.18 Million".	10th , 18th & 25th March & 20th April 2022
5.	PC-I for Remedial Measures to Control Water Logging due to Muzaffargarh & Taunsa Panjnad Link Canal Project - Consolidated replies to the observations of MoWR on 1st Revised PC-I were sent to MoWR	16th April 2022
6.	PC-IV of Rainee Canal Project (Phase-I)	26th April 2022, & 24th May 2022
7.	PC-I titled "Improvements of Kalri Baghar Feeder System and Extension of Keenjhar Lake. Estimated Cost Rs. 75,564.300 Million".	26th April 2022
8.	PC-I for – Land Compensation of Mardan, Swabi Scarp & Pehur High Level Canal (Defunct) Project"	19th July 2022
9.	PC-I Form-Land Compensation of Mardan Swabi Scarp & Pehur High Level Canal (Defunct) (June 2022)	5th Aug & 27th Sep 2022
10.	Kachhi Canal Project: Pre-Final Feasibility Report for Flood Carrier Channels (FCCS) Phase-I Remaining Works (RD 1005 to RD 1322)	5th Oct 2022
11.	Greater Karachi Bulk Water Supply Scheme (K-IV) Phase-II-390 MGD; Submission of Position Paper	28th Nov 2022

1.4.2 National Water Sharing Issues dealt/ Issues related to NWP

Ministry of Water Resources sought the technical advice of O/o CEA/CFFC on different NWP related issues. Accordingly, feedback was provided by Civil Engineering Wing to MoWR. O/o CEA/CFFC, being Secretariat of NWP-Steering Committee is taking stock on progress made by the concerned departments towards implementation of NWP. Activities taken on issues related to NWP are described here under:

i. Followed up the matter with concerned agencies on **2nd February 2022** to expedite actions on the decisions recorded in the minutes of "First Meeting of NWP-Steering Committee held on **28th September 2021**".

a. Further reminders were issued on **24th February 2022, 9th March 2022** to departments wherefrom the response was not being submitted.

b. Likewise, similar follow up letters were also issued on **13th June 2022** and **31st October 2022** to PID, Balochistan and PWD, Govt of GB.

ii. Irrigation Department, Government of Balochistan and GB, PWD was requested on October 31, 2022 regarding "Minutes of First Meeting of National Water Policy (NWP) Steering Committee" held on 28th September 2021.

iii. In response to a news article published on **31st January 2022** in daily "The News" regarding '*Details of Projects to deal with Climate Change'*, Ministry of Climate Change was requested on **3rd February 2022** to submit requisite details.

iv. Ministry of Water Resources was requested on **15th February 2022** to convey current status on the decisions recorded in the minutes of "National Water Policy – Second Meeting of Steering Committee held on **27th December 2021**".

v. Regarding the Islamabad Water Conservation Bill-2022 moved by Ms. Nafeesa Inayatullah Khattak & other MNAs, a detailed presentation for the "24th Meeting of National Senate Standing Committee on Water Resources" was prepared and submitted to MoWR on **19th April, 2022**.

vi. Effectively participated in 'National Workshop on Developing Baseline for National Water Policy- Implementation Framework Priority Actions" organized by Ministry of Water Resources on **29th April 2022**.

a. CEA/ CFFC and DEA (Civil) attended the Workshop

b. CEA/CFFC moderated Thematic Session-II and made a comprehensive presentation on "Thematic Area-II: Water Resources Management and Conservation: Present & Future Scenarios" - Advance copy of the above presentation was submitted to MoWR on **20th July 2022**

c. DEA (Civil) attended the Workshop and prepared subsequently draft proceedings of the Thematic Session-II of the workshop, which were provided to MoWR through U.O Note on **12th August 2022** as the draft input for inclusion in the comprehensive report being prepared by IWMI Pakistan in consultation with MoWR

vii. Regarding 24th Meeting of National Senate Standing Committee on Water Resources, brief/ presentation on related agenda item alongwith nominations (CEA/CFFC & DEA Civil) were submitted to MoWR on **23rd May, 2022**.

viii. Views/ comments on "Report on Salinity Policy Review" were submitted to PCRWR on **21st May 2022.**

ix. At the request of MoWR, views/ comments on Draft template for collecting baseline data regarding target sets in National Water Policy-Implementation Framework (NWP-IF) were submitted to MoWR on **28th May 2022.**

x. Views/comments were submitted to Ministry of Water Resources on **10th June 2022** regarding Mid-term Review Report of the Water Action Decade: Input from Asian Pacific Consultation.

xi. Draft TORs were prepared and submitted on **16th June 2022** to PCRWR for formulation of Water Conservation roadmap**.**

xii. Presentation on National Consultative Seminar on Ground Water in Pakistan "Making the Invisible Visible" was shared with PEC on **16th June 2022**.

   a. CEA/CFFC attended the Seminar and delivered aforementioned presentation to the participants.

   b. Draft speech for the Honourable Federal Minister for Water Resources was also shared on **21st June 2022** who attended the Seminar as the Chief Guest.

xiii. Views/comments on "National Water Conservation Strategy for Pakistan" were shared with Ministry of Water Resources on **22nd September 2022**. Follow-up letter was issued to all Provinces on **22nd October 2022**.

xiv. Letter was issued to all Provinces on **5th October 2022** to provide the data regarding "Development of Baseline for NWP Implementation Framework Priority Action".

xv. WAPDA was requested to furnish information on draft template for "Development of Baseline for NWP Implementation Framework Priority Action" on **5th October 2022**.

xvi. Dr. Muhammad Ejaz Tanveer, DEA (Civil) was nominated as Focal Person regarding "Development of Baseline for NWP Implementation Framework Priority Action" – Nomination forwarded to PCRWR on **6th October 2022**.

xvii. Information obtained from WAPDA regarding Telemetry System was shared with PCRWR on **20th October 2022** for compiling the "Baseline data for NWP-Implementation Framework".

xviii. Follow-up letter was issued to Section Officer (Water), Ministry of Water Resources on **1st November 2022** to share update on the compliance status of the decisions taken during "2nd Meeting of NWP-SC" held on 27th December 2021. Matter was again followed up on **7th November 2022.**

xix. Presentation on the National Water Policy (NWP) and its Implementation Framework (IF) was shared with MoWR on **7th November 2022.**

xx. Irrigation Department, Government of Punjab, Lahore was requested to share progress regarding "Punjab Barrages Improvement and Rehabilitation Project" on **18th November 2022.** Follow up letter was issued on **21st November** 2022.

xxi. Provincial Irrigation Department, Government of Punjab was requested to share information regarding actions taken for establishment of Punjab Water Resources Commission, Punjab Water Services Regulatory Authority, Water Pricing, Basin Level Planning and Water Conservation.

xxii. Irrigation Department, Government of Sindh, Karachi was requested to share progress regarding "Gradual Replacement and Refurbishment of Decades Old Irrigation Infrastructure" on **18th November 2022.** Follow up letter was issued on November 21, 2022 asking to also share information regarding actions taken for establishment of Groundwater Regulatory Authority, Basin Level Planning and Water Conservation.

xxiii. Irrigation Department, Government of Khyber Pakhtunkhwa, Peshawar was requested to share progress regarding "Gradual Replacement and Refurbishment of Decades Old Irrigation Infrastructure" on **18th November 2022.** Follow up letter was issued on **21st November 2022** with the request for sharing also the information regarding actions taken for establishment of

Groundwater Regulatory Authority, Basin level planning and water conservation.

xxiv. Irrigation Department, Govt. of Balochistan, Quetta was requested to share progress regarding "Gradual Replacement and Refurbishment of Decades Old Irrigation Infrastructure" on **18th November 2022.** Follow up letter was issued to on **21st November 2022** requesting thereby to also share information regarding actions taken for establishment of Institutional Re-structuring and legal reforms Water Pricing, Basin Level Planning and Water Conservation.

xxv. Letter was issued to all concerned departments for increasing Renewable Energy of the country in line with Section 3.4 of the National Water Policy regarding "Implementation of National Water Policy: Follow up on Development of Renewable Energy Resources" on **21st November 2022.**

xxvi. The concerned departments were requested to provide progress regarding "Implementation of National Water Policy: Reducing Conveyance Losses in Canals and Water-use Efficiency in Agriculture Sector" on **21st November 2022.**

xxvii. Secretary, Agriculture, Livestock & Irrigation, Government of AJ&K Muzaffarabad on **21st November 2022** was reminded regarding progress to be submitted on (i) Implementation of National Water Policy: Follow up on Development of Regulatory Framework, (ii) Establishment of Groundwater Regulatory Authority, (iii) Water Pricing, & (iv) Basin Level Planning & Water Conservation.

xxviii. Follow up letter was issued to Secretary, Water Management & Irrigation, Government of Gilgit-Baltistan, Gilgit on **21st November 2022** regarding progress on "Implementation of National Water Policy: Follow up on Development of Regulatory Framework", Establishment of Groundwater Regulatory Authority, Water Pricing, Basin Level Planning and Water Conservation.

xxix. Irrigation Departments of the four Provinces (Punjab, Sindh, Khyber Pakhtunkhwa and Balochistan), Gilgit Baltistan and AJ&K were requested on **25th November 2022** to provide updated details of projects on Rainwater Harvesting.

1.4.3 Bilateral International Collaborations Dealt during 2022

Following cases relating to Bilateral International Cooperation and MoU's were dealt during 2022:

Hungary-Pakistan Water Management MOU

1st Bilateral Physical Meeting with the visiting Hungarian Delegation/ Technical Experts Group and their Field Exposure Visits were organized/ hosted by the O/o CEA/CFFC, Ministry of Water Resources of Pakistan from **16-20th May 2022** in Islamabad and Lahore. The In-Person Consultations took place under Pakistan Hungary Water Management MoU that was signed between the Ministry of Interior of Hungary and Ministry of Water Resources of Pakistan on **13th July 2018** followed by the Work Program (2021-23).

The CEA/CFFC and being the designated National Focal Person from Pakistan on MoU implementation, chaired the opening session held on **16th May 2022** which aimed at introduction with high ups of the Ministry of Water Resources and

preliminary meetings focusing on deliberations related to mandate of the Ministry of Water Resources, O/o CEA/CFFC, IRSA and WAPDA. During the opening session, the distinguished delegation members paid a Courtesy visit to office of the Secretary, Ministry of Water Resources of Pakistan.

The 1st Physical Meeting of Joint Expert Group (JEG) notified under MoU on Water Management was held on **17th May 2022** in the committee room of O/o CEA/CFFC, Ministry of Water Resources of Pakistan. It was also attended by the representatives of Ministry of Water Resources, PCRWR, PID, Punjab and WASA Lahore. In order to have a technical field exposure, Hungarian delegates also visited the following important water management related institutions and projects in Pakistan:

- PMD and PCRWR Headquarters and Rawal Dam site at Islamabad on **17th May 2022**
- Khanki Barrage and Irrigation Research Institute, Nandipur in District Gujranwala on **18th May 2022**
- FFD, Lahore and Centre of Excellence in Water Resources Engineering (CEWRE) at UET Lahore on **19th May 2022;** two Professional Engineers from O/o CEA & CFFC accompanied the Hungarian Delegation during their field exposure visits to Districts Gujranwala and Lahore.
- National University of Science & Technology (NUST), Islamabad on the final day i.e. **20th May 2022** in the morning. Focal Person Pakistan side, the CEA & CFFC accompanied the Hungarian delegates.

Wrap up meeting was also held on final day i.e. **20th May 2022** at 1500 Hours, chaired by the Secretary, Ministry of Water Resources of Pakistan. **Excellency Mr. Béla Fazekas,** Ambassador of Hungary in Pakistan graced the occasion as the Guest of Honour. The entire bilateral consultations took place in a cordial atmosphere of mutual understanding, reflecting friendly relations between the two countries and were marked by the desire of both sides to further develop and diversify the technical and economic collaboration in the field of water management.

The supplementary details related to above are given below: -

i. Ministry of Foreign Affairs was requested on **11th January 2022** for issuance/approval of official invitation to Mr. Peter KOVACS, National Focal Person of Hungarian Side. On the same day, Ministry of Interior was also requested to provide necessary security for the members of the Hungarian Delegation during their stay in Pakistan.

ii. Follow-up letters for seeking project proposals regarding "Hungarian Tied Aid Credit Facility" were sent to KW&SB, Karachi, PDMA Sindh, WASA Lahore, & CDA Islamabad on **12th January 2022.**

iii. PCRWR was requested on **14th January 2022** to share details regarding project titled "*Profiling of Wastewater and Piloting Wastewater Treatment in Urban Areas*" for implementation under "Hungarian Tied Aid Credit Facility".

iv. Nomination of Resource Person was requested from PCIW for Webinar on Trans-Boundary Cooperation under "MoU on Bilateral Cooperation Hungary-Pakistan Water Management" on **25th January 2022**.

v. Amendments were conveyed to MoWR regarding "Draft Protocol: 2nd Session of the Pakistan-Hungarian Joint Commission of Economic Cooperation" on **16th March 2022**.

Photographs: Meetings held with Hungarian Experts

Focal Person Pakistan chairing the opening session

Focal Person Hungary Mr. Peter Kovach addressing the opening session

Introductory Meeting held on May 16, 2022 with the visiting Hungarian Experts

Hungarian Expert Mr. Jeno Labdy, Hungarian Telemetry system being used

Concluding Remarks by H.E. Mr. Béla Fazekas, Ambassador of Hungary in Pakistan

vi. Nomination of Mr. Ahmed Kamal, CEA & CFFC and Mr. Ather Hameed, EA (Civil) was shared with Ministry of Water Resources on **25th March 2022** for participation on the "2nd Session of Pakistan-Hungary Joint Commission (JC)-Plenary session to be held on **28th March 2022**".

vii. Through DO letters, IG Police Islamabad, Home Secretary Punjab, CPO Rawalpindi, IG Police Punjab & Chief Commissioner ICT Islamabad were requested to ensure necessary security arrangements for the "Visit of Hungarian Experts to Pakistan under Hungary-Pakistan Water Management MoU" on 7th April 2022.

viii. On behalf of Government of Pakistan, a formal invitation letter was sent to Mr. Peter KOVACS, Focal Person (Hungarian Side), Water Director, Ministry of Interior, Hungary on **7th April 2022** regarding his visit to Pakistan alongwith other Hungarian Experts from May 16-20, 2022 under Hungary-Pakistan Water Management MoU.

ix. Irrigation Department, Govt. of the Punjab, PCRWR & PMD were requested on **19th April 2022**, to ensure necessary arrangements for field exposure visit of the "Hungarian Experts to Khanki Barrage, IRI Nandipur and FFD Lahore."

x. NUST Institute of Civil Engineering, Islamabad was requested on **25th April 2022** to ensure necessary arrangements for visit of "Hungarian Experts to NUST on May 20, 2022".

xi. Assistant Director (Europe-III/ Hungary) in EAD was conveyed on **30th April 2022** the new dates i.e. from May 16-20, 2022 and updated details of Hungarian Delegation to Pakistan under Hungary-Pakistan Water Management MoU.

xii. Country Director, IWMI, Lahore was requested on **30th April 2022** for necessary support/ facilitation for the "Visit of Hungarian Experts to Pakistan under Hungary-Pakistan Water Management MoU".

xiii. Updated Schedule/ Program was shared with Mr. Peter KOVACS, Focal Person (Hungarian Side), Water Director, Ministry of Interior, Hungary on **8th May 2022** regarding visit of Hungarian delegation to Pakistan from May 16-20, 2022 under Hungary-Pakistan Water Management MoU.

xiv. Members of the Joint Expert Group (JEG) from Pakistan Side were requested on **9th May 2022** to attend "1st Physical meeting of the JEG scheduled to be held on **17th May 2022**" under Hungary-Pakistan Water Management MoU.

xv. Secretary, MoWR was requested to Chair the wrap-up meeting of visiting Hungarian Experts with Pakistan Side stakeholder scheduled for **20th May 2022** on **13th May 2022**.

xvi. IG Police Islamabad, Home Secretary Punjab, CPO Rawalpindi, IG Police Punjab & Chief Commissioner ICT Islamabad were requested on **9th May 2022** to ensure necessary security arrangements for the visit of Hungarian Experts to Pakistan under Hungary-Pakistan Water Management MoU.

xvii. Invitations were sent to IWMI-Pakistan, Chairman PCRWR, Joint Secretary EAD, Director General (Europe-II) MoFA and Chief (Water Resource Section), M/o PD&SI, on **11th May 2022** and **13th May 2022** for the wrap up meeting of visiting Hungarian Experts with Pakistan Side stakeholder held on **20th May 2022**.

xviii. As per advice of the Secretary, MoWR, Hungarian Experts were requested to deliver presentation on the 'Telemetry System being used in Hungary' wherein concerned stakeholders i.e. IRSA, PCRWR, WAPDA, PMD, M/o PD&SI, PID Punjab, PID Sindh, PID Khyber Pakhtunkhwa, PID Balochistan and IWMI were requested for participation in wrap-up meeting of visiting Hungarian Experts scheduled for **20th May 2022**.

xix. Focal Person Pakistan Side on Hungary-Pakistan Water Management MoU issued a special invitation to H.E. Mr. Bela FAZEKAS, Ambassador of Hungary in Pakistan on **18th May 2022** for the participation in closing session as a Guest of Honour. Dr. Istan Grafjodi, Commercial Counselor was also requested to participate in wrap up meeting.

xx. Draft Minutes of the wrap up meeting/ closing session regarding the "Visit of Hungarian Experts to Pakistan under Hungary-Pakistan Water Management MoU" were prepared and submitted to MoWR on **30th May 2022** for approval. Thereafter, Minutes were issued to concerned departments on **1st June 2022**.

xxi. Follow up letter was issued to IRSA on **4th June 2022** regarding decision of minutes of wrap up meeting of the visiting Hungarian Delegation with Pakistan side stakeholders held on **20th May 2022**. Another follow up was made on **13th June 2022**.

xxii. Draft proceedings/minutes of the 1st Physical Meeting of JEG, Subsidiary Meetings with Stakeholders & Field Exposure Visits were shared with Hungarian delegation on June 09, 2022 for their approval/ feedback. Thereafter, minutes were circulated among concerned departments on **23rd June 2022.**

xxiii. In line with decisions of "Wrap up meeting of the visiting Hungarian Delegation with Pakistan side Stakeholders held on 20th May 2022", updated U.O. Note was submitted to Secretary, MoWR on **25th July 2022** to share nominations for – Joint Working Group for Implementation of IRSA's Telemetry System Project.

xxiv. Notification of Joint Working Group (JWG) formulated for IRSA's Telemetry System project "Automation of 07 Key Sites for Discharging Monitoring" issued on **29th July 2022**. 1st meeting this project specific JWG stands organized by IRSA on 19th January 2023 wherein it was decided that Hungarian side will host a visit of Pakistan delegation to study fist-hand vast hydro-meteorological telemetry network in stalled in Hungary. Matter was being followed up by IRSA.

Sino-Pakistan Smart Water Management Project (SP-SWMP)

i. MoWR was requested on **15th February 2022** to pursue the matter with EAD for obtaining commitment of the donor for implementation of the project "Sino Pakistan Smart Water Management Project (SP-SWMP)".

ii. Dean, College of Hydrology and Water Resources, Center of Global Change and Water Cycle, Hohai University, Xiang Road, Nanjing, China was requested to expedite the case regarding commitment of funding for "SPSWMP" on **15th February 2022**.

iii. Flood Section, O/o CEA/ CFFC was intimated on **25th February 2022** about "Briefing material & updated details regarding the level of Pakistan's Cooperation with UN-ESCAP in different areas".

Miscellaneous Cases

i. Following project proposals regarding possible funding from "D-8 Project Support Fund (D-8)" were shared with MoWR on **25th February 2022**.

   a. Dam Break Studies & Emergency Preparedness Action Plan for Mangla & Tarbela, Estimated Cost EURO € 1.50 Million.
   b. Urban Flood Management through Rainwater Harvesting and downstream Flood reduction in Islamabad Region, Estimated Cost EURO € 0.50 Million.
   c. Study to address Urban Flooding Problems in Major Cities of Pakistan in line with NFPP-IV, Estimated Cost EURO € 2.50 Million.

ii. Follow up letter was issued to Section Officer (China-II) EAD on **24th June 2022** to share updated status regarding Sino Pakistan Smart Water Management Project (SPSWMP).

iii. Matter was taken up on **27th June 2022** with Additional Secretary (Tech), PID, Punjab, Lahore to share the proposal "Pakistan-Turkey Bilateral Cooperation in Water Sector (Strategic Economic Framework) Grant-in-Aid Proposal on the Analogy of "1000 Reservoirs in 1000 days" Turkish Initiative".

iv. On the request of MoWR, proposals for "Pakistan-Turkey Bilateral Cooperation in Water Sector (Strategic Economic Framework)" were shared with the Joint Secretary (Admin,) MoWR on **5th July, 2022**.

v. Proposals for "Foreign Minister's Visit to Norway" were shared on **4th August 2022** with MoWR

vi. Proposals for "Foreign Minister's Visit to Denmark" were shared on **19th August 2022** with MoWR.

vii. Proposals for "6th Round of Pakistan-Spain Annual Bilateral Political Consultations" were shared with MoWR on **30th August 2022**.

1.4.4 Key Events/Meetings/Seminars/ Workshops Attended

The important/ high level meetings attended by the Senior Officers of Civil Engineering Wing are given below in **Table-1.1**.

Table-1.2: Detailed of Meetings/Seminars/Workshops Attended

Sr. No.	Description/ Meeting/ Workshop Title	Date of Meeting	Attended By
1.	Fourth informal consultation/ review of the conference structure of United Economic and Social Commission for Asia and PACIFIC (UNESCAP) –Hybrid Meeting	27th January 2022	EA (Civil)
2.	Senate Standing Committee on Water Resources.	28th January 2022	CEA & CFFC
3.	Senate Standing Committee on Water Resources.	25th February 2022	CEA & CFFC & EA (Civil)
4.	23rd meeting of the National Assembly's Standing Committee on Water Resources	7th March 2022	CEA & CFFC & EA (Civil)

Sr. No.	Description/ Meeting/ Workshop Title	Date of Meeting	Attended By
5.	National Workshop on Developing Baseline for National Water Policy-Implementation Framework priority actions.	29th April 2022	CEA & CFFC
6.	Consultative Workshop: To Enhance Capacity on Climate Adaptation and Resilience for the Water Sector in Pakistan – Hybrid Mode.	17th August 2022	Senior Engineer (Floods-I) & Sr. Engr. F-II
7.	Building Capacity to Advance National Adaptation Plan Process in Pakistan Consultation on "Climate Projections and Climate Risk Assessment and Institutional Capacity Assessment and Climate Information System	18th August 2022	Senior Engineer (Floods-I)
8.	Multi Hazard Risk Loss and Damage Assessment Framework: Consultative Conference in Kathmandu Nepal	8th-9th December 2022	Superintending Engineer (Floods)
9.	Seminar on "Role of Space Technologies for sustainable Socio Economic Development of Pakistan"	19th December 2022	Superintending Engineer (Floods)

1.4.5 Key Events/Meetings Organized by Civil Engineering Wing

The meetings organized by Civil Engineering Wing during the reporting period are given below in Table-1.2;

Table-1.3: Meetings Organized by the Civil Engineering Wing

Sr. No.	Description/ Meeting Title	Date of Meeting
1.	2nd Meeting of 1st Revised PC-I for Remedial Measures to Control Water Logging Due to Muzaffargarh & Taunsa Panjnad Link Canal Project	17th February 2022
2.	3rd Meeting of the Evaluation Committee regarding "1st Revised PC-I for Remedial Measures to Control Water Logging due to Muzaffargarh & Taunsa Panjnad Link Canal Project"	8th April 2022
3.	1st Joint Meeting of Working Groups of PANCID	12th April 2022
4.	1st Bilateral Physical Meeting under Hungary Pakistan Water Management MoU	16-20th May 2022
5.	Meeting of Technical Committee Constituted to Finalize Baseline & Targets for Sharing Implementation Status of Water Sector Related SDGs Indicators	22nd August 2022
6.	Committee Constituted for PC-I of Strengthening and Capacity Building of Office of CEA/CFFC	29th September 2022

1.4.6. Role as PANCID Secretariat

The purpose of PANCID is to promote the aims and objectives of 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. Following actions were taken as PANCID Secretariat:

i. Members of Joint Working Groups (JWG) were reminded for submission of CVs to PANCID Secretariat on 6th January 2022.

ii. "Amended Constitution of Pakistan National Committee on Irrigation & Drainage (PANCID" as approved by the Committee (PANCID), was circulated among all the stakeholders on 17th January 2022.

iii. As a follow-up of 51st Annual Meeting of PANCID, Vice Chancellor, Balochistan University of Engineering & Technology, Khuzdar, Chairman, ACE Pvt. Ltd, Lahore and Vice Chancellor, University of Agriculture, Faisalabad were conveyed concerns regarding their inactive nature in PANCID activities on 25th January 2022 and ask their willingness for continuing their "Membership of PANCID" or otherwise.

iv. As a follow-up of decisions taken during the 51st Annual Meeting of PANCID, "Notification regarding Working Groups of ICID from PANCID" was issued on 1st February 2022.

v. Requisite details were asked from Members of PANCID on 10th March 2022 for election for the "office of three vice presidents of ICID for term 2022-25".

vi. "Call for Papers for various workshops of ICID to be held on October 3-10, 2022 in Adelaide, Australia during 4th ICID Congress and 73rd IEC meeting of ICID" were requested from PANCID members on 29th March 2022.

vii. Nominations of Mr. Ahmed Kamal, CEA & CFFC and Mr. Ather Hameed, EA (Civil) were shared with ICID on 30th March 2022 for session "Water & Food" to be discussed in the 4th Asia Pacific Water Summit (APWS) scheduled to be held on 24th April 2022.

viii. On the request of Ministry of Water Resources, requisite input for the video message of the Honourable President of Pakistan was shared to MoWR on 31st March 2022 regarding "4th Asia Pacific Water Summit in Kumamoto, Japan (23-24 April 2022)"

ix. As a follow-up of decisions taken during the 51st Annual Meeting of PANCID, a "Joint meeting of Working Groups of PANCID is to be organized on 12th April 2022". Notice of meeting & Working Paper were shared with PANCID members on 31st March 2022.

x. "Full length Paper (Pakistan) for the 24th ICID congress in October 3-10, 2022 at Adelaide, Australia" was requested from PANCID members on 30th March 2022.

xi. Ministry of National Food Security & Research, Agriculture Departments of four Provinces (Punjab, Sindh, Balochistan & KHYBER PAKHTUNKHWA) were asked to submit report on 1st April 2022 regarding "Contribution of Agricultural water to the Rural Development in Asia"

xii. Matter was followed up with PANCID Members on 4th April 2022 for submission of "Papers for following workshops of ICID"

a. International workshop on "Public-Private-Partnership (PPPs) in Irrigation and drainage Operation and Maintenance toward sustainable Irrigated Agriculture Water Management"
b. International Workshop on "The Water-Energy-Food-Nexus: Implementation and Examples of Applications".
c. International Workshop on "Modernizing Irrigation and Drainage Services".
d. International Workshop on "Managing on the Regional, State or Local Level, Water Scarcity Resulting from Conflicting Demands".
e. International Workshop on "Nonconventional Irrigation in High Value Agriculture – Application of Modern Technologies".

xiii. Group members of WG-M&R were asked on **5th April 2022** to fill in the "Questionnaire "Norms and Process for O&M of Irrigation System" –WG-M&R" and submit to this office for onward submission to ICID.

xiv. At the request of ICID, requisite updated brief related to Baloki Barrage was submitted to ICID on **8th April 2022** regarding "Compendium of WHIS-Pakistan"

xv. "1st Joint Meeting of Working Groups of PANCID" was organized by this office on 12th April 2022. Minutes were issued to all the stakeholders on **15th April 2022** for taking necessary actions on the decisions reflected in the minutes.

xvi. At the request of ICID, updated mailing list of Office Bearers, Founding & Executive Member Organizations and Working Body Members, was submitted to ICID on **26th April 2022** regarding distribution of soft & hard copies of Irrigation & Drainage Journals of ICID.

xvii. "Full Length Paper (Pakistan) for the 24th ICID Congress in October 2022 at Adelaide Australia" were requested from PANCID members for onward submission to ICID on **28th April 2022.**

xviii. On the request of ICID, progress report related to activities of PANCID Secretariat was submitted to ICID on **29th April 2022** for inclusion in "ICID Annual Report 2021-22".

xix. Members of PANCID were reminded on **30th April 2022** for submission of nominations for ICID's election for the "office of three vice presidents of ICID for term 2022-25".

xx. As a follow-up of "1st Joint Meeting of Working Groups of PANCID", Dr. Usman Khalid Awan, Water Specialists, IWMI Lahore was requested to convey concurrence or otherwise on **30th April 2022**.

xxi. PANCID members were informed on **24th May 2022** about "Call for Papers (Pakistan) for the 4th World Irrigation Forum, 16-22 April 2023 at Beijing, China"

xxii. Ministry of National Food Security and Research and Agriculture Departments of four Provinces (Punjab, Sindh & Balochistan) were reminded on **25th May 2022** to submit report regarding "Contribution of Agricultural water to the Rural Development in Asia" for onward submission to ICID.

xxiii. Nomination of Mr. Zafar Iqbal, DEA (Civil) was shared with ICID on 27th May 2022 to attend the "Young Professional Training Program during 24th ICID Congress in October 2022, Australia".

xxiv. Matter was followed-up with PANCID members on **28th May 2022** for submission of "Papers for various workshops of ICID to be held on October 3-10, 2022 in Adelaide, Australia during 4th ICID Congress and 73rd IEC meeting of ICID"

PANCID members were requested on 30th May 2022 to share "Papers International Workshops of WG-SDTA and WG-AFM October 2022"

xxv. Nomination of Mr. Basit Hussain, Sub Engineer (Civil) was shared with ICID on **31st May 2022** to attend the "Young Professional Training Program during 24th ICID Congress in October 2022, Australia".

xxvi. Matter was taken up with Dr. Usman Khalid Awan, Water Resources Specialist IWMI, Lahore on **9th August 2022** regarding decisions of minutes of 1st Joint meeting of Working Groups of Pakistan National Committee on Irrigation & Drainage (PANCID).

xxvii. Matter was followed up with Admn Wing of this office on **13th June 2022** regarding Annual Subscription Fee of ICID for the year 2022 and Arrears. Another reminder issued on 21st June, 2022.

xxviii. All PANCID members were requested on **16th August 2022** to share papers for 4th World Irrigation Forum scheduled from April 16-22, 2023 Beijing, China.

xxix. In compliance of decision taken in Annual Meeting of PANCID, nominations of PANCID members for various working Groups of ICID were shared with Secretary General of ICID on **2oth June 2022**.

xxx. All PANCID members were requested on **24th June 2022** to share papers for International Workshop on Non-Conventional Irrigation in High Value Agriculture – Application of Modern Technologies scheduled for October 04, 2022 Adelaide, Australia.

xxxi. All PANCID Working Group members were requested on 27th June 2022 for registering themselves for 24th ICID Congress & 73rd IEC Meeting, October 3-10, 2022, Adelaide Australia.

xxxii. All PANCID members were requested on **28th June 2022** to share nominations for the Water Save Awards & Recognition of World Heritage Irrigation Structures (WHIS) 2022 for onward submission to ICID.

xxxiii. Nomination of CEA/CFFC & Chairman, PANCID was shared with ICID on **30th June 2022** for "International Review Committee being formulated for Fourth World Irrigation Forum (WIF4) April 16-22, 2023, Beijing, China.

xxxiv. Follow up letter was issued to all PANCID members on **6th July 2022** about "Call for Papers for 4th World Irrigation Forum scheduled from April 16-22, 2023 Beijing, China".

xxxv. Updated figures regarding Total Agricultural Area, Arable Area, Cultivated Area and Cropped Area of Pakistan were shared with ICID on **14th July 2022** for inclusion in ICID Annual Report 2021-22.

xxxvi. U.O. Note and Summary for Prime Minister were issued to Deputy Secretary (Admn) M/o Water Resources on **18th July 2022** for obtaining approval for visit of CEA/CFFC for attending 24th ICID Congress and 73rd IEC Meeting to be held from October 03-10, 2022, Adelaide, Australia.

xxxvii. Nomination of Mr. Basit Hussain for participation in ICID Working Group meeting for "Managing Water Scarcity under conflicting Demands (WG-MWSCD) & Adaptive Flood Management (WG-AFM)" shared with ICID on **21st July, 2022**.

xxxviii. ICID was requested on **27th June 2022** to share Invoice for Payment of Registration Fee for participation in "24th ICID Congress and 73rd IEC meeting in Adelaide Australia scheduled from 3-10 October 2022". (In respect of Chairman PANCID).

xxxix. Follow up letter was issued to Agriculture Department, Government of Balochistan on **29th July 2022** to submit report on "Contribution of Agriculture Water to the Rural Development in Asia".

xl. PANCID members were requested to participate in "Webinar on Advanced Micro Irrigation Technology with Precision Water and Salt Management" organized on August 25, 2022 by ICID.

xli. CV and photograph of CEA/CFFC were shared with ICID on **15th August 2022** after his nomination as member of ICID's Review Committee for 4th World Irrigation Forum being organized in April 2023 in Beijing China.

xlii. Follow up email was issued to ICID on **12th August 2022** to convey an Invoice of the Registration Fee regarding participation of Mr. Ahmed Kamal, CEA/CFFC for "Participation in the 24th ICID Congress and 73rd IEC Meeting scheduled from 3-10 October 2022, Adelaide, Australia". Matter was followed up on August 24, 2022.

xliii. Follow up letter was issued to Agriculture Department, Government of Balochistan and Ministry of National Flood Security & Research on August 30, 2022 regarding "Report on Contribution of Agricultural Water to Rural Development in Asia"

xliv. Follow up email was issued to ICID on **2nd September 2022** to share an Invoice of the Registration Fee regarding participation of Mr. Ahmed Kamal, CEA/CFFC in "24th ICID Congress and 73rd IEC Meeting scheduled from 3-10 October 2022, Adelaide, Australia".

xlv. Nomination of Mr. Ahmed Kamal, CEA/CFFC, Mr. Ghulam Zakir Sail, Director IRI and Mr. Basit Hussain, Sub Engineer (Civil) were shared with ICID on **9th September 2022** for participation in the "Meeting of NC Representative with Office Bearers, scheduled for 4th October 2022, in Adelaide".

xlvi. D.O letter was issued to President ICID on **4th October 2022** October 04, 2022 for nominating Dr. Mohsin Hafeez, Country Director, IWMI as Head of PANCID Delegation for "24th ICID Congress & 73rd IEC Meeting scheduled from 3-10 October 2022 in Adelaide, Australia".

xlvii. PANCID members were requested on **5th October 2022** to share abstracts of papers for "10th International MCRO Irrigation Conference scheduled for January 2023 in Morocco".

Circulation of ICID's Irrigation & Drainage Journals and Call for submission of Papers

i. "Irrigation and Draining-Journals (Volume 70, Number 5, December 2021" was shared with Members of PANCID on **4th January 2022**.

ii. "Irrigation and Draining-Journals (Volume 71, Number 1, February 2022" was shared with Members of PANCID on **29th March 2022**.

iii. "ICID's Irrigation and Draining-Journal (Volume 71, Number 2 April 2022)" was shared with Members of PANCID on **25th May 2022**.

iv. "Irrigation and Drainage-Journals (Volume 71, Number 3, July 2021)" was circulated in hard/soft form among the PANCID Members on **19th August 2022.**

v. "Irrigation and Drainage-Journals (Volume 71, Number 4, October 2022 & Volume 71, Number S1, October 2022)" were circulated in hard/soft form among the PANCID Members on **18th November 2022.**

DAMS SAFETY COUNCIL

OFFICE OF THE CHIEF ENGINEERING ADVISOR & CHAIRMAN
FEDERAL FLOOD COMMISSION, ISLAMABAD

2. DAMS SAFETY COUNCIL/DSC-WING

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 Dams						On-going/ Proposed		
	Large Dams^		Small/Medium Dams		Total		On-going (No.)	Proposed (No.)	Total (No.)
	No.	Gross Capacity (MAF)	No.	Gross Capacity (MAF)	No.	Gross Capacity (MAF)			
Punjab	71	0.662879	3	0.004779	74	0.667658	05	02	07
Sindh	08	0.216255	80	0.181903	88	0.398190	39	07	46
Khyber Pakhtunkhwa	25	0.182802	02	0.002462	27	0.185264	15	20	35
Balochistan	159	0.737913	441	0.15745	600	0.882998	454	-	454
Merged Areas (Ex. FATA)	19	0.117333	-		19	0.117333	-	-	00
AJ&K	-		-				-	34	34
Sub-Total	282	1.917182	526	0.334219	808	2.251411	513	63	576
WAPDA's Mega Dams	8	18.902946	-	-	8	18.902946	3	13	16
Grand Total	**290**	**20.820128**	**526**	**0.334219**	**816**	**21.15434**	**516**	**76**	**592**

* It includes total number of completed, ongoing and proposed dams in Pakistan, upto year 2021.

^ 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). The Organogram of Dam Safety Wing is shown in **Figure 2.1.**

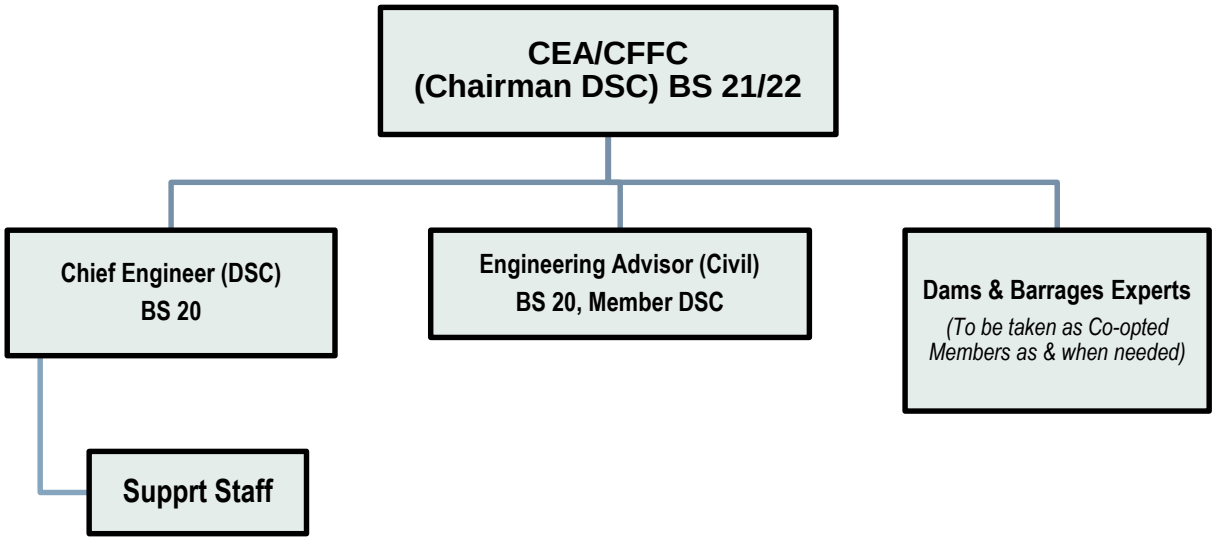


Figure 2.1: Organogram of Dams Safety Council

2.3. Issues Faced by Dams Safety Council

Dams Safety Council is most understaffed wing of CEA & CFFC. 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. The study recommended enriching composition of DSC 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 study recommendations, proposal prepared for strengthening DSC enabling it an effective 3rd tier dams monitoring/ regulatory body has been submitted to MoWR 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, dam 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 2022

During the year 2022, Dams Safety Council of O/o the CEA & CFFC performed following functions related to its charter of duties given on preceding page as follows;

2.5.1 General Technical Activities

Chief Engineer DSC performed following salient technical/coordination task during year 2022:

i. Represented office in Standing Committee of Ministry of Water Resources to examine Inquiry Reports conducted in compliance of PAC/DAC directives and recommend disposal/actions by Principal Accounting Officer (PAO) of MoWR (Meetings attended on **17th February 2022, 24th February 2022, 10th March 2022, 15th July 2022** and **25th August 2022**).

ii. Represented the office during 7th periodic inspection of Mangla Dam Project held from February **8th to February 14th 2022** and also conducted a field visit of Barakas Nullah to assess its discharge carrying capacity as emergency spillway of Mangla Reservoir.

iii. Represented the office as advisor to Pakistan Commissioner for Indus Water (PCIW) during 117th PIC meeting held from March 01 to **3rd March 2022** in

Islamabad and presented a special case for obtaining advanced flood flow information from Indian side on Eastern Rivers including Chenab River during Monsoon Season of every year.

iv. Coordinated for record examination/exploration and necessary arrangements regarding Inquiry Committee on PDP-211 AR 2021-22 "Unjustified increase in the quantities of hard rock material **Rs. 2,709.31 million** pertaining to GM Diamer Basha Dam Project under chairmanship of CEA/CFFC. Meeting held on **10th June 2022** and final report was submitted to Ministry of Water Resources on **18th July 2022**.

v. Coordinated for an agreement between Karot Hydropower Authority and Mangla Dam Organization of WAPDA for mutual provision of discharge/level data during monsoon season reached under patronage of worthy CEA/CFFC after series of meetings that was concluded on **7th July 2022** and was successfully implemented in Monsoon 2022.

2.5.2 Technical Review of PC-Is of Dam Projects

Following PC-Is evaluated during year 2022 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 2022

Sr. No.	Name of Project	Financing	Submission date to MoWR
Khyber Pakhtunkhwa			
1.	Construction of Surkhwai Dam Project District Mardan Costing **Rs 2141.825 Million**	Federal	**25th Feb 2022**
2.	Construction of Sher Dara Dam Project District Swabi Estimated Cost **Rs 2936.569 Million**	Federal	**25th Feb 2022**
3.	Construction of Sumari Payan Dam District Kohat Estimated Cost **Rs. 1968.108 Million**	Federal	**18th March 2022**
4.	Construction of Kora Nullah Dam Project, District D.I Khan Estimated Cost **Rs 2887.030 Million**	Federal	**28th Feb 2022**
5.	Construction of Barwasa Dam Project District Haripur Estimated Cost **Rs 1,253.273 Million**	Federal	**18th March 2022**
6.	Kurram Tangi Dam Project (Stage-1) 2nd Revised PC-I, Estimated Cost **Rs. 39194.840 Million**	Federal	**13th Dec 2022**
Balochistan			
1.	Construction of Roshanabad Kalat Dam District Kalat Estimated Cost **Rs. 350.00 Million**	Federal	**5th Dec 2022**
2.	Construction of Dams at Kamalzai and Tora Shah Area District Pishin	Federal	**15th Sep 2022**
3.	Construction of Karbala Storage Dam District Pishin Estimated Cost **Rs 1126.596 Million**	Federal	**6th July 2022**

Sr. No.	Name of Project	Financing	Submission date to MoWR
4.	Construction of Ghoro Delay Action Dam Lohi Tehsil Dureji District Lasbela	Federal	1st July 2022
WAPDA			
1	1st Revised PC-I (updated) Satpara Dam Project (17.4 MW) Estimated Cost **Rs 6,371.246 Million**	Federal	2nd Sep 2022

2.5.3 Technical Review of PC-IIs of Dam Projects

PC-II of WAPDA titled "*Bhimber Dam Project – PC-II Performa for Feasibility Study, Detailed Engineering Design Preparation of Tender Documents & PC-I*" was evaluated and technical views/comments were submitted on **14th February 2022** to concerned quarters.

2.5.4 Activities Performed as PANCOLD Secretariat

i. Letter was issued to Secretary to PEC Think Tank, Water Resources Development Committee, and Pakistan Engineering Council regarding "Draft Memorandum of Collaboration (MOC) for Strengthening of Pakistan National Committee on Large Dams (PANCOLD)" on **3rd January 2022**.

ii. PANCOLD members were informed regarding the nominations to participate 90th Annual meeting /7thCongress of ICOLD to be held from **27-30th May** to **3rd June 2022** at Marseille France.

iii. 48th Meeting of Pakistan National Committee on Large Dams (PANCOLD) was organized on **11th March 2022.** Notice of Meeting was issued to all PANCOLD members on **28th February 2022.**

iv. Minutes of the above meeting were circulated with all PANCOLD members on **16th March 2022**.

v. Letter was issued on **4th April 2022** to all members of PANCOLD regarding implementation of decision taken in the minutes of the 48th Meeting of Pakistan National Committee on Large Dams (PANCOLD) was held on March 11, 2022.

vi. Reminder was issued on **14th May 2022** to all members of PANCOLD regarding implementation of decisions taken in the Minutes of 48th Meeting of Pakistan National Committee on Large Dams (PANCOLD) held on **11th March 2022**.

vii. Reminder was issued on **1st June 2022** to Additional Registrar, Pakistan Engineering Council, and Islamabad regarding "Memorandum of Cooperation (MOC) between PANCOLD and PEC".

viii. Letter was issued on **4th April 2022** to all members of PANCOLD regarding implementation of decision taken in the minutes of the 48th Meeting of Pakistan National Committee on Large Dams (PANCOLD) was held on **11th March 2022**.

ix. Letter was issued on **7th April 2022** to Chairman, Pakistan Engineering Council, Islamabad regarding "Memorandum of Cooperation (MOC) between PANCOLD and PEC".

x. Reminder was issued on **14th May 2022** to all members of PANCOLD regarding implementation of decision taken in the Minutes of the 48th Meeting of Pakistan National Committee on Large Dams (PANCOLD) was held on March 11, 2022.

xi. Reminder was issued on **1st June 2022** to Additional Registrar, Pakistan Engineering Council, Islamabad regarding "Memorandum of Cooperation (MOC) between PANCOLD and PEC".

xii. Notice of Meeting regarding "PANCOLD Sub-Committee for Updation of National Register of Dams" was issued to all PANCOLD members on **21st July 2022**.

xiii. Meeting of PANCOLD Sub-Committee for Updation of National Register of Dams was held on **13th October 2022** under the Chairmanship of Engineering Advisor (Civil).

xiv. Minutes of Meeting were issued to all concerned organization regarding "Meeting of PANCOLD Sub-Committee for Updation of National Register of Dams" on **20th October 20, 2022.**

Meeting of PANCOLD held on March 11, 2022

Memorandum of Cooperation signed between PANCOLD and PEC in Jan 2023

FLOOD MANAGEMENT WING/ FFC

OFFICE OF THE CHIEF ENGINEERING ADVISOR & CHAIRMAN
FEDERAL FLOOD COMMISSION, ISLAMABAD

3. FEDERAL FLOOD COMMISSION/ FLOOD WING

3.1 Floods in General Perspective

3.1.1 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.

3.1.2 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 Walls etc. 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.

3.1.3 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 3.1.**

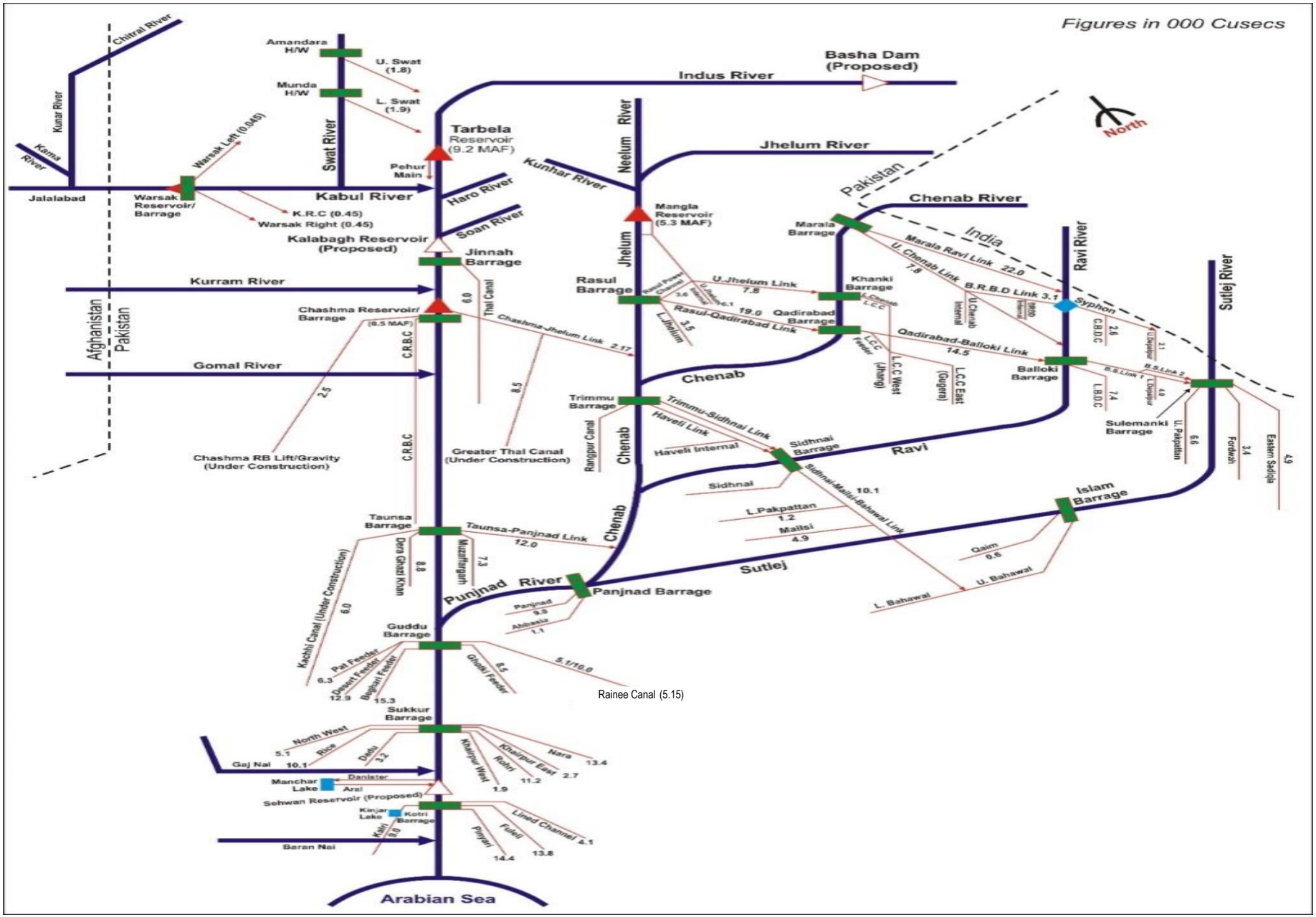


Figure 3.1: Schematic Diagram of Indus Basin Irrigation System

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 PIDs, Pakistan

Sr. No.	Zone/Region/ Agency/District	No. of Protection Works
Punjab		
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
	Sub-Total (Punjab)	**1,185**
Sindh		
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
	Sub-Total (Sindh)	**261**
Khyber Pakhtunkhwa		
1.	North Irrigation Zone	439
2.	South Irrigation Zone	345
3.	Merged Area	209
	Sub-Total (KHYBER PAKHTUNKHWA)	**993**
Balochistan		
1.	North Irrigation Zone	159
2.	South Irrigation Zone	96
3.	Canal Irrigation Zone	05
	Sub-Total (Balochistan)	**260**
	Total (In four Provinces)	**2,699**
Gilgit-Baltistan		
1.	Gilgit	02
2.	Hunza/Nagar	08
3.	Skardu	04

Sr. No.	Zone/Region/ Agency/District	No. of Protection Works
4.	Ghizar	04
5.	Astore	02
6.	Ghanche	09
7.	Diamer	01
	Sub-Total (G-B)	**30**
AJ&K		
8.	Bagh	03
9.	Bhimber	06
10.	Kotli & Mirpur	01
11.	Muzaffarabad	02
	Sub-Total (AJ&K)	**13**

3.1.4 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 ^{o}C to 4.0 ^{o}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.

3.1.5 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 18th 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^2 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 18th 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 major historical flood events and their damages are given in **Table 3.3** on the ensuing page.

3.1.6 Traditional & Innovative Approaches in Flood Management

Flood management plays important role in protecting people and their socio-economic activities in flood prone areas from flooding. The development in the river basins has been closely linked with successful implementation of flood control projects. In the past, exposure to flood risks has been handled largely through structural measures. However, strategies that rely largely on structural solutions may alter the natural environment of the river, which may result in loss of habitats, biological diversity and ecosystem productivity.

Further, structural approaches are bound to fail the moment an extraordinary or unforeseen event occurs. These traditional approaches, where the risks are merely transferred spatially, are likely to generate conflicts and inequities. Environmental degradation has the potential to threaten human security, including life and livelihoods, food and health security. This realization has recently led to calls for a paradigm shift from traditional flood management approaches to Integrated Flood Risk Management (IFRM). Based on this, 4th Flood Protection Plan of the country (NFPP-IV) is being updated with support from ADB.

Table 3.2: Major Flood Events Witnessed in Pakistan

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#
Total		**68,225**	**15,199**	**203,704**	**701,558**

* PDNA Report, M/o PD&SI

^ Union Councils (UC's): Source NDMA

United Nations Satellite Centre: 2022 Floods Imagery Analysis from 1.7.2022 to 31.8.2022

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 are briefly described below:

i. **Source Control to Reduce Runoff**

Permeable pavements, afforestation artificial recharge;

ii. **Storage of Runoff**

Detention Basins, check dams and small/medium/large reservoirs etc.;

iii. **Capacity enhancement of Headwork/Barrages across Rivers**

Remodeling of Barrages/Headworks for enhancing their discharge capacities besides, provision of Bypass/Escape channels, wherever feasible;

iv. Separation of Rivers and Population

Land-use control, flood plan mapping & zoning, removal of illegal encroachments as per River Law/ Act, construction of flood protection infrastructure

v. Emergency Management during Floods

Flood Forecasting & Warnings, flood fighting works i.e. raising/strengthening flood embankments, flood flows diversion and evacuation of flood affectees from dangers zone and their temporary settlement at safe places; and

vi. Flood Recovery

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.

3.1.7 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 bank s 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.

3.1.8 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.

3.1.9 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 chocked 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 per cent of GDP, 70 per cent 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 mullahs 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.

3.2 FFC – History, Organogram, Functions and Achievements

3.2.1 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.

3.2.2 Organogram

CEA & CFFC heads the FFC/ National Flood Management Wing as Chairperson. He is assisted by two senior officers i.e. Member Technical (BS-21) and Chief Engineer (Floods) BS-20. The Organogram of FFC showing gazetted staff strength is given in **Figure 3.2.**

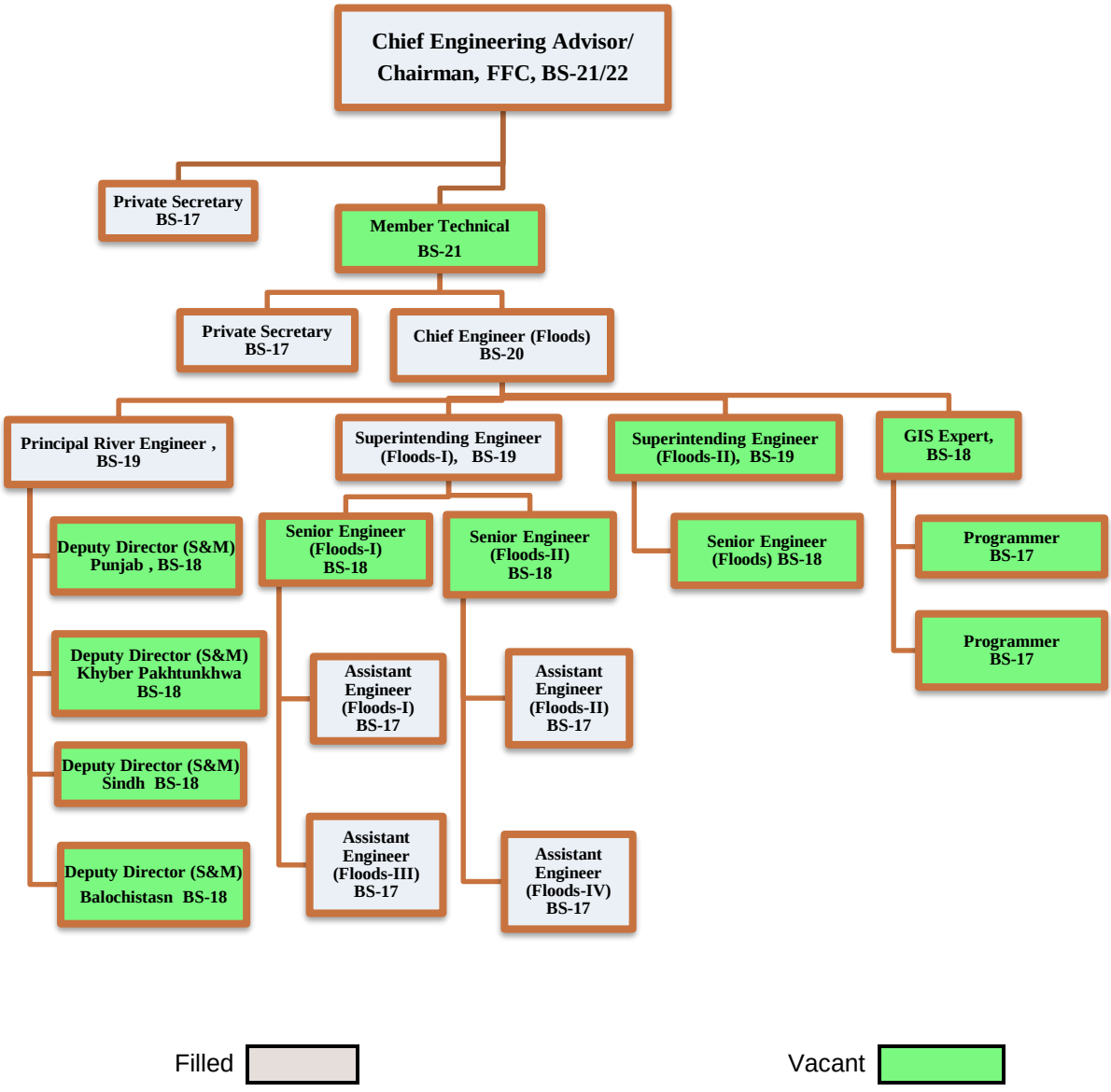


Figure 3.2: Organogram of FFC

3.2.3 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.

3.2.4 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:

1. 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.

2. National Flood Protection Plan-II (1988-98)

Normal/ Emergent Flood Program

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%)

3. 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/1st 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.

3.2.5 National Flood Protection Plan – IV (NFPP-IV)

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 had been 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 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 31st 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".*

Meetings to Review Priority Projects

In compliance to CCI's above decision & to ensure commencement of work without any delay, FFC organized a joint meeting of concerned Federal and Provincial level organizations on 1st June 2017 to review priority of projects for implementation under NFPP-IV and their inclusion in Umbrella PC-I. The draft Umbrella PC-I of NFPP-IV was submitted by the Consultants (M/S NESPAK) to FFC on 28th July 2017. FFC conveyed to consultants detailed comments on draft umbrella PC-I on 17thAugust 2017. A meeting of consultants & FFC was organized on 12thSeptember 2017 in office of CEA & CFFC to review the draft umbrella PC-I of NFPP-IV in the light of observations of FFC. The draft umbrella PC-I of NFPP-IV remained under extensive review for its refinement by the consultants in consultation with FFC's Officers.

The modified umbrella PC-I of NFPP-IV was considered and cleared by Scrutinizing Committee of FFC in its meeting of 15th December 2017 subject to certain observations. The updated umbrella PC-I was submitted by the consultants to FFC on 28th February 2018, which was circulated among the Irrigation Departments of the four provinces for getting its clearance from PDWP.

Clearance by PDWPs of Punjab, Sindh, Khyber Pakhtunkhwa and Balochistan

The umbrella PC-I of NFPP-IV was cleared by the PDWP's of Governments of Sindh, Balochistan, Punjab and Khyber Pakhtunkhwa on 6th April 2018, 8th May 2018, 12th June 2018 and 10th August 2018 respectively. The finalized version of umbrella PC-I was submitted to Ministry of Water Resources on 16th November

2018. Ministry of Water Resources had submitted the same to Ministry of Planning, Development & Reforms on 11th January 2019.

Flood Protection Sector Project-III (FPSP-III)

The Umbrella PC-I was considered in the Pre-CDWP meeting held on 4th April 2019 under the Chairmanship of Member (Infrastructure), Planning Commission, wherein it was agreed in principle to process the Umbrella PC-I for approval of CDWP/ECNEC. However, it was highlighted during the meeting that projects like GLOF-I & GLOF-II, Project of Flood Forecasting and Warning System, besides, other projects had either been executed by NDMA, PMD and MoCC or under process of approval for which PD&R Division had received the project documents for approval of CDWP/ECNEC. Later on Ministry of Planning, Development & Special Initiatives M/o PD&SI) returned the Umbrella PC-I in July 2019 with the comments that neither scope of the project was firmed up nor fiscal space available to take up the project. In light of M/o PD&SI letter, Ministry of Water Resources also advised that keeping in view the financial constraints, FFC may pick only top priority/emergent nature works at this stage in consultation with all stakeholders and formulate an Umbrella PC-I with firm scope of work and realistic cost estimates, so that implementation of NFPP-IV may be materialized.

The strategy for reformulation of Umbrella PC-I for Flood Protection Sector Project-III (FPSP-III) and to explore source of funding for FPSP-III was discussed with all stakeholders in the meeting of FFC held on 20th August 2019 and 14th November 2019 in office of CEA & CFFC, Islamabad. It was agreed that the overall cost of the Umbrella PC-I of FPSP-III containing priority sub-projects of NFPP-IV should be around Rs 96.00 Billion. After detailed discussions and deliberations, the investment plan of FPSP-III in the sum of Rs 95.980 Billion **(Table 3.3)** based upon the proposals received from Irrigation Departments Government of Punjab, Sindh, Khyber Pakhtunkhwa, Balochistan & Federal Line Agencies (Merged Area, Khyber Pakhtunkhwa, G-B, AJ&K, NDMA, PMD, WAPDA and MoCC) was unanimously agreed. In order to process the issue on fast track basis, as a 1st step it was decided to prepare and process Concept Clearance Paper (CCP) of FPSP-III through MoWR for approval of CDWP and for approaching external donors through EAD.

Table-3.3: Investment Plan of FPSP-III (Umbrella PC-I of 2020)

Sr. No.	Province/Line Agency	Proposed Estimate (Rs billion)
1.	Punjab	23.040
2.	Sindh	16.348
3.	Khyber Pakhtunkhwa	11.400
4.	Balochistan	7.769
5.	FATA (Merged Area Secretariat)	6.000
6.	Gilgit-Baltistan	6.996
7.	AJ&K	4.500
8.	NDMA	0.962
9.	Ministry of Climate Change	6.000
10.	PMD	4.505
11.	WAPDA (H&WM Directorate)	6.000
12.	FFC (Technical Studies & Construction Supervision through consultants)	2.460
	Total:	**95.980**

CCP for FPSP-III based on NFPP-IV (Cost of Rs 95.980 Billion) was forwarded to MoWR for further processing on 6th December 2019. Side-by-side Umbrella PC-I of the project was prepared through in-house capacity. The CCP of FPSP-III was approved by the CDWP/CCC in its meeting held on 3rd March 2020. Sequel to that Ministry of Water Resources forwarded the case for approaching prospective donor for FPSP-III financing to EAD. In the meanwhile, the Umbrella PC-I of FPSP-III was submitted to M/o PD & SI enroute MoWR on 23rd June 2020 for approval of CDWP/ECNEC.

The umbrella PC-I of FPSP-III was considered in the Pre-CDWP meeting held on 9th September 2020 and recommended for consideration in CDWP. It was considered in the CDWP meeting held on 12th October 2020 and CDWP approved the Umbrella PC-I at an estimated cost of Rs 95,980 Million, including FEC Component of Rs 6,905 Million, with a condition to confirm financing from donors before consideration of the project by ECNEC. In this regard, MoWR was requested for taking-up the issue of external financing of FPSP-III with NDRMF/ADB through EAD, as NDRMF has been put in place through MoU between ADB and EAD, GoP for the purpose of implementation of National Disaster Management Plan (NDMP) of which NFPP-IV covers more than 75% portion.

Subsequently, EAD was requested enroute MoWR for approaching prospective foreign donors to implement FPSP-III. EAD in response conveyed that Umbrella PC-I could not be shared with donors being only composed of selected list of structural and non-structural interventions. So far external financing arrangements for FPSP-III are not available/ forthcoming through EAD, which is a main condition of CDWP for Project consideration by ECNEC. Accordingly, a Ready-to-Implementation portfolio of sub-projects out of approved FPSP-III PC-I costing Rs. 44.880 billion was prepared in consultation with all the stakeholders and forwarded to EAD through Ministry of Water Resources for exploring external funding.

Need for Preparation of Updated 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 **29th 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 **14th 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.

With reference to above, it is stated that NFPP-IV is being updated by M/o PD&SI through ADB financing. M/s Deltares of the Netherlands is doing the updation work.

Current Status regarding Updated FPSP-III

- Regarding FPSP-III, it is stated that the updated Umbrella PC-I costing **Rs 194.625 billion** was submitted to PD&SI Division on **December 16, 2022** enroute MoWR for the approval of CDWP & ECNEC and for the arrangement of finances.

- PD&SI Division has desired a "*No-Duplication Certificate*" from all Executing Agencies, to be made part of PC-I. Needful is being done *(Requisite Certificates have been received from WAPDA, PCRWR, PMD and Irrigation Departments of Governments of Sindh and AJ&K; follow up underway for obtaining the same, also from Governments of Punjab, Khyber Pakhtunkhwa and Balochistan etc.)*

- **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 etc. & improvement of drainage network in Sindh. These interventions will be implemented mainly through Irrigation Departments of four provinces, Federal Line Departments (G-B, AJ&K and Merged Areas).

- **Non-Structural Interventions** mainly comprise off Improvement works of Flood Forecasting & Early Warning System of **PMD** including installation of Automatic Weather Stations (AWS) etc. & and establishment of Regional FF&W Centers. Likewise, Installation of Flood Telemetry Network & watershed management interventions by **WAPDA** along main, secondary & tertiary rivers and construction of ecosystem-based interventions by **MoCC** through Recharge Pakistan Project.

- Summary of updated FPSP-III project and anticipated benefits of the FPSP-III (derived from initial Ready-to-Implement sub-project proposals submitted by the PIDs/FLAs) are given in **Table 3.4.**

3.2.6 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.

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-3.4: Summary of Interventions in Updated Umbrella PC-I of FPSP-III

(Rs Million)

Sr. No.	Description	No. of Sub-Projects	Estimated Cost	Tentative key benefits to be achieved/ Assets to be protected from future floods
a.	Punjab	12	29,708.25	Around 160,000 population, 5,000 houses, 12 Basic Health Unit (BHU), 20 No. Irrigation Channels, 30 No. schools, 10 No. roads and 31000 acres of lands
b.	Sindh	40	50,570.59	Around 2,507,800 population, 65,500 household, 685,000 acres of agricultural lands
c.	Khyber Pakhtunkhwa	31	14,157.20	Settlements along Rivers Swat, Panjkora, Kabul and their tributaries/ other rivers and hill torrents like Tochi Rivers etc. and around 24,699 acres agricultural lands
d.	Merged Area	25	1,206.80	
e.	Balochistan	29	44,289.41	Around 22,850 population, 3,811 farm families, 5,762 houses, 12,910 acre agricultural lands, 1,500 livestock and 223 No. Tube Well
f.	Gilgit-Baltistan	10	8,197.51	Around 1,200,000 population, 93,466 acre agricultural lands and 4500 houses
g.	Azad Jammu & Kashmir (AJ&K)	4	11,052.59	Conservation 55,345 Acre feet (68.25 million m^3) of flood water for direct irrigation and drinking purposes benefiting about 19,224 acres of fertile cultivable land, Supply of safe drinking water of 0.521 MGD to 52,015 people, production of 1,539 tons of fish annually, hydropower generation of 566,800 KW, Protection of 200 acres valuable agriculture land from floods and Protection of 1,000 households
Sub-Total (A)		**151**	**159,182.35**	
h.	Water & Power Development Authority (WAPDA)	05	15,318.743	457 Telemetry Station on country wide basis, improved data sets for making more accurate flood forecasts, conducting climate studies, timely flood early warnings etc.
i.	Pakistan Meteorological Department (PMD)	02	5,025.390	Improved weather forecast, riverine and flash flood forecast, Institutional weather early warning capabilities strengthening and increased satisfaction of end-users.
j.	Recharge Pakistan Project (MoWR + MoCC)	01	6,000.000	More than 10 million people will directly benefit, while 20 million people across 50 vulnerable districts of Pakistan will be the indirect beneficiaries.
k.	LiDAR Survey of flood plain areas of Indus River/its	01	779.900	Capture high resolution images alongwith accurate terrain information/ DEM i.e. base data for any type of flood modeling software and similar others.
l.	Hill Torrent Management Studies updation &	04	457.590	Improving Climate Resilience in Gilgit-Baltistan, Improving Climate Change Adaptation Capacity of Local Communities in Thar Desert etc.
m.	Federal Flood Commission	-	7,861.030	Project Coordination & Management Unit, office renovation (FFC's office building), Project Supervisory Consultants, and other key projects/studies on Urban flood control/ Rainwater Harvesting projects
Sub-Total (B)		**13**	**35,593.450**	
Grand Total (A+B)		**179**	**194,625.821**	

Table 3.5: Status of Budget Demanded and Allocated for Normal/ Emergent Flood Programme during 2010-11 to 2021-22

(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	855.533
5.	2014-15	5,000.000	1,000.000	1,000.000	898.477
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
Total		**83,236.516**	**11,034.798**	**8,362.227**	**6,323.452**

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

An amount of Rs. 1500.00 million was allocated under PSDP (2021-22) for Normal/ Emergent Flood Programme. Detailed list of schemes to be executed under Normal/ Emergent Flood Programme during Financial Years (2021-22) is attached as **Appendix-I.**

3.2.7 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 2021 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)
1.	**NFPP-I (1978-88)**			
i.	Normal Annual Development Programme GOP funded	Countrywide	311	1,730
		Sub-Total (NFPP-I)	*311*	*1,730*
2.	**NFPP-II (1988-98)**			
i.	Normal/Emergent Flood Programme	Countrywide	170	805
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
		Sub-Total (NFPP-II)	*436*	*6,153*
3.	**NFPP-III (1998-2008)**			
i.	Normal/Emergent Flood Programme	Countrywide	362	4,192.348

Sr. No.	Flood Plans/ Programs	Location	No. of Schemes	Expenditure (Rs Million)
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
	Sub-Total (NFPP-III)		*485*	*8,797*
4.	**Normal/Emergent Flood Programme**			
i	Normal/Emergent Flood Programme (2008-09 to 2021-22)	All over country	373	9,420
	Sub-Total (N/EFP)		373	**9,420**
Total (1+2+3+4)			**1588**	**26,100**
5.	**Flood Damages Restoration Projects**			
i.	1988-Flood Damage Restoration Project	Four Provinces	2,028	1,874
ii.	1992-Flood Damage Restoration Project	Countrywide	1,980	6,888
Grand Total			**4,008**	**8,762**

3.3 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/ DDMAs

Major functions of the above organizations are briefly described hereinafter:

3.3.1 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.

3.3.2 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.

3.3.3 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 DDMAs 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.

3.3.4 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, PDMAs & 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.

3.3.5 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).

3.3.6 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.

3.3.7 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.

3.3.8 Role of Federal Flood Commission in Flood Management

Pre-Monsoon Season Action Taken by FFC

- FFC chalks out pre-emptive measures for better flood management during monsoon season.
- For that purpose, Pre-Monsoon 2022 meeting of Federal Flood Commission was held on **15th March 2022** 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 2021 flood activities and preparatory works for Monsoon Season 2022. Accordingly, necessary directions regarding pre-emptive measures for Monsoon Season 2022 were issued to concerned organizations;
- 57th Annual meeting of FFC was organized on **7th June 2022** under the Chairmanship of Chief Engineering Advisor/ Chairman Federal Flood Commission, which 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 2022.
- Moreover, FFC organized a special meeting of stakeholders on **15th June 2022,** keeping in view PMD's 2022 Monsoon Seasonal Weather Outlook. The purpose of the meeting was to review the precautionary steps taken in the Provinces & Federal Line Agencies to combat 2022 Monsoon including their present state of preparedness.
- A follow up meeting was held on **30th June 2022** to deliberate on the preparatory arrangements made over and above those already reported by the Provinces/ Federal Line Agencies (FLAs) in the context of combating any flooding situation during Monsoon Season (MS) 2022.
- A special meeting of FFC was convened on **7th July 2022** in order to deliberate on the data sharing mechanism of Karot HPP with Mangla Dam Organization (MDO).
- An emergency meeting regarding Flood Management during the Monsoon-2022 was held on **22nd August 2022.**

- Monsoon Season 2022 Review meeting of Federal Flood Commission was held on **1st September 2022.**

Role of FFC during Monsoon Season

- Flood Communication Cell established in FFC started working on round the clock basis with effect from 15th June 2022 and worked on 24-hour basis during the entire Monsoon Season (15th June - 15th October 2022) 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, PDMAs, 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.;
- In addition to DFSRs, eleven (11) Press Releases, five (05) Weather Advisories, four (04) 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 prepared the list of flood protection schemes in consultation with Provincial Irrigation Departments and Federal Line Agencies and re-prioritized in light of budget allocated under PSDP i.e. **Rs 1500 million** allocated under PSDP (2021-22) for execution of urgent nature flood protection schemes through Normal/Emergent Flood Programme;
- 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. Four meetings of Scrutinizing Committee of FFC were organized on **28th February 2022, 18th March 2022, 4th November 2022,** and **1st December 2022**, wherein flood protection schemes were technically examined and recommended to Ministry of Water Resources for approval of DDWP.
- Two (02) meetings were organized by FFC for review of progress on implementation of flood projects under GOP funded Normal/Emergent Flood Programme.
- 14th Progress Review meeting of Federal Flood Commission was organized on **24th October 2022** to review the status of compliance of directions given by the Honourable Supreme Court of Pakistan on the recommendations of Flood Inquiry Commission regarding 2010- floods.
- Post Monsoon 2022 meeting of Federal Flood Commission (FFC) was held on **22nd November 2022**, 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.

- Site inspections of 12 No. flood protection schemes of Normal/Emergent Flood Programme were carried out by FFC's Monitoring Teams throughout the country.

3.3.9 Flood Warning Dissemination System

- Monsoon Season normally starts in 1st week of July (s*ometimes, 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 15th June every year for collecting weather & flood flow data and keep continue upto 15th 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.

3.4 Flood Preparedness & Contingency Planning for Monsoon Season 2022

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.

As per the annual practice, FFC holds meetings prior to start of Monsoon Season every year. As stated above, 57th Annual Meeting of FFC was organized on 7th June 2022 to review the arrangements made by the concerned organizations for flood management during Monsoon Season 2022. The contingency planning measures done by FFC for Monsoon Season 2022 hare been briefly mentioned under 3.3.8 above.

Further details with reference to FFC's coordination meetings held with federal and provincial stakeholder departments on flood preparedness are explained in the subsequent paragraphs.

3.4.1 13th Meeting of FFC to Review Progress on Honourable Supreme Court's Directions regarding Constitution Petition No. 62 of 2010

13th meeting of Federal Flood Commission (FFC) to review progress regarding Directions of Honourable Supreme Court of Pakistan related to Constitution Petition No. 62 of 2010, filed by Ms. Marvi Memon versus Federation of Pakistan was held on **20th January 2022**.

Following decisions were made in the meeting:

i. Installation of state of the art Weather Radars at Mangla, Lahore and Sialkot would be given top priority.

ii. PMD would make utmost efforts to further improve its coordination mechanism with WMO & SAARC countries for sharing the information regarding Early Weather Forecast and issuance of Flood Warning.

iii. PMD would submit a status report regarding its Flood Forecasting & Early Warning System (FEWS) position in 2010, improvement made till now and

Future Plans for further improvement within 30 days to FFC for consideration in the next Progress Review Meeting.

iv. PID Punjab & Sindh to share comprehensive report on all Barrages on regular basis indicating date of start & completion and activities carried out/being carried out on the projects till completion of projects.

v. All existing/ designated breaching sections be revisited by Punjab Irrigation Department for their operationality and need keeping in view the present site conditions besides identification of new breaching sections, if needed, at vulnerable locations as highlighted by Flood Inquiry Commission. The report may be submitted to FFC within 60 days for consideration in the next Progress Review Meeting.

vi. Pak Railways would send the PC-I of Left Guide Bund of Shershah Railway Bridge to Punjab Irrigation Department through its administrative Secretary and also share the same with FFC for consideration of Scrutinizing Committee.

vii. PID, Khyber Pakhtunkhwa to furnish details of O&M funds demanded / required, allocated, released & utilized during the financial years (2010-11 – 2019-20) and status of maintenance of flood protection infrastructure to FFC at the earliest.

viii. NHA to provide to FFC detailed updated progress report regarding 57 vulnerable sites identified by Consultants M/S NESPAK containing the sub-project wise recommendations and their status of implementation alongwith brief details of the scope and obligation of each sub-project.

ix. Irrigation Departments of Sindh, Balochistan, GB and AJ&K to vigorously pursue their cases with concerned authorities for early approval of River Act and submit latest status to FFC.

x. Irrigation Departments of the Punjab, Sindh, Khyber Pakhtunkhwa & Balochistan, GB-PWD and Agriculture, Livestock, Irrigation & ESMA, Government of AJ&K would share with SUPARCO under intimation of FFC, the details of encroachments, besides, those encroachments already removed on prescribed format already circulated among concerned organizations at the earliest.

xi. PDMAs, GBDMA & SDMA will take steps to remove encroachments in floodplains/ waterways along major and other rivers including hill torrents with the coordination of concerned District Administrations and submit report to FFC at the earliest.

xii. Upon receipt of information from Irrigation Departments, SUPARCO will carry out the verification of encroachments removed and those existing and submit report to FFC.

xiii. WAPDA to keep on providing progress on Munda/ Mohmand Dam Project to FFC on regular basis.

xiv. Forest Departments of four Provinces and Federally Administered Areas including Watershed Management Authorities of Mangla & Tarbela Dams Projects (WAPDA), will keep up their efforts and would regularly submit to FFC detailed progress made on watershed management/ afforestation promoting activities carried out so far in the catchment areas of rivers/hill torrents in order to check land sliding and excessive bed erosion, besides, flood mitigation.

xv. Irrigation Departments of Punjab, Khyber Pakhtunkhwa & Balochistan and Forest Department of Sindh Province to submit their views/ comments on PC-II for formulation of National Watershed Management Plan to FFC at the earliest.

xvi. PID, Punjab will provide to FFC on regular basis the updated progress on Construction of Hydro Power Station along right side of Taunsa Barrage.

xvii. WASA, in consultation with RDA, to share progress on construction of Lai Expressway with FFC on regular basis.

xviii. PID, Punjab to share updated status regarding Model Study of River Channelization for Ravi River Front Urban Project on regular basis.

xix. PID, Balochistan & G-B to share details about critical locations (including their number, nature of criticality/vulnerability) requiring attention and funds needed etc. to be shared with FFC by PIDs/FLAs.

xx. KMC & KDA to keep on sharing the progress regarding rehabilitation/up-gradation of storm drainage system of the city on regular basis until completion of the job.

xxi. PID, Sindh to keep on sharing latest updates to FFC on regular basis regarding Long term rehabilitation/ up-gradation works of LBOD and its allied components i.e. Dhora Poran water drains to Shakoor Dhund for further action.

xxii. WAPDA to furnish latest status of the approval of remaining PC-I of the project to FFC within a fortnight.

xxiii. WAPDA and PID Sindh to keep on sharing the progress about Rainee Canal on regular basis to FFC.

3.4.2 4th Progress Review Meeting regarding Normal/ Emergent Flood Programme for Financial Year (2021-22) held on February 15, 2022

4th Progress Review Meeting regarding Normal/Emergent Flood Programme for Financial Year (2021-22) was held on **February 15, 2022**.

Following decisions were made in the meeting:

i. PIDs & FLAs to submit request for obtaining extension in execution period of all those flood protection schemes of previous years, which could not be completed within the target period given in the approved PC-Is on the prescribed proforma of Planning Commission at the earliest, for obtaining approval from Ministry of Water Resources.

ii. PID Punjab and Khyber Pakhtunkhwa to complete the ongoing schemes at the earliest possible time and completion reports (on prescribed PC-IV proforma) may be submitted to FFC soon after completion of works for taking further action in the matter.

iii. PIDs & FLAs to submit to Federal Flood Commission, the utilization account of funds released during previous five (5) years (2015-16 to 2019-20) without further delay, for taking further action in the matter.

iv. The utilization of funds of Rs. 248.978 million is still pending by PID Punjab. If PID Punjab cannot utilize the available balance of outstanding amount, then the funds would be adjusted through federal adjuster after the approval of Competent Forum.

v. FFC to write letter to Finance Department, Government of Khyber Pakhtunkhwa for the revalidation of funds amounting to Rs. 47.500 million.

vi. FFC to prepare and submit position paper for the CDWP through MoWR highlighting the issue of non-utilization of released funds during previous financial years by PID Punjab for its settlement.

vii. PID Balochistan to refund the un-spent funds of Rs. 5.854 million to the federal government, if it is unable to utilize the said funds on implementation of approved schemes, taken up under Normal/ Emergent Flood Programme.

viii. PIDs & FLAs to strictly follow the implementation schedule of Normal/ Emergent Flood Programme, which was approved by ECNEC on 27th July 2004, as given below;

Sr. No.	Activity	Scheduled time
i.	Finalization of priority works in consultation with the Provinces/ Federal line Agencies and Pak Army after allocation of funds under PSDP.	End of August and as a special case by end of September
iii.	Preparation of PC-Is of schemes their clearance by PDWPs, Scrutinizing Committee of Federal Flood Commission and approval from DDWP/ CDWP	Before/ By 31st October and exceptional cases by 30th November each year
iv.	Execution of works	October/ November to April-May each year

ix. FFC will submit to MoWR the proposal for re-appropriation of Rs. 403.773 million (as per distribution given in Para-13 above) from PID Punjab share for approval of competent authority.

x. Meanwhile, five (5) No. schemes (Khyber Pakhtunkhwa=3 under one PC-I, Balochistan = 1 & Gilgit-Baltistan = 1) would be processed on immediate basis for consideration of Scrutinizing Committee of FFC and DDWP of Ministry of Water Resources so that the same could be approved and started as early as possible.

xi. PID Sindh, Khyber Pakhtunkhwa & Balochistan and GB-PWD will ensure in written that they will complete their schemes (taken up through saving account) before 30th June 2022.

xii. PIDs & FLAs to submit demand for release of budget allocated under PSDP (2021-22) alongwith other necessary documents to FFC without further delay for further processing of the case.

xiii. PIDs & FLAs to submit to FFC Project Completion Reports (PCRs) of flood protection schemes carried out during (2007-08) to (2019-20) under Normal/ Emergent Flood Programme on prescribed PC-IV Proforma (in triplicate) alongwith as built drawings, X-sections & coloured site pictures for further action.

3.4.3 Preparatory Meeting of FFC held on 15th March 2022

FFC chalks out pre-emptive measures for better flood management during monsoon season each year, which are circulated amongst all stakeholders for taking further

action at their end. For that purpose, a preparatory meeting of Federal Flood Commission was held on **15th March 2022** in order to review the progress on post 2021 flood activities and preparatory works for Monsoon Season 2022. Accordingly, following necessary directions regarding pre-emptive measures for Monsoon Season 2022 were issued to PIDs/Federal Line Agencies, WAPDA, PMD & other concerned agencies etc.:

i. **Provincial Irrigation Departments & Federal Line Agencies** to ensure completion of all approved and ongoing flood protection schemes taken up under Provincial ADP and Normal/ Emergent Flood Programme, besides, rehabilitation and Flood Damages Restoration Works including O&M works related to Barrages/Head Works/Bridges, Irrigation, Drainage and Flood Protection Infrastructure well before the start of 2022 Monsoon Season.

ii. **Provincial Irrigation Departments of Sindh, Balochistan, G-B & AJ&K** to pursue the matter with respective Provincial Authorities regarding approval and enactment of River Act (Draft prepared by FFC) for flood plains regulation i.e. removal of existing encroachments and restricting new settlements in the flood plains. The progress on the case to be shared with FFC on regular basis. PIDs/FLAs to ensure the approval of River Act and its enactment before 30th June 2022.

iii. **PIDs & FLAs** to ensure removal of encroachments from flood plains/ High Risk Zones, waterways of major and other rivers including Hill Torrents/ Flood Flow generating nullahs, which are under the threat of flood waters and also causing hindrance in flood flows. The progress on the job would be submitted to FFC on monthly basis till completion of the task. The entire exercise be completed well before the start of Monsoon Season 2022.

iv. **PIDs & FLAs** to initiate the case for opening a separate Assignment Account for implementation of Normal/ Emergent Flood Programme for smooth transfer of funds to the Project Authorities. Efforts may be made to open the accounts by/ before 30th June 2022.

v. **PIDs** to expedite efforts with respect to Revision in Flood Limits of their respective Barrages/ Head Works/ Bridges falling in their jurisdictions in view of changing ground realities. The exercise may be completed before 30th June 2022.

vi. **PID Khyber Pakhtunkhwa** to share revised/ updated limits of their rivers with all the stakeholders including FFC, PMD & PID Punjab.

vii. **PID, Punjab** to conduct study on need of existing as well as additional needed (at critical locations) Breaching Sections in Punjab on fast track basis. The exercise may be completed before 30th June 2022.

viii. **Irrigation & Agriculture Department, Government of AJ&K** to complete the rehabilitation works and submit status report before 30th June 2022.

ix. **PMD** to ensure procurement & installation of the Weather Radar at D.I. Khan as per approved Implementation Plan.

x. **Mangla Dam Organization (MDO)** would prepare draft Contingency Plan by 31st March 2022 for discussion in the special meeting with regards to safe passage of surplus flood water through Emergency Spillway of Barakas Nullah in case of emergency situation.

xi. Based on Contingency Plan prepared by **MDO**, a special meeting on Barakas Nullah would be held around 10th April 2022.

xii. **Rawalpindi District Administration** to ensure removal of encroachments from the banks/ bed of Lai Nullah at the earliest.

xiii. **Pak Railways** to ensure the execution of Left Guide Bund of Shershah Railway Bridge across River Chenab in District Multan at the earliest.

xiv. **PID, Punjab and NHA** to facilitate Pak Railways in design work/ preparation of PC-I. Pak Railways to ensure execution of work before 30th June 2022.

xv. **WAPDA** to take action on the decisions reflected in the minutes of the 2nd meeting of High Level Barakas Nullah Committee without any loss of time.

xvi. **WAPDA** to ensure that the 2nd Revised PC-I of Mangla Dam Raising Project got approved by/ before 31st March 2022.

xvii. **Provincial Governments** to provide list of encroachments removed alongwith proper coordinates to SUPARCO for analysis & verification of encroachments removed from the waterways & flood plains of rivers.

xviii. **PCIW Office** to take up the agenda of timely provision of advance flood flows information of River Chenab and Eastern Rivers with the ICIW in the next Permanent Indus Commission meeting.

xix. **PCIW office** to make all the necessary arrangements for gathering information of River Chenab and Eastern Rivers from India as per practice in vogue and share the same with PMD/ FFD, Lahore

xx. **PMD** to submit its PC-Is under Flood Protection Sector Project –III (FPSP-III) to FFC at the earliest.

3.4.4 Flood Communication Cell of FFC

The Flood Communication Cell of Federal Flood Commission started functioning on round-the-clock basis from 15th June 2022 till end Monsoon Season (15th October 2022) for collection, compilation rainfall, rivers flow data and reservoir water levels and its transmission to concerned agencies at Federal and Provincial Government level on 24 hours/daily basis in normal/ low flood stage and 6-hourly basis in case of high flood levels in main rivers. For that purpose, FFC issued daily flood situation report containing weather situation, reservoir and rivers flood data at important control structures through its Flood Communication Cell till end of Monsoon Season 2022.

3.4.5 57th Annual Meeting of FFC (07thJune 2022)

The 57thAnnual Meeting of Federal Flood Commission was held on **07th June 2022** under the Chairmanship of CEA & CFFC Islamabad, in order to review the status of preparedness of the Provinces & Federal Line Agencies for Monsoon Season 2022. The following directions were given to PIDs/ Federal Line Agencies, WAPDA, WASA & PMD etc.:

i. **Federal Flood Commission** to write D.O. letters to Chief Secretaries of Sindh, Balochistan, G-B and AJ& K for early approval and enforcement of Flood Plain Management/ River Act ensuring removal of existing settlements in river flood plains/ water ways and placing restrictions on future encroachments.

ii. Federal Flood Commission to write D.O. letters to Chief Executive (IESCO, LESCO and KESC) on power supply issue of PMD, Islamabad, FFD, Lahore and PMD Regional Met. Centre, Karachi.

iii. **Provincial Irrigation Departments (PIDs) & Federal Line Agencies (FLAs-GB, AJ&K, Merged Area)**:

(a) To ensure completion of all ongoing flood protection schemes taken-up under Provincial ADP & Federal PSDP, besides, strengthening/ rehabilitation works of all critical reaches including Operation & Maintenance (O&M) works related to Barrages/ Head-works/ Bridges at the earliest.

(b) To ensure early submission of their respective priority lists and PC-Is of need based flood protection projects proposed under Normal/ Emergent Flood Programme of PSDP (2022-23) to FFC within July 2022 (not beyond July 2022) so that their technical clearance from Scrutinizing Committee of FFC is completed well within November 2022 for their final approval of DDWP/ CDWP and issuance of Administrative Approval.

(c) To remain vigilant and ensure Round-the-Clock patrolling of flood protection infrastructure, especially vulnerable sections of embankments as identified by the PIDs, besides, operation of dams and Barrages/ Headworks as per existing SOPs.

(d) To aggressively follow the case with concerned quarters for early approval of River Flood Plains Management Act and its enactment and preparation of necessary regulatory framework for removal of existing encroachments and restricting new settlements in the waterways/ flood plains of major & other rivers.

(e) For all those barrages & head-works of Punjab, which have been rehabilitated with increased design capacities, Punjab Irrigation Department to circulate the revised design capacities of its barrages to all the stakeholders including FFC.

(f) PID Punjab to carry out an in-house technical study to review the existing Flood Classification of Eastern Rivers in the Punjab and update. Efforts be made to complete the entire exercise at the earliest since Monsoon Season 2022 is approaching fast, and the compliance status be shared with all the stakeholders including FFC.

(g) PID Punjab to take up a desk study on need of existing as well as additional (at critical locations) Breaching Sections in Punjab on fast track basis. The feasibility study is to be finalized in consultation with Pak Railways and NHA in the wake of improvement in barrage capacity and construction of new communication lines. Efforts be made to complete the entire exercise at the earliest since Monsoon Season 2022 is approaching fast, and the compliance status be shared with all the stakeholders including FFC.

(h) PID Khyber Pakhtunkhwa to share revised/ updated limits of rivers in Khyber Pakhtunkhwa with all the stakeholders including FFC, PMD & PID Punjab.

(i) PIDs and FLAs (GB, AJ&K, PMD, WAPDA, NDMA, MoCC etc.) to submit their respective final lists of sub-projects under Ready-to-

Implement Portfolio of FPSP-III at the earliest preferably within 25th June 2022 to FFC.

(j) PIDs and FLAs (GB, AJ&K, PMD, WAPDA, NDMA, MoCC etc.) to submit PC-Is of the sub-projects under Sr. No. 1 above by 15thJuly 2022, to FFC for further processing.

iv. **PMD:**

(a) To ensure completion of all essential repairs/maintenance of equipment relating to Flood Forecasting & Warning System.

(b) To formally share its viewpoint on keeping in view the D.I. Khan Weather Radar Project present pace of progress.

(c) 100 percent functionality of all existing weather radars shall be ensured by PMD.

(d) To ensure effective use of FEWS computer model and the IFAS model towards better and precise runoff information, flood forecasting.

(e) FFD, Lahore, to ensure its best efforts for an early issuance of daily Bulletins (A&B) preferably by 0930 hours daily morning during the Monsoon Season 2022.

(f) For all purposes, only FFD, Lahore/PMD-Islamabad shall give official point of view, update, assessment etc. on past, existing and future meteorological conditions and the likely impacts.

(g) To submit duly corrected PC-Is of its four (04) projects under FPSP-III to FFC besides on NDRMF Format to FFC latest by July 15, 2022 for further action.

v. **Pakistan Railways** to ensure the approval and subsequent execution of Left Guide Bund of Shershah Railway Bridge across River Chenab in District Multan at the earliest.

vi. **PDMAs/ SDMA & GB-DMA**

(a) To ensure removal of encroachments from flood plains/waterways causing hindrance in flood flows with the help of concerned districts administrations. The compliance report be submitted to FFC on regular basis till completion of the task.

(b) To submit to FFC hard & soft copies of the relevant Contingency Plans prepared for Monsoon Season 2022 for official use and uploading on its website.

(c) To ensure proper and effective coordination with concerned district administrations and WASAs/ Municipal Corporations in order to ensure

that all necessary arrangements were put in place for effective management of Urban Floods, Flash Floods & GLOFs etc.

(d) PDMA Khyber Pakhtunkhwa will inform FFC in writing whether they are interested in implementation of some components from its Early Warning System Proposal through NDRMF facility of US$ 3.5 million or not**.** If yes, requisite PC-I including on NDRMF format shall be submitted by PDMA-Khyber Pakhtunkhwa to FFC within June 25, 2022 for further action.

(e) PDMA-Balochistan and PDMA Sindh to share details of equipment proposed for procurement possibly through NDRMF.

vii. **PID Punjab including NHA, Pak Railways to ensure:**

(a) Complete clearance/ cleaning of the silted up bays of Barrages/ Bridges.

(b) Arrangements of explosive and related/ required material at sites of pre-determined breaching sections.

(c) Arrangement of stone reserve stock/ flood fighting material at all critical reaches of flood embankments based on the sites identified as a result of pre-flood inspections carried out before the start of Monsoon Season 2022.

viii. **PCIW**:

(a) To ensure continuity of all necessary arrangements for obtaining reservoirs/rivers flows data and other information from Indian Counterpart (ICIW), as well as through its own efforts on River Chenab and Eastern Rivers during Monsoon Season 2022 and its timely transmission to all stakeholders especially to FFD, Lahore for preparation of daily flood forecast including significant flood forecast in case of any high flows from upstream riparian in river Chenab and eastern rivers.

(b) O/o PCIW shall exercise all possible efforts to ensure availability of authentic, reliable and real time cross border data (River Chenab and Eastern Rivers) to FFD, Lahore.

ix. **WAPDA:**

(a) To expedite action on inclusion of Barakas Nullah (BN) Rehabilitation Works in 2nd Revised PC-I of Mangla Dam Raising Project (MDRP) and its approval from concerned fora at the earliest so that implementation is commenced accordingly.

(b) To operate the Tarbela Dam as per SOPs, based on the latest Periodic Inspection, for filling of reservoir beyond elevation 1510 feet during Monsoon-2022.

(c) To ensure conducting mock exercise at Mangla Dam as per approved SOPs as and when the desired level of 1220 SPD is achieved.

(d) To ensure that Contingency Plan prepared in consultation with HQ Engineers 1 Corps (Mangla Garrison) regarding Emergency Spillway/ Barakas Nullah is implemented for safe passage of surplus water.

(e) To ensure 100% workability of existing flood telemetry system on a countrywide basis ensuring availability of related information to FFD/PMD on a real time basis for precise forecast generation and dissemination.

(f) To ensure the activation and operation of Flood Management Committee (FMC) in line with its ToRs.

(g) To ensure an early submission of its all PC-Is to FFC under FPSP-III Ready-to-Implement Portfolio, preferably within early July 2022 besides submission of their details on NDRMF format already shared by FFC with WAPDA.

x. **SUPARCO** to share its Flood Watch Report/ Rivers monitoring report with PCIW, PMD/ FFD, Lahore, FFC and other concerned organizations on daily basis for effective use in flood management activities. Event based outcomes of any of the major/extreme flood event shall be shared with FFC for incorporation in FFC's daily reports and for further coordination with relevant department(s)/agency/ies for early restoration/rehabilitation of damages.

xi. Karachi Water & Sewerage Board (KW&SB), (WASA) MCs of all major cities-Punjab (Lahore, Sialkot, Gujranwala, Faisalabad, Sargodha, Multan, Rawalpindi etc.), Sindh (Karachi, Hyderabad, Sukkur, Thatta, Jacobabad, Shikarpur, Kashmore etc.), Khyber Pakhtunkhwa (Peshawar, Mardan, D.I. Khan, Nowshera, Charsadda etc.), Balochistan (Quetta, sibi, Nasirabad, Jaffarabad, Dera Allah Yar etc.).

a) To ensure regular cleaning and clearance of all main sewer lines, storm drains etc. within the respective city by removal of debris, solid waste etc. for unhindered flow of rain/storm water for ease of civic life and to avoid urban flooding/drainage issues.

b) Installing sizeable number of dewatering pumps, flood fighting machinery etc. fully operational to combed rain induced urban flooding.

xii. **WASA Rawalpindi** to complete all necessary desilting works of critical sections of Lai Nullah by 30th June 2022 and submit report to FFC by July 10, 2022.

xiii. **477 Army Survey Group** to share its proposal on river Chenab alongwith recommendations for implementation and use of LiDAR for effective flood risk management under the overall umbrella of NFPP-IV.

3.4.6 FFC's Special Meeting on Pre-Monsoon Rains (15th June 2022)

Keeping in view PMD's 2022 Monsoon Seasonal Weather Outlook, dated **7th June 2022**, a meeting was held on **15th June 2022** in the Committee Room of WAPDA's Mega Hydel Complex, Islamabad. The purpose of the meeting was to review the precautionary steps taken in the Provinces & Federal Line Agencies to combat 2022 Monsoon including their present state of preparedness. Secretary, Ministry of Water Resources chaired the meeting and gave following directions to the stakeholders:

(i) **Ministry of Water Resources (MoWR)** will write D.O letters to Power Division, Ministry of Energy for provision of uninterrupted power supply to PMD's at its HQ Islamabad, FFD, Lahore and Regional Center, Karachi during the entire Monsoon Season-2022 to avoid any untoward situation which may develop potentially due to non-availability of Radar's inputs in PMD's forecasts owing to interruptions in power supply.

(ii) **MoWR** will approach Ministry of PD&SI for an early approval of 2nd Revised PC-I of Mangla Dam Raising Project (MDRP) including rehabilitation works of Barakas Nullah for their early implementation. MoWR will also approach Government of the Punjab, Military Operation Directorate for effective enforcement of Contingency Plan in the absence of surplus discharge of flood water through Barakas Nullah.

(iii) **Provincial Irrigation Departments** to ensure the availability and use of District Level Submergence/ Inundation Maps during the upcoming Monsoon Season 2022 besides adding the vulnerable points lying in the jurisdiction of the respective provinces.

(iv) **MoWR** will approach Aviation Division for up-gradation of Sialkot Weather Radar on priority and backup power supply arrangements for PMD's Forecasting centers for uninterrupted supply during Monsoon Season.

(v) **Provinces/ Federal Line Agencies (FLAs)** shall ensure removal of encroachments from the floodplains using available legal framework of Irrigation and Drainage Act 1877 until approval and enactment of their individual River Acts. Provinces to consider use of LiDAR facilities of Pak Army for survey of river floodplains.

(vi) **Provinces/ FLAs, PDMAs/ DDMAs** to give due consideration to the issue of combating urban flooding while preparing the Contingency Plan for Monsoon Season-2022.

(vii) **MoWR** will approach Chief Secretary AJ&K for arrangement of funds from ADP for restoration of flood protection works at Bararkot which was executed through Federal PSDP.

(viii) **MoWR** will approach National Disaster Risk Management Fund (NDRMF) for the approval of pending flood related projects including their financing.

(ix) **WASA, Rawalpindi** should ensure to earmark adequate funds for O&M of Flood Early Warning System of Lai Nullah installed through JICA under Grant-in-Aid.

(x) Joint Secretary (Water), Ministry of Water Resources, CEA/ CFFC, representatives of WAPDA & GHQ will visit the Control Room of NDMA to determine as to how that facility can be better linked with the FFC to manage floods.

(xi) **MoWR** will approach Ministry of Communication for taking necessary actions regarding vulnerable points/ locations on the NHA bridge sites on major rivers for safe passage of floods.

(xii) **MoWR** to approach Ministry of Railways for the provision of funds to purchase explosives meant for activation of pre-determined breaching sections at vulnerable locations of Pak. Railway bridges in case of emergency.

(xiii) **MoWR/FFC** will organize another meeting within next 15 days (if needed) for further deliberations on the preparatory arrangements made by the Provinces/

FLAs in the context of combating any flooding situation during Monsoon Season-2022. Higher level participations from the provinces is much desired and hence expected for precise and accurate decisions.

3.4.7 FFC's Pre-Monsoon Rains Follow-up Meeting (30th June 2022)

FFC organized a follow up meeting of stakeholders on **30th June 2022** to deliberate on the preparatory arrangements made over and above those already reported by the Provinces/ Federal Line Agencies (FLAs) during 57th meeting of FFC (June 07, 2022) and June 15, 2022 meeting of Ministry of Water Resources in the context of combating any flooding situation during Monsoon Season (MS) 2022. Following decisions were made:

i. **PIDs/FLAs/NDMA/PMDA/DDMAs** to ensure the compliance of decisions taken in the 57th Annual meeting of FFC held on **7th June 2022** for better management of Monsoon Season-2022.

ii. **WAPDA**

a) To operate the Tarbela Dam as per SOPs, for filling of reservoir beyond elevation 1510 feet during Monsoon-2022.

b) To ensure conducting mock exercise at Mangla Dam as per approved SOPs as and when the desired level of 1220 SPD is achieved.

c) To ensure that Contingency Plan prepared in consultation with HQ Engineers 1 Corps (Mangla Garrison) regarding Emergency Spillway/Barakas Nullah is implemented for safe passage of surplus water during Monsoon-2022.

d) To ensure the activation and operation of Flood Management Committee (FMC) in line with its ToRs as per approved SOPs.

e) To share on Top Priority basis latest status with FFC regarding data sharing mechanism of those stations of Mangla Dam Project which have been submerged as a consequence of construction of Karot & Gulper Hydropower Projects and for which the existing stations (Azad Pattan) and (Kotli) have been shifted to Tain Dhalkot Bridge and Talhair Bridge respectively.

iii. **PID Punjab** to share the compliance status regarding review of existing flood classification of eastern rivers with all the stakeholders including FFC.

iv. **PID Sindh** to share the progress on Gujjar Nullah desilting alongwith works on Malir & Korangee Nullahs.

v. **PID Sindh** to consider the establishment/ formation of a Regulatory Framework for monitoring of nullahs in Karachi.

vi. **PID Khyber Pakhtunkhwa** to share revised/ updated flood limits of rivers in Khyber Pakhtunkhwa with all the stakeholders including FFC, PMD & PID Punjab.

vii. **PID Sindh & Balochistan, GB-PWD and Irrigation and Small Dams of AJ&K t**o aggressively pursue their case with concerned quarters for early approval and enactment of River Act.

viii. **O/o PCIW** will exercise all possible efforts for obtaining cross border reservoirs/ rivers flows data (River Chenab and Eastern Rivers) for onward

transmission to FFD, Lahore for flood forecast generation besides to all other related stakeholders.

ix. **PIDs and FLAs** (GB, AJ&K, PMD, WAPDA, NDMA, MoCC etc.) to submit their respective final lists of sub-projects under Ready-to-Implement Portfolio of FPSP-III and their PC-Is within **15th July 2022**, to FFC for further necessary action.

x. **WASA, Rawalpindi** to ensure early completion of dredging work on eleven (11) nullahs/ tributaries of Lai Nullah under intimation to all concerned including FFC.

xi. **O/o CEA/ CFFC** to look into the possibility of linkage of Flood Communication Cell of FFC with Control Room of NDMA besides with WAPDA, PMD/FFD, PIDs, PDMAs etc. for better coordination particularly during monsoon season in general round the year. For an early action, FFC to look into the possibility of revamping its Flood Communication Cell (FCC) through some support of donors (ADB etc.) by Technical Assistance arrangements.

xii. **Dam management authorities of Khanpur, Rawal & Simly Dams** to share SOPs regarding flood management including sharing of data during entire monsoon season on daily basis with all concerned stakeholders including FFC.

3.4.8 FFC's Special Meeting on Karot HPP (07th July 2022)

A special meeting of FFC was convened on **July 07, 2022** in the WAPDA's Mega Hydel Complex, Islamabad in order to deliberate on the data sharing mechanism of Karot HPP with Mangla Dam Organization (MDO) and miscellaneous Flood Management related issues in the context of combating any flooding situation during Monsoon. After detailed discussions, a comprehensive Cooperation Mechanism for Data Sharing between Karot HPP and MDO-WAPDA regarding Flood Management at Mangla Dam was agreed during the meeting, as explained in ensuing paragraphs.

<u>Cooperation Mechanism for Data Sharing between Karot HPP and MDO-WAPDA Regarding Flood Management at Mangla Dam</u>

Regular data sharing between KHPP and Mangla Dam Organization (MDO) is essential for national cause of flood mitigation to save lives and properties downstream of Mangla Dam as per following:

i) Regarding sharing of data following timings were agreed between KHPP and WAPDA:

- In normal situation throughout the year, data will be shared two times daily (i.e. at 0600 Hrs in the morning and at 1800 Hrs in the evening) by KHPP with Mangla Dam Project.
- During Flood in Monsoon Season (minimum outflows from KHPP > 2100 Cusecs or 75,000 Cusecs)/ Emergency Situation hourly inflow, outflow and level data of KHPP will be shared by KHPP with WAPDA-Mangla Dam Project authority till end of Emergency Situation, in addition to similar situation any time during the currency of the year.
- The data may be served at following simple format:

Date:	05.07.2022
Time:	0600 Hrs
Reservoir Level:	ft and m
Tail Water Level:	ft and m
Inflow:	cfs and m^3/s
Outflow:	cfs and m^3/s

ii) Data will be shared through easy to use platforms such as:
- Whatsapp Groups
- Landline Numbers
- Wireless
- Email Mode
- Website

iii) Both sides have nominated and shared details of focal persons and contact numbers of control rooms for better coordination by Karot HPP and MDO as below:

Mangla Dam Project

Mr. Abdul Majid Ch.	Superintending Engineer (Hydrology) WAPDA Mangla Dam Project
Contact No.	0544-671354, 0343-0590519
Mr. Kelash Kumar	Junior Engineer (Hydrology) WAPDA Mangla Dam Project
Contact No.	0544-671353, 0333-7127099
Control Room Numbers	0544-639005, 0544-639209, 0544-671353

Karot Hydropower Plant Project

Mr. Aftab Alam	Sr. Manager (Safety), Karot Power Co. Ltd.
Contact No.	0317-5777265, 0345-9486677
Mr. Zulqarnain	Operation Engineer (Karot HPP)
Contact No.	0342-4576636
Control Room No.	0310-5666605

iv) KHPP will share all the documents (in English Language) related to releases/hydrology of the KHPP. These documents need to cover all aspects of KHPP that may affect Mangla Dam Project in any way and will be shared well within July-2022.

v) KHPP will issue Spillway Operation Warning to Mangla Dam Project Authority as per Sr. No. (ii) Above, for releases beyond normal KHPP power station releases/unit generation flow. The Warning will contain time and quantum of water to be released towards Mangla Dam Project.

vi) Dam Safety Organization of WAPDA and Dam Safety Council, O/o CEA/CFFC-MoWR may offer their technical reviews for annual and periodic inspection of KHPP to ensure its safety as per guidelines of International Commission on Large Dams (ICOLD) as per reports/program provided by KHPP.

vii) WAPDA-Mangla Dam Project authority will share available data of Chattar Klass Flood Warning Station with KHPP which includes the flows from Neelum Jhelum

Hydropower Project, to facilitate KHPP with respect to hydrological perspective and inflow warning from Jhelum River as per availability with WAPDA with special consideration of KHPP data requirements.

3.4.9 Meeting regarding Finalization of Portfolio of Ready-To-Implement Sub-Projects out of FPSP-III for Financing through NDRMF (July 22, 2022)

A joint meeting of Federal Flood Commission, National Disaster Risk Management Fund (NDRMF), and relevant stakeholders i.e. Provincial Irrigation Departments of the Punjab, Sindh, Khyber Pakhtunkhwa, Balochistan & FLAs (PMD & WAPDA) was held on **22nd July 2022**. The purpose of the meeting was to finalize the portfolio of Ready-to-Implement sub-projects under Flood Protection Sector Project-III (FPSP-III) for financing through NDRMF.

After detailed discussion the following decisions were taken:

i. PIDs (Punjab & Sindh) and PMD will submit remaining PC-Is of Ready-to-Implement sub-projects of FPSP-III within **15th August 2022**.

ii. PID Balochistan &FLA (Merged Area Khyber Pakhtunkhwa) will submit list alongwith PC-Is of Ready-to-Implement sub-projects of FPSP-III preferably by **15th August 2022**.

iii. WAPDA will submit PC-I for Flood Telemetry Network to FFC & NDRMF within one week's time for technical scrutiny.

iv. NDRMF will share schedule for joint field investigation/technical appraisal within one week's time to FFC so that further process be taken accordingly.

3.4.10 Meeting on Flood Management for Monsoon 2022 held on August 15, 2022 in PMD Headquarters, Islamabad (15th August 2022)

An urgent meeting of relevant stakeholders was held on **15th August 2022** in Pakistan Meteorological Department (PMD) Headquarters, Islamabad jointly chaired by Chief Engineering Advisor/ Chairman Federal Flood Commission and Director General, PMD. After detailed discussion following were mutually agreed:

(i) For efficient operation of reservoirs, manipulation of extra discharge via off-taking canals be considered to avoid flood synchronization in the Indus River System.

(ii) Keeping in view the SOPs of Tarbela Dam, filling of Tarbela dam reservoir is the responsibility of Tarbela Dam Management Committee. The issue shall be discussed with GM-Tarbela for their information and consideration viz-a-viz the approved SOPs.

(iii) PMD to provide 10-dayadvance weather forecast for Tarbela upstream, for Hill Torrent areas of D.G. Khan & Rajanpur District of Punjab and for the Indian side for future flood management purposes.

(iv) PID Punjab &PDMA Punjab to exercise maximum vigilance to ensure safe passage of river flood flows and the safety of communities, public & private property including irrigation and flood protection infrastructure etc. Additionally:

a) All concerned Chief Engineers of Irrigation Department, Government of the Punjab shall take necessary precautionary measures for safe

passage of flood flows in line with contingency plans of their respective irrigation zones in view of PMD's forecast as well as releases of flood flows from Indian side.

b) PDMA Punjab including all related DDMAs will ensure all necessary precautionary measures well in time with respect to their contingency plans prepared to avoid loss of precious human lives and damages to public & private properties.

3.4.11 FFC's Special Meeting on Flood Management during Monsoon-2022 (22nd August 2022)

A special meeting of FFC regarding Flood Management during the Monsoon-2022 was held on **22nd August 2022** in the Committee Room of O/o CEA/ CFFC, Islamabad under the chairmanship of Chief Engineering Adviser & Chairman, Federal Flood Commission. Following decisions were taken:

(i) PMD to issue Exclusive Weather & Flood Forecast for catchments of River Indus (upstream Tarbela) and River Kabul to FFC, IRSA & WAPDA (Tarbela & Chashma Management authorities) for 24 hours, 72 hours and for 7-days (August 31, 2022) for better management of flood flows at Tarbela Dam to avoid any situation at Taunsa.

(ii) PIDs/ FLAs to ensure round-the-clock patrolling of all embankments and vulnerable locations during the rest of the period of the current Monsoon in order to save human lives and public & private properties from flood flows.

(iii) PIDs/ FLAs to ensure effective implementation of Contingency Plan regarding flood fighting during rest of current Monsoon Season.

(iv) For regulations of high flows in eastern rivers and in River Chenab, Punjab Irrigation Department shall use off-taking canals from the respective barrages so that the main thrust including synchronizations of flood peaks could be avoided at Guddu Barrage.

(v) PID Punjab to share the details of study in progress on management of D.G. Khan hill torrents with FFC.

(vi) PIDs/ FLAs to submit details of damages to irrigation, flood protection infrastructure and restoration cost and plans to FFC on an immediate basis for the appraisal of higher authorities.

(vii) Tarbela Dam Authorities, WAPDA, should do close liaison with PMD and IRSA for better management of flood flows and regulation of the reservoir in accordance with the SOPs.

(viii) WAPDA will start work on the restoration of CRBC immediately under intimation to all concerned including FFC.

(ix) Tarbela Dam Authorities, WAPDA, will continue to operate the reservoir as per existing SOPs ensuring maximum possible flood mitigation through routing of inflows coming into the reservoir. Further Tarbela Dam Management to take utmost care, exercise extra vigilance in reservoir operation, and ensure realistic dam regulation with a view to manage high flows from Kabul and to reduce inflows at Taunsa.

(x) Pakistan Meteorological Department will provide more accurate and precise forecasting for catchments areas of Kabul, Indus and D.G Khan hill torrents and will also strengthen quantitative forecasting of flood flows for hill torrent areas of D.G Khan.

(xi) PCIW ensure close liaison with the ICIW and shall immediately transmit flood flows/ data to the concerned quarters more accurately and precisely.

(xii) IRSA and WAPDA to utilize maximum indents from River Indus and ensure maximum storage in Mangla Dam.

3.4.12 1st Meeting of Technical Committee on MoWR related SDG Indicators

The 1st meeting of the Technical Committee on Water Sector related SDG Indicators was held on **22nd August 2022.** Following decisions were made:

(i) O/o CEA/CFFC will take up the matter with the Pakistan Water Partnership (PWP) with regard to ascertain the necessity for carrying out again a "National Survey on SDG Indicator 6.5:1: PWP will review and submit their Feedback/ Work Plan with regard to arranging obligatory stakeholder Consultation in this regard".

(ii) O/o PCIW will act as Focal Point organization on SDG Indicator 6.5.2 to review drat input already prepared by O/o CEA/CFFC on SDG-Indicator 6.5.2 and submit to O/O CEA/CFFC the final report, at the earliest for further action.

(iii) Agriculture Department, Government Sindh shall be the Focal Point on SDG Indicator 6.4.1 to coordinate with concerned organizations, review the methodology set by FAO regarding reporting implementation status of SDG Indicator 6.4.1 and submit to O/o CEA/CFFC. "Workable Action Plan with timelines" for evaluation and finalization of baseline regarding implementation of this SDG indicator in Pakistan.

(iv) WAPDA shall act as Focal Point on SDG Indicator 6.4.2 to review the methodology set by FAO regarding reporting the implementation status of SDG Indicator 6.4.2 and submit a "Workable Action Plan with timelines" in order to evaluate and finalize baseline with regard to implementation status of this SDG indicator in Pakistan.

(v) PCRWR shall be the Focal Point on SDGs Indicators 6.3.2 & 6.6.1 to review the methodology set by-UNEP regarding reporting the implementation status of SDGs Indicators 6.3.2 & 6.6.1 and submit to O/o CEA/CFFC a "Workable Action Plan with timelines" with timelines, to evaluate and finalize the baselines of these SDG Indicators will be in Pakistan.

(vi) O/o CEA/CFFC (National Focal Point) will maintain a close liaison with the Federal SDGs Unit of PD&SI Division regarding accomplishment of the task for determining baselines i.e. implementation status of water sector related SDG Indicators in Pakistan.

(vii) Ministry of Climate Change, Irrigation and Public Health Engineering Departments Govt. of Khyber Pakhtunkhwa, Agriculture & Public Health Engineering Departments of Sindh and Public Health Engineering Department of Balochistan including WAPDA & Public Health Department, Government of Punjab, will nominate suitable officer well versed with the SDGs to act as "Nominative Member" of the Committee: contact details of the nominated officer will be submitted to O/o CEA/CFFC within a week time.

3.4.13 FFC's July-August 2022 Monsoon Review Meeting

The Monsoon Season 2022 (July-August period) review meeting of Federal Flood Commission was held on **1st September 2022.** Decisions made in the meeting are as follow:

i. **PMD** to issue precise Weather & Flood Forecast for catchments of River Indus (upstream Tarbela) and River Kabul, besides overall forecast on countrywide basis during rest of the current Monsoon Season for better management of flood flows keeping in view the present Water Level in Tarbela Dam.

ii. **PIDs/ FLAs** to continue round-the-clock patrolling of all embankments and vulnerable locations during the rest of the period of the current Monsoon in order to save human lives and public & private properties from flood flows.

iii. **PIDs/ FLAs** to ensure effective implementation of Contingency Plan on flood fighting during rest of current Monsoon Season.

iv. **PIDs/ FLAs** to share details of damages to Irrigation derange and flood protection infrastructure caused due to rains/ floods during current Monsoon Season along with coordinates with FFC and share their restoration / rehabilitation plans.

v. **SUPARCO** will verify the damages caused to the Irrigation, Drainage and Flood Protection Infrastructure based on the coordinates provided by the PIDs/FLAs.

vi. **PID Punjab** to share the details of studies carried out for flood management of D.G. Khan & Rajanpur hill torrents with FFC, besides the projects in hand for implementation (on-going & in the pipeline).

vii. **PID Sindh** to ensure early plugging of breaches occurred in Qadirpur Loop Bund, FP Bund and Suprio Bund.

viii. **Tarbela Dam Authorities, WAPDA**, to continue exercising close liaison with PMD and IRSA for better management of flood flows and regulation of the reservoir in accordance with the SOPs during rest of current Monsoon Season.

ix. **PMD** to issue quantitative forecast of flood flows for hill torrent of D.G Khan, in case any weather situation develops, during the rest of current Monsoon Season.

x. **PCIW** to ensure close liaison with the ICIW and shall immediately transmit flood flows/ data to the concerned quarters more accurately and precisely.

3.4.14 1st Progress Review Meeting for GOP funded Normal/Emergent Flood Programme during Financial Year (2022-23) held on September 01, 2022

Decisions made in the meeting are as under:

(i) PIDs & FLAs to ensure that the schemes taken-up for implementation under Normal/ Emergent Flood Programme of current financial year (2022-23) are meant for the benefit of community and not for an individual family. The reference of NFPP-IV, if any, must be mentioned in the PC-I besides, reason of selection be given in PC-I, in case it is not recommended under NFPP-IV.

(ii) PIDs & FLAs should submit coloured pictures of all proposed sites indicating the abadies, private & public property to be protected in the PC-Is of schemes

being implemented under Normal/ Emergent Flood Programme of current financial year (2021-22) for further processing.

- PIDs & FLAs to strictly follow the implementation schedule of flood protection works approved by ECNEC on **27th July 2004**, reminded time and again.

(iv) PIDs & FLAs to submit PC-1s of prioritized schemes duly cleared by the respective Provincial DWPs to Federal Flood Commission (FFC) before **15th September 2022** for further processing of technical clearance from the Scrutinizing Committee (SC) of FFC and approval from the DDWP of Ministry of Water Resources.

(v) PIDs & FLAs to submit request for obtaining extension of execution period of all those flood protection schemes of previous years, which could not be completed within the target period given in the approved PC-Is on the prescribed proforma of Planning Commission **by/ before 15th September 2022**, for obtaining approval from Ministry of Water Resources.

(vi) PIDs & FLAs to submit demand proforma for release of 1st installment of budget allocated under PSDP (2022-23) alongwith other necessary documents to FFC by/before **15th September 2022** for further processing of the case.

(vii) PIDs & FLAs to submit in writing about the damage occurred to the on-going/ completed structures during monsoon season 2022. It must be noted that any damage, if occurred to the ongoing structures during monsoon season would be restored by PIDs & FLAs through their own resources and the restoration expenditure would not be charged to the capital cost of the projects.

(viii) PIDs & FLAs to submit physical & financial progress report of all on-going/new schemes taken under Normal/ Emergent Flood Programme upto **5th of each following month** on the prescribed proforma of Planning Commission regularly till completion of the scheme.

(ix) PIDs & FLAs to submit to Federal Flood Commission, the utilization account of funds released during previous years (2015-16 to 2021-22) without further delay, for taking further action in the matter.

3.4.15 1st Meeting of the Prime Minister's Coordination Committee for monitoring Flood Relief Efforts in Sindh

In wake of devastating 2022 floods, the honorable Prime Minister was pleased to constitute Provincial Coordination Committees for monitoring of relief efforts in the flood affected areas by NDMA and other federal agencies in particular, the provision of tents, food bags, drinking water, mosquito nets and medical supplies to the flood affected population. The Committee constituted **for Sindh Province**, was headed by the Federal Minister for Water Resources.

The **1st meeting of the Committee** was held on **September 05, 2022** under the chairmanship of the Federal Minister for Water Resources/ Convener of the Committee. Recommendations made by the Committee/decisions taken are as follows:

(i) NDMA will provide district-wise detail of flood relief items/services provided to flood affected populations in Sindh province.

(ii) Flood emergency should be declared in Sindh.

(iii) Immediate measures should be taken to drain the vast inundated lands in flood affected areas of Sindh.

(iv) NDMA in close coordination with the PDMA-Sindh and all concerned District Administrations will carry out aerial spray for control of mosquito growth and associated risk of malaria in flood affected communities of the Sindh provinces.

(v) Necessary directions shall be given by the Government of Sindh to the Commissioners and the Deputy Commissioners to hold meetings on every alternate day with the elected representatives of the flood affected areas to apprise them ground situation and deliberate on future course.

(vi) Teams of senior ministers be formed to approach international fraternity and sensitize them to come forward for contributing in relief activities as the flood devastation in Pakistan is owed to climate change which is a consequence of large-scale and persistent carbon emissions by the developed world to the detriment of nations like Pakistan.

(vii) Next meeting of the Committee will be held on Thursday, September 08, 2022 in the Committee Room of the Chief Secretary, Sindh, Sindh Secretariat Building, Karachi.

(viii) Chairman Federal Flood Commission shall be the focal person for coordinating the implementation of Committee's recommendations and liaison among the Members of the Committee and other concerned agencies.

3.4.16 2nd Meeting of the Prime Minister's Coordination Committee for monitoring Flood Relief Efforts in Sindh

The said meeting concerning Sindh Province was held on **September 08, 2022** in the Committee Room of the office of Chief Secretary, Sindh, Sindh Secretariat Building, Karachi. Federal Minister for Water Resources chaired the meeting being Convener of the Committee. After detailed deliberations, Committee recommended as under:

(i) Irrigation Department, Government of Sindh will mobilize necessary resources to drain out water from inundated areas on immediate basis.

(ii) As a long term measures, Irrigation Department, Government of Sindh will prepare a study proposal for comprehensive re-modeling of already constructed drains (MNV, RBOD-I, RBOD-II and RBOD-III) keeping in view the exceptional rainfall of 2022 and potential for conservation of torrential flows from the Kirther range and Balochistan. It would be presented to the federal cabinet for its consideration.

(iii) NDMA/ PDMA-Sindh to arrange additional tents/ tarpaulins for displaced persons on war footing basis.

(iv) BISP to revisit the Poverty Index from existing threshold score of 19% and preferably extend it upto 29% so that maximum number of affected people of calamity hit districts could avail the relief announced by the Federal Government i.e. Rs. 25,000 per household.

(v) NHA will expedite rehabilitation work on all flood damaged highways including N-5 so that flood relief could reach all flood affected villages/Talukas.

(vi) Health Department, Government of Sindh in collaboration with NDMA/ PDMA Sindh shall arrange at least 50 Dengue spray guns for each district for carrying out anti-mosquitoes spray in order to avoid the outbreak of water borne diseases. Mobile teams containing ambulance equipped with Doctors/ Para-Medical Staff/ necessary medicines will also be deployed in the calamity hit districts.

(vii) Department of Live Stock, Government of Sindh shall start immediately relief activities to save the livestock in calamity hit districts on war footing basis.

(viii) Government of Sindh shall arrange an early approval of Provincial River Act from provincial cabinet and ensure its enforcement for removal of encroachments from drains, flood plains and local nullahs etc.

(ix) Chief Secretary, Sindh shall issue necessary directions to all Commissioners/ Deputy Commissioners to convene coordination meetings on daily basis on flood relief activities in close coordination with the public representatives of the area including Committee Members. Meetings to be followed up/ preceded by field visit to the flood affected areas by the Committee Members residing in close vicinity.

(x) In order to monitor the implementation of Committee's recommendations at micro level, O/o Chief Secretary, Sindh shall be the Provincial Focal Point to coordinate with all Provincial Line Departments, Committee Members and Focal Person at Federal Government level for better coordination. For this purpose, next/ follow up meeting of the Committee will be organized by O/o Chief Secretary, Sindh on Thursday, September 15, 2022 in the Committee Room of the Chief Secretary, Sindh, Sindh Secretariat Building, Karachi.

(xi) Representative from Engr. 5-Corps, Pak Army will also be invited in next meeting of the Committee to brief about the real-time facts regarding rescue and relief operations.

3.4.17 3rd Meeting of the Prime Minister's Coordination Committee for monitoring Flood Relief Efforts in Sindh

The said meeting concerning Sindh Province was held on **September 16, 2022** in the Committee Room of O/o Chief Secretary, Sindh, Sindh Secretariat Building, Karachi. Honorable Federal Minister for Water Resources presided over the meeting being Convener of the Committee. After detailed deliberations, Committee recommended as under:

(i) **NDMA & PDMA-Sindh** shall define their district-wise specific roles with regard to ensure full scale relief operation so that duplication of efforts could be avoided and relief items could reach the affected population still waiting for the relief assistance. Defined roles shall be apprised to Committee in its next meeting.

(ii) All **Commissioners of respective Divisions** of Sindh Government shall attend next meeting of the Committee and make presentation about the assessment of flood damages and relief operations as well as the detail of funds allocated, received, utilized and unutilized.

(iii) **Irrigation Department, Government of Sindh** will prepare district-wise Plan with timelines, to drain out flood water from inundated areas and ensure the drainage of water on immediate basis. A committee comprising of (i) Chief Engineer, Sukkur, (ii) Chief Engineer, Drainage and (iii) Chief Engineer, Kotri shall exclusively prepare a Plan to drain out lands from their respective areas, in particular from KN Shah and ensure its implementation on war footing basis.

(iv) **Health Department, Government of Sindh** shall expedite actions to eradicate mosquito growth in calamity hit districts, in particular, procurement of 50 anti-mosquitoes spray guns for each district in order to avoid the outbreak of water borne diseases.

(v) **Chief Secretary, Sindh** shall issue necessary directions to all Commissioners/ Deputy Commissioners to approach INGOs/ NGOs interested/ involved in reconstruction of damaged houses in affected areas and assist them in identification of areas where they can build houses for displaced families.

(vi) **BISP, NHA and NDMA** shall submit to O/o CEA/CFFC (Focal Point) the compliance status of the Committee's recommendations issued in its previous meetings (1st & 2nd meetings respectively held on September 05 & 08, 2022) as well as of this 3rd meeting held on September 16, 2022, within **September 21, 2022** for consideration by the Committee in its next meeting.

(vii) **O/o Chief Secretary, Sindh,** being the Provincial Coordination Point, shall submit to O/o CEA/CFFC (Focal Point Federal) the consolidated compliance status of the Committee's recommendations related to respective Provincial Line Departments within **September 21, 2022** for consideration by the Committee in its next meeting.

(viii) Next/ 4th meeting of the Committee shall be held on **Friday, September 23, 2022** in the Committee Room of **O/o the Chief Secretary, Sindh, Sindh Secretariat Building, Karachi.**

(ix) **Secretary, Home Department Sindh/ IG Police Sindh** shall also attend next meeting of the Committee to brief about the measures carried out for control of social crimes in flood affected areas.

3.4.18 4th Meeting of the Prime Minister's Coordination Committee for monitoring Flood Relief Efforts in Sindh

The said meeting concerning Sindh Province was held on **September 23, 2022** in the Committee Room of O/o Chief Secretary, Sindh, Sindh Secretariat Building, Karachi. Honorable Federal Minister for Water Resources chaired the meeting being Convener of the Committee. After detailed deliberations, Committee recommended as under:

(i) NDMA shall expedite process for procurement of additional tents & tarpaulins to be made available expeditiously for displaced persons in Sindh; rescue and relief operations in Districts Khairpur and Larkana shall exclusively be taken up by NDMA.

(ii) NDMA/ PDMA-Sindh to ensure improving the composition/number of ration bags to cover needs of affected family for relatively longer time; funds required for provision of improved food baskets/ration bags shall be shared by the Government of Pakistan and Government of Sindh on 50:50 basis. Apropos, Government of Sindh shall process a Summary for the Federal Government for arranging 50% of total funds required for providing cooked food/ration bags to affected families in Sindh province.

(iii) Sindh Irrigation Department shall prepare the project proposal on early basis for purchase of new pumping stations/ complete overhaul of old pumps for immediate drainage of flood water. A separate proposal for procurement of dredgers shall also be prepared by Government of Sindh for possible funding through federal PSDP.

(iv) Sindh Irrigation Department shall also ensure removal of dead animals floating in canals, drains and rivers and those stranded in the gates of hydraulic structures, within a week time.

(v) Secretary, Public Health Engineering Department, in close coordination with Local Government & Irrigation Departments of Sindh Government shall make a Joint Action Plan to drain out the flood water from inundated cities; besides removal of dead animals floating in inundated lands/cities shall also be ensured within a week time.

(vi) Government of Sindh, in coordination with NESPAK and concerned Provincial line departments, to carry out a due diligence/assessment study to confirm the time required to evacuate the flood water and the sufficiency of existing pumps used by Irrigation Department Sindh and inter alia recommend measures for drainage of stagnant flood water from inundated cities/lands at a large scale.

(vii) Secretary, Agriculture & Livestock Department, Sindh shall process a Summary for Federal Government for arranging 50% of total funds (Rs 66 billion) required for providing seed free of cost to farmers in Sindh province.

(viii) Secretary Health Department, Sindh will expedite process for procurement of anti-malaria and other necessary medicines from international market; the Committee shall be apprised about the same in its next meeting.

(ix) NHA, BISP, IG Police Sindh and all concerned Departments of Sindh Government shall present to the Committee the updated status of compliance of the Committee's recommendations made earlier during in its previous meetings held on September 05, 08 & 16, 2022 respectively.

(x) Next/ 5th meeting of the Committee shall be held on Friday, September 30, 2022 in the Committee Room of O/o the Chief Secretary, Sindh, Sindh Secretariat Building, Karachi.

(xi) NGOs/INGOs showing inclination towards providing much needed relief and damage restoration/reconstruction shall be invited in the next meeting of the Committee to make short presentation about their flood relief and rescue/reconstruction efforts.

3.4.19 5th Meeting of the Prime Minister's Coordination Committee for monitoring Flood Relief Efforts in Sindh

The said meeting concerning Sindh Province was held on **September 30, 2022** in the Committee Room of O/o Chief Secretary, Sindh, Sindh Secretariat Building, Karachi. Honorable Federal Minister for Water Resources chaired the meeting being Convener of the Committee.

After detailed deliberations, Committee recommended as under:

(i) Irrigation Department, Government of Sindh will prepare weekly drainage plans regarding complete drainage of flood water from inundated areas connected/ not connected with drainage network; same to be presented to Committee in its next meeting. The Committee shall also be briefed in the next meeting about the formulation of a study proposal for comprehensive re-modeling of Sindh's drainage network required for holistic management of water logging, torrential flash flooding & pluvial floods as experienced in 2022. For that, all areas including Badin, Sujawal, Jhuddo, KN Shah, Khairpur, Qambar Shahdadkot, Dadu & Sehwan etc. shall also be included. This shall be recommended to the Federal Government for financing out of PSDP.

(ii) PDMA-Sindh to procure mobile/truck mounted dewatering pumps to expedite ongoing drainage of flood water from inundated areas/ cities not connected with the existing drains.

(iii) NDMA will expedite the process of procurement of additional tents and other relief items through international manufacturers and provide the adequate share to PDMA-Sindh for distribution among affected population.

(iv) Government of Sindh will waive off toll tax being charged from Trucks of NGOs/INGOs carrying ration bags, cooked food and other flood relief items to calamity hit areas; matter will also be taken up with NHA to provide requisite relief on national highways.

(v) Works and Services Department, Government of Sindh will prepare details related to structural damages assessed so far and present before the Committee their plan for implementation of 2022 flood damages restoration and rehabilitation works.

(vi) Planning & Development Department, Government of Sindh will ensure that future development schemes are properly designed duly incorporating the DRR elements and that their technical specifications are strictly followed up during the course of their implementation on ground.

(vii) Livestock Department, Government of Sindh to carry out necessary relief measures including up-scaling of the incentives given to livestock farmers in calamity hit areas. The Committee shall be apprised about the same in its next meeting.

(viii) Government of Sindh will issue necessary directions to concerned Commissioner/ District Commissioners asking them to coordinate with NGOs/INGOs working in their respective areas and provide them necessary support regarding arrangement of safe and cheaper transport for distribution of ration bags and cooked food among the affected people.

(ix) Health Department, Government of Sindh will nominate a focal person to coordinate with all INGO/NGOs who were providing medical services to affected population so as to assist them with every possible support regarding availability of doctors and medicines etc. Representatives from Liaqat Memorial hospital, Indus hospital and SIUT may also be invited to virtually participate in the next meeting of the Committee w.r.t possible support they could extend to INGO/NGOs providing medical services as flood relief.

(x) O/o the Chief Minister, Sindh will issue certificate of appreciation to all those NGOs/ INGOs who had given exemplary relief support to the flood affected population in Sindh.

(xi) With regard to the request of one of the NGOs (Faizan Global Relief Foundation) to support in construction of 10,000 houses for the affected population, the process shall include giving an advertisement in the daily newspapers and the Deputy Commissioners shall indicate the places/ sites where these can be built to avoid doubling. Information Department, Government of Sindh will advertise the Government campaign in print media regarding reconstruction of damaged houses whereby the affected household/ families will be asked to submit the application to concerned Deputy Commissioners.

(xii) Next/ 6th meeting of the Committee shall be held on Friday, October 07, 2022 at 1030 hours in the Committee Room of O/o Chief Secretary Sindh, Sindh Secretariat, Karachi.

3.4.20 6th Meeting of the Prime Minister's Coordination Committee for monitoring Flood Relief Efforts in Sindh

The said meeting concerning Sindh Province was held on **October 19, 2022** in the Committee Room of O/o Chief Secretary, Sindh, Sindh Secretariat Building, Karachi. Honorable Federal Minister for Water Resources chaired the meeting being Convener of the Committee. After detailed deliberations, Committee recommended as under:

(i) NDMA/PDMA-Sindh will provide updated status in terms of demand versus supply regarding flood relief items/ provided to flood affected populations in Sindh province.

(ii) Chief Secretary, Sindh to present comprehensive sector-wise regarding flood relief and restoration works/ services already provided and yet required to be provided to residents of flood affected areas.

(iii) Irrigation Department, Government of Sindh will present updated district-wise status with regard to drainage of flood water from left and right side of Indus River.

(iv) Government of Sindh to issue necessary directions to Deputy Commissioners asking them to visit frequently their respective flood affected areas in order to better coordinate the flow of correct information on ground (including the exact number of people who have returned back to their homes and whom require reconstruction of their houses etc.) in order to improve further ongoing relief operations.

(v) O/o Chief Secretary, Sindh shall follow up the matter with FBR regarding issuance of NOC for NGOs/ INGOs willing to provide free of cost clean drinking water to the flood affected population in Sindh province.

(vi) NHA will mobilize all possible resources to expedite their ongoing flood damages restoration and rehabilitation works in the Sindh province; Chairman NHA to personally attend next meeting of the Committee and present comprehensive status of ongoing rehabilitation works in Sindh province including roads namely (i) Halai- Moro Road, (ii) Sehwan- Mehr Road and (iii) Larkana- Khairpur Road.

(vii) All concerned Federal & Provincial Departments shall submit to O/o CEA/CFFC (Focal Point) compliance status of decisions taken/ recommendations earlier made by the Committee in its previous meetings (1st ,2nd, 3rd , 4th, & 5th meetings) respectively held on September 05,08, 16, 23 & 30, 2022, in annotated form at the earliest, for onward submission to the Prime Minister's office through O/o Minister for Water Resources.

(viii) Next/ 7th Meeting of the Committee shall be held in physical mode in Committee Room of O/o Chief Secretary Sindh, 7th Flood of Sindh Secretariat Building No. 1 at Karachi. Date and time shall be intimated in the due course of time.

(ix) CEO, SEPCO shall attend next meeting of the Committee to brief about the issues related to load shedding carried out in flood affected areas of Sindh province.

3.4.21 14th Progress Review Meeting of FFC on Supreme Court Recommendations

The 14th Progress Review meeting of Federal Flood Commission was held on **24th October 2022** to review the status of compliance of directions given by the Honourable Supreme Court of Pakistan related to Constitution Petition No. 62 of 2010, filed by Ms. Marvi Memon versus Federation of Pakistan, through Secretary Cabinet & others.

Following decisions were taken.

i. Installation of state of the art Weather Radars at Mangla, Lahore and Sialkot would be given top priority.

ii. PMD would make utmost efforts to further improve its coordination mechanism with WMO, SAARC countries and other multilateral fora for sharing the information regarding Early Weather Forecast and issuance of Flood Warning.

iii. PMD would submit a status report regarding its Flood Forecasting & Early Warning System (FF&WS) capability in 2010, improvement made till now and Future Plans for further improvement at the earliest to FFC.

iv. PID Punjab & Sindh to share comprehensive report on improvement of all Barrages on regular basis indicating date of start & completion and activities carried out/being carried out on the projects till completion of projects.

v. Punjab Irrigation Department to hold a high level meeting of Chief Engineers in order to review the operationality of the existing/ designated breaching sections and reassess their need keeping in view the recent enhancements made in the capacities of the barrages. The report/ decisions may be submitted to FFC at the earliest for consideration in the next Progress Review Meeting.

vi. Pak Railways to share the latest status of the PC-I of Left Guide Bund of Shershah Railway Bridge with FFC.

vii. NHA to provide to FFC detailed updated progress report regarding 57 vulnerable sites identified by the Consultants M/S NESPAK containing the sub-project wise recommendations and their status of implementation alongwith brief details of the scope and obligation of each sub-project.

viii. NHA to provide to FFC detailed updated progress report regarding damages occurred, new vulnerable points identified during 2022 floods and the plans for their restoration.

ix. NHA, in future, would consult the Provincial Irrigation Departments while constructing roads or any bridge/ intervention across the river so that any flood flow generated could pass through the NHA structures without damaging/ jeopardizing them.

x. Irrigation Departments of Sindh, Balochistan, GB and AJ&K to vigorously pursue their cases with concerned authorities for early approval of River Act and submit latest status to FFC.

xi. Irrigation Departments of the Punjab, Sindh, Khyber Pakhtunkhwa & Balochistan, GB-PWD and Agriculture, Livestock, Irrigation & ESMA, Government of AJ&K would share with SUPARCO under intimation of FFC, the details of encroachments, besides, those encroachments already removed on prescribed format already circulated among concerned organizations at the earliest.

xii. PDMAs, GBDMA & SDMA will take steps to remove encroachments in floodplains/ waterways along major and other rivers including hill torrents with the coordination of concerned District Administrations and submit report to FFC at the earliest.

xiii. Upon receipt of information from Irrigation Departments, SUPARCO will carry out the verification of encroachments removed and those existing and submit report to FFC.

xiv. WAPDA to keep on providing progress on Munda/ Mohmand Dam Project to FFC on regular basis.

xv. WAPDA and PID, Khyber Pakhtunkhwa to have further coordination for expeditious completion of Munda Headworks.

xvi. Forest Departments of four Provinces and Federally Administered Areas including Watershed Management Authorities of Mangla & Tarbela Dams Projects (WAPDA), will keep up their efforts and would regularly submit to FFC detailed progress made on watershed management/ a forestation promoting activities carried out so far in the catchment areas of rivers/hill torrents in order to check land sliding and excessive bed erosion, besides, flood mitigation.

xvii. Irrigation Departments of Khyber Pakhtunkhwa & Balochistan and Forest Department of Sindh Province to submit their views/ comments on PC-II for formulation of National Watershed Management Plan to FFC at the earliest.

xviii. PID, Punjab will provide to FFC on regular basis the updated status/ progress on Construction of Hydro Power Station along right side of Taunsa Barrage.

xix. WASA, in consultation with RDA, to share progress on construction of Lai Expressway with FFC on regular basis.

xx. PID, Punjab to share updated status regarding Model Study of River Channelization for Ravi River Front Urban Project on regular basis.

xxi. WAPDA and Provincial Irrigation Departments of Sindh & Balochistan to share latest report about the length of the drainage project (RBOD) under their control with FFC at the earliest.

xxii. PID, Balochistan & G-B to share details about critical locations (including their number, nature of criticality/vulnerability) requiring attention and funds needed etc. to be shared with FFC by PIDs/FLAs.

xxiii. KMC & KDA to keep on sharing the progress regarding rehabilitation/up-gradation of storm drainage system of the city on regular basis until completion of the job.

xxiv. PID, Sindh to keep on sharing latest updates to FFC on regular basis regarding Long term rehabilitation/ up-gradation works of LBOD and its allied components i.e. Dhora Poran water drains to Shakoor Dhund for further action.

3.4.22 Post Monsoon 2022 Meeting of FFC (22nd November 2022)

The Post Monsoon Meeting of Federal Flood Commission was held on **22nd November 2022** in the Committee Room of office of CEA & CFFC Islamabad, in order to review the status of preparedness and lessons learnt by the Provinces & Federal Line Agencies during Monsoon Season 2022. The following directions were given to PIDs/ Federal Line Agencies, WAPDA, WASA & PMD etc. as a way forward for Monsoon 2023:

(i) For future meetings of FFC, all the members of FFC including MoWR are requested to ensure their participation particularly NDMA, PID Sindh and Khyber Pakhtunkhwa.

(ii) **Provincial Irrigation Departments & Federal Line Agencies (PIDs & FLAs)** to ensure completion of all approved and ongoing flood protection schemes taken up under Provincial ADP and Normal/ Emergent Flood Programme, besides, rehabilitation and Flood Damages Restoration Works including O&M works related to Barrages/Head Works/Bridges, Irrigation, Drainage and Flood Protection Infrastructure well before the start of 2023 Monsoon Season. Detail of all those projects, be shared with FFC.

(iii) **PIDs & FLAs** to ensure removal of encroachments from flood plains/ High Risk Zones, waterways of major and other rivers including Hill Torrents/ Flood Flow generating nullahs, which are under the threat of flood waters and also causing hindrance in flood flows. The progress on the job would be submitted to FFC on monthly basis till completion of the task. The entire exercise be completed well before the start of Monsoon Season 2023.

(iv) **PIDs & FLAs** to ensure rehabilitations of breaches and damaged flood protection infrastructure well before the next year Monsoon-2023

(v) **PIDs** to expedite efforts with respect to Revision in Flood Limits of their respective Barrages/ Head Works/ Bridges falling in their jurisdictions in view of changing ground realities. The exercise may be completed before 30th June 2023.

(vi) **PID Punjab** to expedite the working on the Revised Flood Limits of eastern rivers in entire jurisdiction of Punjab keeping in view the new tool and technique under intimation to all relevant stakeholders including FFC.

(vii) **PID, Punjab** to conduct study on need of existing as well as additional needed (at critical locations) Breaching Sections in Punjab on fast track basis. The exercise may be completed before **30th June 2023.**

(viii) **PMD** to ensure procurement & installation of the Weather Radars at Sialkot and Sukkur as per approved Implementation Plan.

(ix) **Deputy Commissioner, Rawalpindi** to ensure removal of encroachments from the banks/ bed of Lai Nullah at the earliest.

(x) **RDA, Rawalpindi** to expedite work on Lai Expressway project to resolve the flooding problem in Rawalpindi city. The progress on Lai Expressway project may also be shared with FFC on regular basis.

(xi) **Pak Railways** to ensure the execution of Left Guide Bund of Shershah Railway Bridge across River Chenab in District Multan at the earliest.

(xii) **Provincial Governments** to provide list of encroachments removed alongwith proper coordinates to SUPARCO for analysis & verification of encroachments removed from the waterways & flood plains of rivers.

(xiii) **PCIW** to ensure to make necessary alternate arrangements for obtaining reservoirs/ rivers flow data and other information of Chenab and Eastern Rivers, in case ICIW does not agree to provide the same during Monsoon Season 2023.

(xiv) **PID Balochistan** to share the details of seven indicative sites in Quetta Valley with PMD for installation of rain gauges there.

(xv) **WAPDA** would prepare initial draft working paper for flood management SOPs for Tarbela Dam and share the same with the stakeholders for further deliberations.

3.4.23 2nd Meeting of Technical Committee of MoWR on Water sector related SDG Indicators (29th November 2022)

The 2nd meeting of the Technical Committee on Water Sector related SDG Indicators was held on 29th November 2022. Following key decisions were made:

(i) **Pakistan Water Partnership (PWP)** shall remain in close contact with Global Water Partnership (GWP) regarding holding of the next Stakeholders Workshop for carrying out again national survey to report Pakistan's progress on SDG 6.5.1 Indicator. In this respect, PWP in coordination with O/o CEA/CFFC will ensure representation of all stakeholder departments at national and provincial level, in particular all members of the Committee during the workshop, besides representatives from private sector, academia (experts from different universities), industry, civil society, public representatives and development partners etc.

(ii) **O/o PCIW** will expedite ongoing consultative process regarding review of the draft input already prepared and shared by O/o CEA/CFFC on SDG-Indicator 6.5.2. Thereafter, the final report to be submitted to O/o CEA/CFFC within 1st week of January 2023 for its consideration by the Committee in its next meeting.

(iii) **PCRWR** shall prepare comprehensive national progress report on SDGs Indicator 6.3.2 on the format/ guidelines prescribed by UNEP and present the finalized updated report to O/o CEA/CFFC within 1st week of January 2023 for its consideration by the Committee in its next meeting.

(iv) **PCRWR** shall also prepare updated draft progress report on SDGs Indicator 6.6.1 on the format/ guidelines prescribed by UNEP and present the same for consideration of the Committee during in its next meeting.

(v) **Agriculture Department, Government of Sindh** shall propose composition and TORs regarding establishment of a Sub-Committee w.r.t collection of data and compiling the overall progress regarding implementation of SDG Indicator 6.4.1 in Pakistan.

(vi) **WAPDA** shall organize stakeholders' workshop with regard to collection of data, compilation and finalizing the baseline of SDG Indicator 6.4.2 with regard to its implementation in Pakistan. Timelines and other necessary arrangements for the Workshop would be presented during the next meeting of the Committee.

(vii) **O/o CEA/CFFC** shall invite Representatives from all concerned UN organizations (UNEP, FAO and UNESCO) in the next meeting of Technical Committee, in order to provide necessary guidance w.r.t reporting of the progress on their relevant SDG Indicators.

3.4.24 Meeting Regarding Preparation of National Master Plan for Flood Telemetry held on 7th December 2022

A joint consultative meeting of WAPDA, FFC, PMD, AB and Provincial Irrigation Department Sindh and Irrigation and Small Dams AJ&K was held on **7th December 2022.** After detailed discussion, following decisions were taken:

(i) Irrigation Department, Government of Sindh, to submit list including coordinates of locations of additional telemetry stations proposed based on experience of 2022-floods to FFC within a week time for inclusion in the Final Master Plan document by the ADB Consultants.

(ii) ADB Consultants to finalize add submit the Final Master Plan duly incorporating the suggestions of PMD, AJ&K, PID Sindh & WAPDA and to submit to FFC immediately.

(iii) WAPDA to submit PC-I of the Phase-I of the Flood Telemetry Project at the earliest to FFC for its inclusion in the updated Umbrella PC-I of FPSP-III.

(iv) Each province to submit commitment of bearing the operation & maintenance cost of the respective interventions duly approved from their concerned provincial cabinets.

3.4.25 Miscellaneous Activities of FFC during 2022

In addition to the above activities, FFC organized/ attended various meeting for overall better flood management in the country. The details of meetings held are given as under:

i. Scrutinizing Committee meeting of Federal Flood Commission held on **28th February 2022**.

ii. Meeting on National Master Plan for Flood Telemetry Network held on **17th March 2022.**

iii. Scrutinizing Committee Meeting of FFC held on **18th March 2022.**

iv. Meeting of Inquiry Committee Constituted for Inquiry in Light of Directives of DAC Meeting regarding IR PARA No. 4 KFW Grant No. BMZ 2013 977 44 Pakistan held on **28th March 2022**.

v. One-Day Stakeholders Workshop on Implementation Modalities of National Master Plan for Flood ADB Workshop held on **31st March 2022.**

vi. Meeting with NITB and Google for artificial intelligence system through Google for Flood Alerts held on **30th August 2022.**

vii. Meeting with Chinese Expert Delegation Visit in Pakistan held on **30th September 2022.**

viii. Meeting of JICA Head Quarter South Asia Disaster Management Advisory Mission held on **31st October 2022.**

ix. Scrutinizing Committee Meeting of FFC held on **4th November 2022.**

x. Meeting with JICA HQ. South Asia Disaster Management Mission for Pakistan held on **7th November 2022.**

xi. Meeting of JICA HQ. South Asia Disaster management Mission for Pakistan held on **11th November 2022.**

xii. Flood Stakeholders Workshop on River on Bank Protection, Reinforcement and Maintenance based on Post Floods held on **21st November 2022.**

xiii. Scrutinizing Committee Meeting of FFC held on **1st December 2022.**

xiv. 1st Workshop on Climate Change Adaptation: Related Measurement Reporting and Evaluation (MRE) Guidelines-Stakeholders Consultation held on 2nd December 2022.

xv. Meeting with Visiting Dutch Team on Disaster Risk Reduction (DRR) held on 13th December 2022.

xvi. Meeting with the UNEP High Level Mission to Pakistan (13th – 16th December 2022)

xvii. Dutch Team on Disaster Risk Reduction (DRR) De-Briefing Session held on 16th December 2022.

xviii. Meeting with IUCN Team was held on 19th December 2022 to hear from IUCN about its past work undertaken in the overall realm of integrated water/ flood management.

xix. Meeting with PCRWR Team was held on 26th December 2022 regarding specific research conducted for future flood management.

2022 Rains/ Floods in Pakistan

District Jafarabad (Balochistan)

District Dadu (Sindh)

District Rajanpur (Punjab)

District Swat (Khyber Pakhtunkhwa)

Munda Headworks before 2022 Floods

Munda Head Works collapse during 2022 Floods

3.5 Climatically Invigorated 2022 Rains/ Floods

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. Owing to the climate change, Westerly Wave has altogether altered the monsoon rainfall pattern in the country and caused Low Pressure areas developed in southern parts resulting in to heavier than unusual rainfall during Monsoon Season 2022 in particular in Sindh and Balochistan.

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.

Between June and August 2022, torrential rains and a combination of riverine, urban, and torrential flash flooding led to an unprecedented 2022 flood disaster in Pakistan. It resulted in damages on large scale. According to NDMA, around 33 million people have been affected by the 2022-floods, including nearly 8 million displaced. The floods have taken the lives of more than 1,739 people, one-third of which were children. 90 districts were declared as “calamity hit,” during 2022 monsoon accounting for more than half of all districts in the country. The majority were in the provinces of Balochistan, Sindh, and Khyber Pakhtunkhwa.

As per Post Disaster Need Assessment (PDNA) Report of GoP dated October 28, 2022, total damage is estimated at PKR 3.2 trillion (US$14.9 billion), total loss at PKR 3.3 trillion (US$15.2 billion), and total reconstruction/ rehabilitation needs at PKR 3.5 trillion (US$16.3 billion). Out of the 25 poorest districts in the country, 19 were calamity-affected. Preliminary estimates suggest that as a direct consequence of the floods, the national poverty rate will increase from 3.7-4.0 % pushing between 8.4 to 9.1 million people into poverty.

3.5.1 Rainfall Analysis for Monsoon Season 2022

In the summer of 2022, the country experienced its wettest August since 1961. Sindh and Balochistan provinces experienced unprecedented rainfall, surpassing average monthly totals by six and seven times, respectively.

PMD’s Outlook for Monsoon 2023:

According to Pakistan Meteorological Department (PMD) Seasonal Outlook for Monsoon 2022 for Pakistan issued on **7th June 2022**, the following weather situation was predicted:

- Overall, a tendency for nearly **normal precipitation** is predicted over most parts of the country during forecast season (May-July 2022) with mostly **below normal** during May while **normal to slightly above normal** during June and July.
- Northern Punjab, Kashmir and the adjoining areas of Khyber Pakhtunkhwa and Gilgit Baltistan may get slightly **above normal** precipitation.
- Nearly normal precipitation is expected over rest of the country; Area weighted normal rainfall of Pakistan during July to September is **140.8 mm**.

Keeping in view the atmospheric conditions observed in June 2022, PMD's updated the seasonal forecast issued on **July 04, 2022**, is described as under: -

- Overall, a tendency for **above normal precipitation** is likely over the country during forecast season (July-August-September).
- First half of the monsoon from 1st July to Mid-August is likely to be wetter than last half (mid-August to end of September).
- Monsoon rainfall is expected to be '**Above Normal' over Punjab and Sindh** whereas **slightly above normal rainfall** is expected **over remaining parts** of the country. Temperature would be above-normal during the monsoon season.

Based on above, forecasted impacts were as under: -

- **Potential for Riverine Floods** - Possibility of extreme hydro-meteorological events over catchment areas cannot be ruled out, that may generate riverine floods **in the major rivers.**
- **High probability of Urban Flooding** in metropolis cities and flash flooding in hilly areas
- Heavy rainfall events may trigger **flash flooding in hilly areas** and urban flooding in plain areas i.e. major cities of **Sindh, Punjab, AJ&K and Khyber Pakhtunkhwa** during the season.
- Above-normal Temperature in high altitudes are likely to increase rate of snowmelt in the Northern Areas subsequently increasing the chances of base flow in the Upper Indus basin.
- Sufficient water availability for irrigation and power sectors will be a good impact.

Actually observed Weather/ Rainfall Situation:

PMD forecasted (about 40%) **Above-Normal** rainfall all over the country during 2022 Monsoon Season, however, cumulative rainfall received was around 175% above normal. Province-wise detail is given in **Table 3.7.**

Table 3.7: Province-wise Rainfall actually observed across the Country

Sr. #	Province/ Regain	Rainfall Occurred (mm)	Rainfall Occurred (%age above Normal)
1.	Sindh	703.1 mm	426% above normal
2.	Balochistan	320.7 mm	450% above normal
3.	Punjab	393.5 mm	70% above normal
4.	Khyber Pakhtunkhwa	341.1 mm	33% above normal
5.	Islamabad	1,199.46 mm	17% less than normal
6.	Gilgit-Baltistan	81.1 mm	104% above normal
7.	Azad Jammu & Kashmir	382.6 mm	2% less than normal

Source: **PMD**

Pre-monsoon rainfalls started on 13th June 2022 and lasted till 25th June 2022. This was followed by the below given four (04) major rainfall spells during the monsoon season 2022:

i) 1st Spell (**29th June – 9th July 2022**);

ii) 2ndSpell (**23rd - 28th July, 2022**);

iii) 3rd Spell (**5th – 13th August 2022**); &

iv) 4th Spell **(23th – 26th August 2022)**

Cumulative Rainfall actually observed has been shown in **Figure 3.3.**

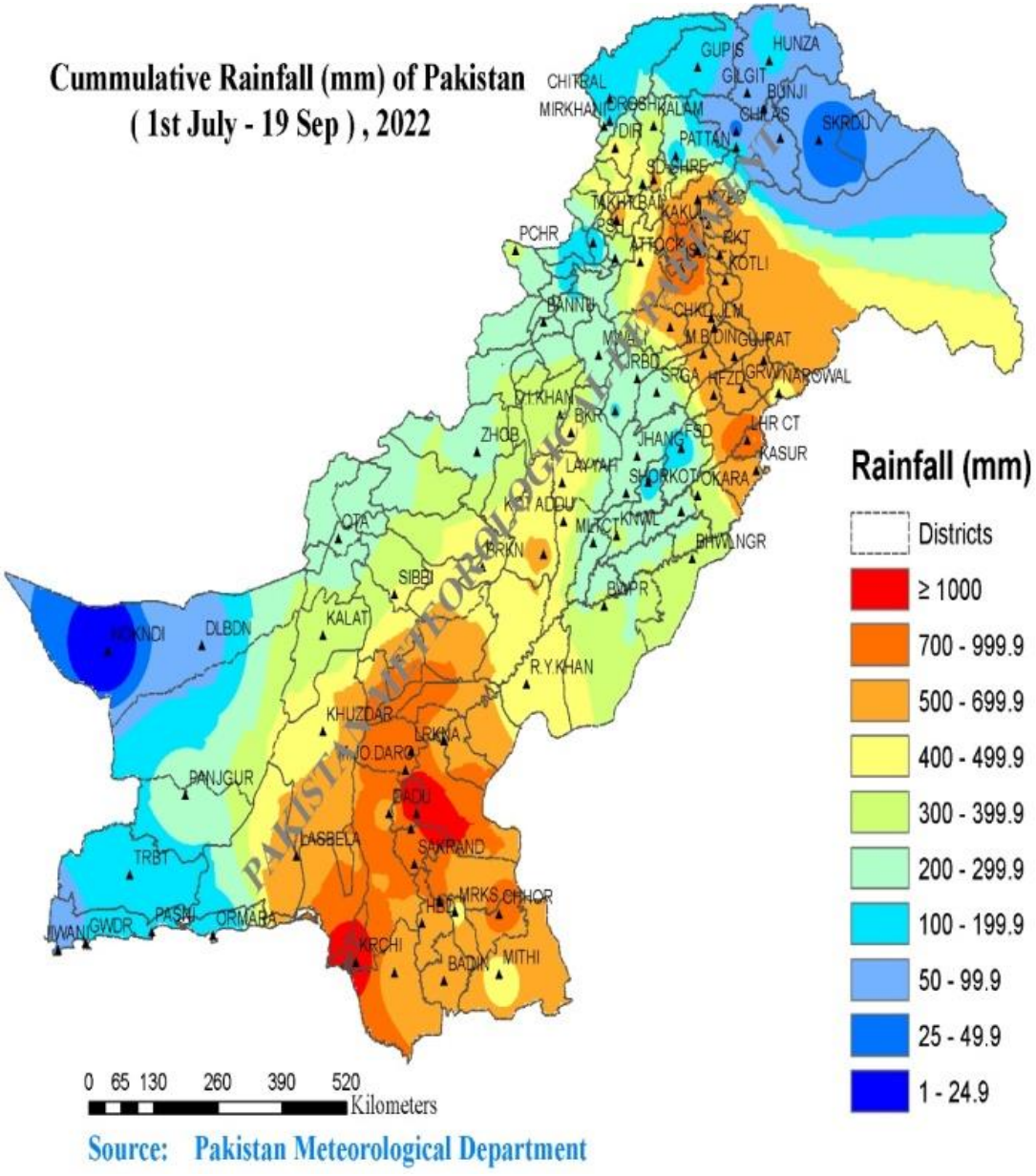


Figure 3.3 Cumulative Rainfall actually observed across the Country

Similar maps showing rainfall spells occurring during the four (04) individual monsoonal rainfall spells (i.e. Spell No. 1 from 29th June to 9th July 2022, Spell No. 2 from 23rd July to 28th July, 2022, Spell No. 3 from 5th August to 13th August 2022 and Monsoon Spell No 4 starting from 23th August and ending on 26th August 2022) are shown in **Figure 3.4.**

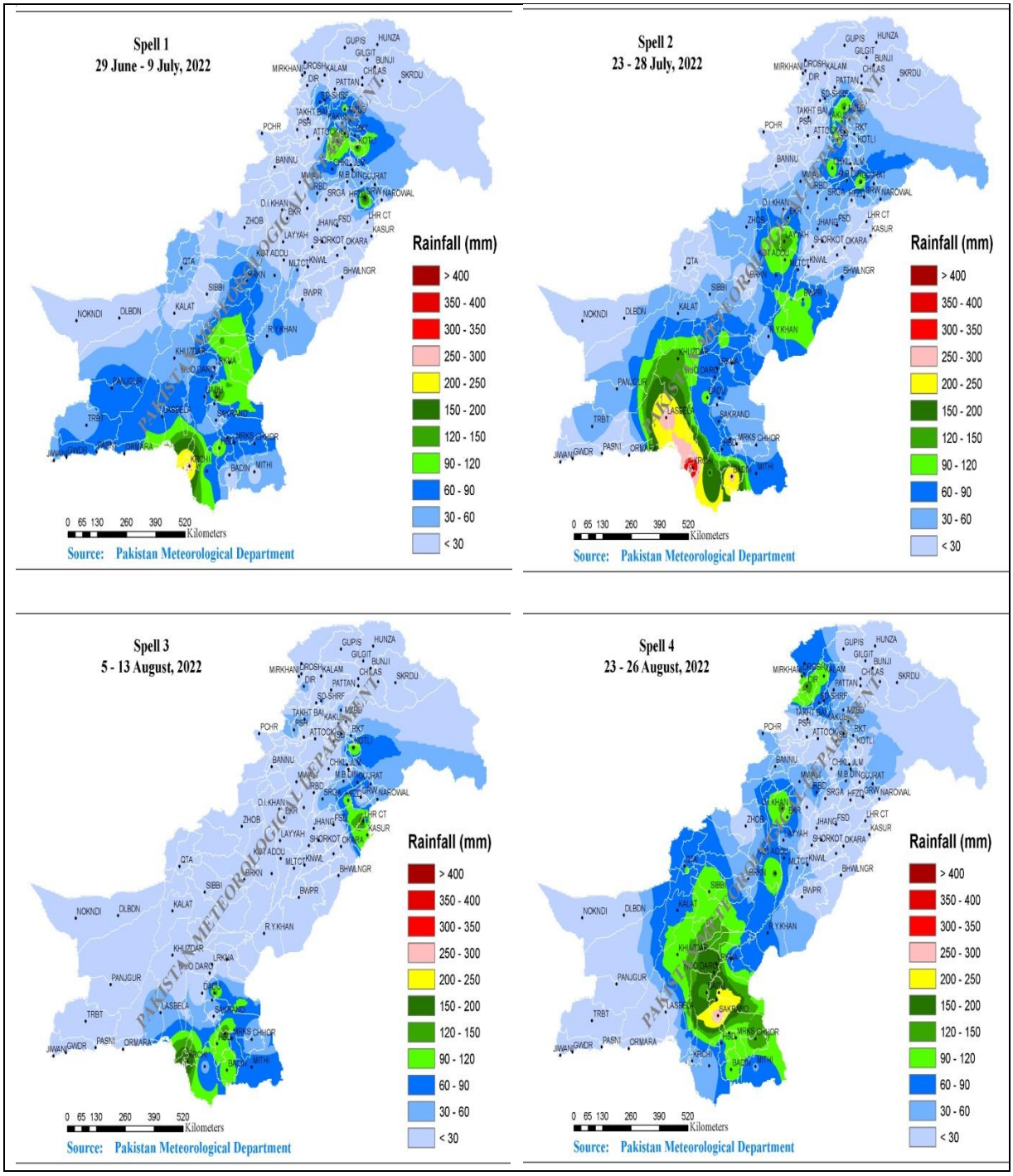


Figure 3.4: Rainfall Observed during the four different Monsoon Spells

According to PMD, number of cities has observed excessive rainfall. A comparison of few cities which observed extra ordinary/ exceptionally high rainfall in Monsoon Season 2022 as compared to previous record, is given in **Table 3.8:**

Table 3.8: Stations/ Regions that experienced Above-Normal Rainfall

Sr. No.	Name of Stations	Name of Province /Region	July-Sep 2022 Rainfall (mm)	Annual 2022 Rainfall (mm)	Annual Average Rainfall (mm)	2022 Rains % above Average
1.	Padidan	Sindh	1,764	1806.82	108	1633 %
2.	Moinjo Daro	Sindh	990.5	1029.82	100.1	989 %
3.	Larkana	Sindh	893.4	956.82	127.4	701 %
4.	Jacobabad	Sindh	783.1	833.04	110	711 %
5.	Chhor	Sindh	781.9	810.4	74.5	1049 %
6.	Rohri	Sindh	652	718	105.8	616 %
7.	Sh. Benazir Abad	Sindh	648	703.12	135	480 %
8.	Sukkur	Sindh	552.53	696.52	87.6	630 %
9.	Badin	Sindh	665.33	668.3	16.9	3936 %
10.	Kalaat	Balochistan	501	638.2	12.93	3874 %
11.	Lasbela	Balochistan	538.22	606.1	69	780 %
12.	Khanpur	Punjab	490.21	535.83	21.6	2269 %
13.	Hyderabad	Sindh	492.04	512.01	177.9	276 %
14.	Khuzdar	Balochistan	464.61	644.4	13.29	3495 %
15.	Karachi A/P	Sindh	519.74	572.95	205	253 %
16.	Sibbi	Balochistan	406.01	472.04	13.7	2963 %
17.	Barkhan	Balochistan	471.01	648	13	3623 %
18.	Quetta (Samungli)	Balochistan	271.07	376	56.7	478 %
19.	Panjgur	Balochistan	255	281	115	221 %
20.	Bahawalnagar	Punjab	353.05	362	45	784 %
21.	Bahawalpur (City)	Punjab	303.57	391.02	143	212 %
22.	Dir	Khyber Pakhtunkhwa	520.52	1016	127.01	409 %
23.	Ormara	Balochistan	243	340.01	76.2	318 %
24.	Zhob	Balochistan	311	424	13.47	2308 %

Source: PMD

A bar chart indicating difference in rainfall in July-September 2022 and average rainfall has been shown in **Figure 3.5**: -

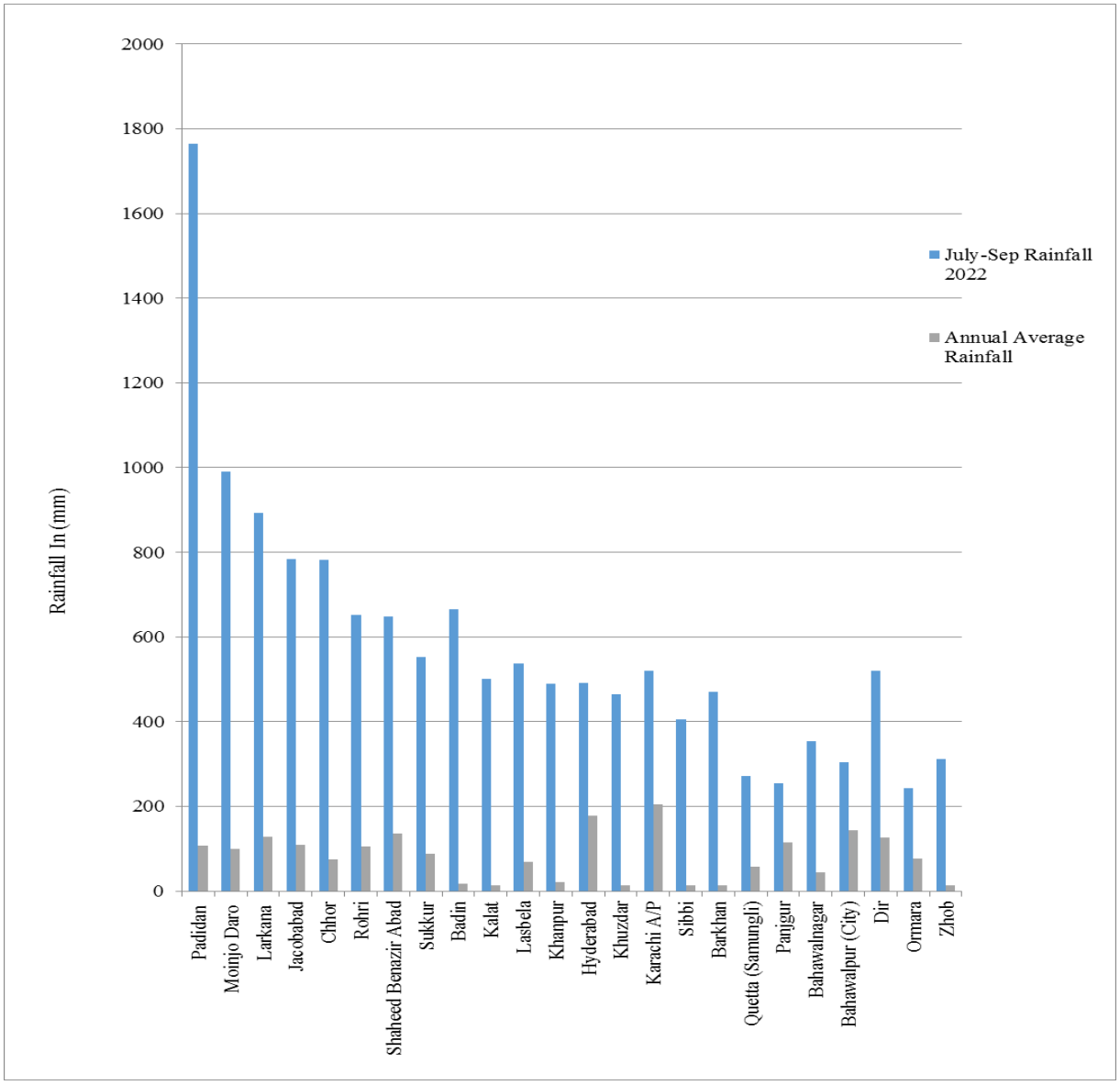


Figure 3.5: Bar Chart showing Cities with Exceptional High Rainfall in 2022

3.5.2 Hydraulic Characteristics of 2022 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. However, during 2022, **monsoon rain** 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 Basi**n as well as in local tributaries of Indus River upstream of Tarbela.

The country received unprecedentedly abnormal rains from July – August 2022, especially in the lower half of the country in Sindh & Balochistan Province (Refer **Figure 3.3**), which generated High Flows in various hill torrents on a countrywide basis. The hill torrents of Kirthar Range in Sindh affected the Districts of Larkana, Sukkur, Kandhkot, Jacobabad and Dadu. Extreme hydro-meteorological events

(torrential rainfall) generated flash floods in hill torrent areas of Punjab (D.G. Khan District), Balochistan (Districts Lasbela, Barkhan), Khyber Pakhtunkhwa (Swat, Bahrain & Kalam etc.), Azad Jammu & Kashmir, Gilgit-Baltistan and urban flooding in major cities of Pakistan (refer again **Table 3.8** given above).

In Balochistan, significant increase in monthly rainfall, considerably higher than Annual Average/ Normal Rainfall was observed at Kalat, Barkhan, Quetta, Sibbi, and Khuzdar besides Ormara. Climate driven and intensified rainfall/ flooding brought massive devastation to these areas, which were previously secured from the brunt of the severe monsoon.

In Punjab, Floods 2022 affected the districts DG Khan, Rajanpur, Muzaffargarh, Mianwali, Sialkot and Layyah. Worst-hit areas in Punjab Province were DG Khan & Rajanpur area including the cities namely Taunsa Sharif, DG Khan, Fazilpur and Rojhan. Hill torrent structures of D.G Khan Canal and its system, and drainage network overtopped from numerous spots leaving behind massive destruction to the infrastructure and public and private properties. CRBC main canal system was badly affected due to Vehova and Sanghar Hill Torrents, Kachhi Canal, D.G. Khan Canal. Existing drains were breached by Sori Lund, Vidore, Sakhi Sarwar and Mithawan Hill Torrents, besides, structures on the Hill torrents were also damaged badly.

Heavy to Very-Heavy Rains in southern Punjab particularly in the Koh-e-Suleiman Range, generated record floods in the 13 major hill torrents of D.G. Khan and Rajanpur Districts which brought large scale destruction in D.G. Khan Division. The flood situation is given in **Table-3.9**:

Table 3.9: 2022-Floods in major Hill Torrents of D.G. Khan and Rajanpur

D.G. Khan Hill Torrent Region		Rajanpur Hill Torrent Region	
Gauge Station	**Flood Peak observed**	**Gauge Station**	**Flood Peak observed**
Kaura	105,668 @ 26.8.2022	Kaha	108,941 @ 14.8.2022
Vehova	154,362 @ 14.8.2022	Chachar	75,900 @ 21.8.2022
Sanghar	268,149 @ 14.8.2022	Sori Janubi	17,000 @ 4.8.2022
Sori Lund	135,544 @ 21.8.2022	Pitok	5,000@ 25.8.2022
Vidor	174,360 @ 21.8.2022	Sori Shomali	7,150 @ 2.8.2010
Sakhi Sarwar	32,643 @ 4.8.2010	Zandi	9,000 @ 25.8.2022
Mithawan	61,905 @ 8.8.2010	-	-

Source: PID Punjab

Recurring flash flood events were experienced in entire GB (Districts Ghizer, Diamer, Ghanche, Gilgit, Hunza, Kharmang, Nagar, Shigar, Skardu and Astore) badly affected public & private infrastructure mainly including Power Houses, Roads, bridges, Drinking Water Supply & Irrigation Channels etc. From 1st July to 12th July, normal flows were observed in the rivers of the Indus basin. However, due to continuously higher temperatures at Skardu later and heavy rainfall in G-B increased flows were subsequently observed in the River Indus. Due to heavy rainfall in the catchment areas of **River Kabul** (a tributary of River Indus downstream Tarbela), it

remained in "High Flood" at Warsak on 27th August 2022 (peak discharge of 139,086 cusecs) and Very High Flood at Nowshera on 28th August 2022 (peak discharge of **336,461 cusecs**). Moreover, **River Swat** (tributary of Kabul River) experienced in Very High Flood stage at Khawazakhela (246,392 cusecs), Chakdara Bridge (275,215 cusecs), Munda Headworks (260,000 cusecs) & Charsadda Road (220,000 cusecs) on 26th August 2022.

Due to heavy torrential rainfall and cloud bursts in the upper catchments of Swat River on August 25-26, 2022, unprecedented and exceptionally high floods were generated in Swat River and its tributaries i.e. Barwai Khwar, Haronai Khwar, Chail Khwar, Ushu Matiltan River, Gabral River etc. Swat River experienced historic flood of **246,392 cusec viz-a-viz 175,546 cusec in 2010** which is **53%** higher than previously highest recorded flood and devastated the infrastructures, built-up areas and agricultural lands on both banks. The flood caused havoc and severely devastated/ swept away the public & private infrastructure and agriculture lands in villages namely Lalkoo, Sakhra, Darmai, Nowkhara, Kalakot, Drushkhela, Bamakhela, Sulatan, Mandaldag, Rodingar, Gwalerai, Barthana, Chuprial, Shokhdara, Kharerai, Utror, Gabral, Behrain, Madyan, Asala, Gashkorr etc.

The swollen **Kabul & Swat Rivers** brought destruction of catastrophic proportions in the Kalam, Swat, Upper Dir, Kohistan, Charsadda and Nowshera, sweeping away hotels & homes and submerging several areas. **Munda Headworks** on the Swat River in Khyber Pakhtunkhwa sustained serious damage by 2022 devastating floods; middle three bays got washed away/ completely destroyed including the bridge deck, piers, and hoisting mechanisms etc.

Heavy contribution of torrential flood flows from D.G. Khan (including Rajanpur) hill torrents generated "High Flood" in River Indus at **Taunsa Barrage** which received peak discharge (outflow) of **622,000 cusecs** on 30th August 2022. The control structures downstream Taunsa at river Indus i.e. Guddu & Sukkur Barrages also experienced High Flood at Guddu & Sukkur Barrages. **Guddu** Barrage achieved peak discharge of **576,000 cusecs** on 23rd August 2022 whereas the **Sukkur** had peak discharge of **580,000 cusecs** on 25th August 2022. The Indus at **Kotri** touched high Flood on 10th September 2022 with peak discharge (outflow) of **600,000 cusecs**.

Flood situation was encountered at S.M Bund in Hala Division at Shank of T-Head Spur @ Mile 135/7 (Bhanote), S.M Bund Mile 12/2 to 12/3 (Bakhri Site) Rohri Division Kandiaro, Qadirpur Shank Bund at 1/7+100 downstream Guddu Barrage in jurisdiction of Ghotki Feeder Canal Area Water Board. To combat the situation, the emergent work of Dumping Stone Boulders was started immediately and further Flood Fighting arrangements viz: Heavy machinery including Excavators, Bulldozers, Dumpers, Tractors etc. deployed & Patrolling arrangements including stocking of stone boulders at site were carried out to curb further erosion and control the situation.

During Monsoon season 2022, heavy to very heavy monsoon rains in Balochistan Province activated local Nullahs/Hill Torrents which caused flash floods. As a result, the flood water level raised beyond the maximum level of **FP Bund** which caused breaches at various location. Breaches also occurred along **Suprio Bund.** Flood water also entered in the pocket between FP Bund, MNV and other compartment between MNV and Suprio Bund affecting all drainage system in the area. Due to very heavy rainfalls in Larkana Division, all the drains were flowing over their

maximum gauge which caused pluvial flooding. Manchar Lake attained very high level of 123.0 ft and at that stage River Indus was not accepting the desired water from Manchar, hence, relief cuts were made in Manchar to control the excessive flood situation.

3.5.3 Attenuation of Torrential & Pluvial Flood in Sindh through Manchar & other Irrigation & Flood Protection Network

Manchar Lake is the largest natural freshwater lake in Pakistan and is one of South Asia's largest lakes. It is located west of the Indus River, in Jamshoro District and Dadu District, Sindh - 18 km away from Sehwan Sharif. In the 2010 Pakistan floods, the lake overflowed due to a high inflow of water. During the 2022 Pakistan floods, it again overflowed. Controlled/ Relief Cuts were made into the lake embankment to facilitate drainage and protect the cities of Sehwan, Dadu, Mehar and the town of Bhan Saeedabad from flooding.

Manchar Lake is connected with Hamal Lake by the Main Nara Valley Drain built in 1921. The average depth is only 2.5 to 3.75 meters. It is 6 meters lower than the bed of the Indus, and sometimes catches floodwater from the river, while in winter when the river is low, water flows from the lake into the Indus. Manchar Lake collects water from numerous small streams in the Kirthar Mountains, and then empties into the Indus River through Aral Wah.

Surface runoff generated from torrential flows in Balochistan flowed along FP Bund and Drains such as RBOD & MNV in Sindh province. Flood water entered in the pocket between FP Bund and MNV drain and other compartment between MNV drain and Suprio Bund which ultimately affected all drainage system in the area. Due to very heavy rainfall in Larkana Division, all the drains were flowing above their maximum gauges and chocked due to inadequate drainage capacity due to flat slope (1 foot per 03 miles i.e. 01 meter per 10 KM).

To stimulate drainage from the area, several relief cuts were provided and to avoid afflux and spreading water in larger area. After Manchar Lake attained ever Maximum Level of R.L. 123 feet on 4th September 2022, relief/ controlled cuts in the Manchar Lake Bank at RD 14 & RD 52 were also made to save Sehwan Sharif & Dadu city. This was followed by four (4) Relief Cuts made in Larkana-Sehwan (LS) Bund:

- 1st Cut at Mile 95/6 (8th September 2022);
- 2nd Cut at Mile 99/2 (9th September 2022);
- 3rd Cut made at Mile 97/2 (10th September 2022); &
- 4th Cut made at Mile 96/0 (12th September 2022)

After evacuation of flood water, all the breaches and relief/controlled cuts were plugged by the Irrigation Department, Government of Sindh. The flood water level raised beyond the top level of FP Bund which caused breaches at many locations. The detail of main breaches which occurred in the flood protection and irrigation infrastructure are given in Table 3.10.

Table 3.10: Major Breaches caused in FP Bund & Suprio Bund in Sindh

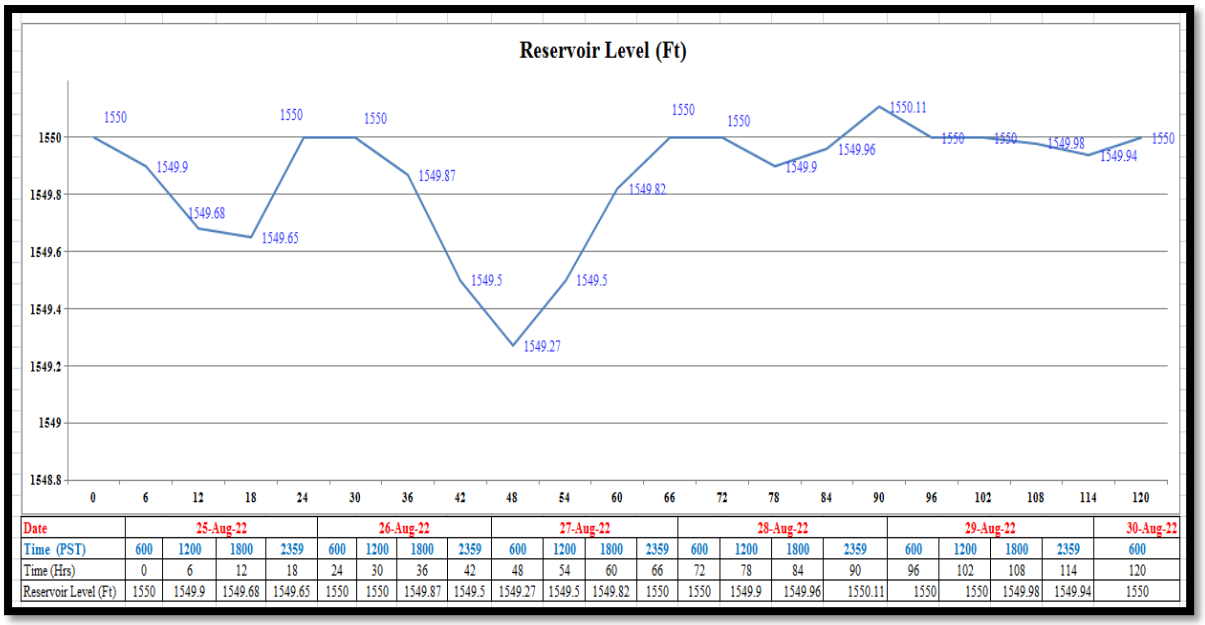
Sr. #	Name of Bund	Date	Time	Breach RD
1.	FP Bund	25.08.2022	07:30 PM	340
2.	FP Bund (Balochistan)	26.08.2022	03:00 PM	169
3.	FP Bund	27.08.2022	06:00 AM	432
4.	FP Bund	27.08.2022	02:00 PM	476
5.	FP Bund	28.08.2022	05:30 AM	200
6.	Suprio Bund	28.08.2022	10:00 PM	52
7.	Suprio Bund	29.08.2022	06:00 AM	12
8.	Suprio Bund	29.08.2022	10:00 AM	28
9.	Suprio Bund	30.08.2022	02:00 AM	82
10.	Suprio Bund	30.08.2022	05:00 AM	42
11.	Manchar Bund	04.09.2022	11:00 AM	14
12.	Manchar Bund	05.09.2022	02:00 AM	52
13.	MNV Drain	04.09.2022	06:00 AM	2,318
14.	MNV Drain	05.09.2022	07:00 AM	8,068
15.	LS Bund	08.09.2022	08:00 PM	95/6
16.	L/S Bund	09.09.2022	08:00 AM	99/2
17.	LS Bund	10.09.2022	06:00 AM	97/2
18.	L/S Bund	12.09.2022	09:30 PM	96/0

In addition to above, several relief cuts were made in the irrigation infrastructure to drain out the rain water from cities, towns and fields. Irrigation and canal network in Sindh sustained 5,412 natural/ controlled breaches because of 2022 floods. Subsequently, after dewatering/ evacuation of flood water, all the breaches and controlled cuts were plugged by Irrigation Department, Government of Sindh.

3.5.4 Flood Routing through Major Reservoirs during Monsoon 2023

The water level at Tarbela Dam initially remained down upto 30th June 2022; however, afterwards, it started increasing gradually and the Tarbela attained its maximum conservation level (MCL) of 1550 feet on 20th August 2022. The outflows at Tarbela Dam were adjusted with the view to avoid peak at Khairabad (junction point of rivers Indus & Kabul). Around 57,000 cusecs were discharged into the Ghazi Barotha Power Channel. Adjustments in water levels of **Tarbela Reservoir** helped in reducing inflows at Khairabad near to 600,000 cusecs; otherwise Khairabad could have received upto 700,000 cusecs or even more. River Indus at Khairabad (junction point after merging river Kabul in the Indus) experienced a peak discharge of 602,400 cusecs on 27th August 2022.

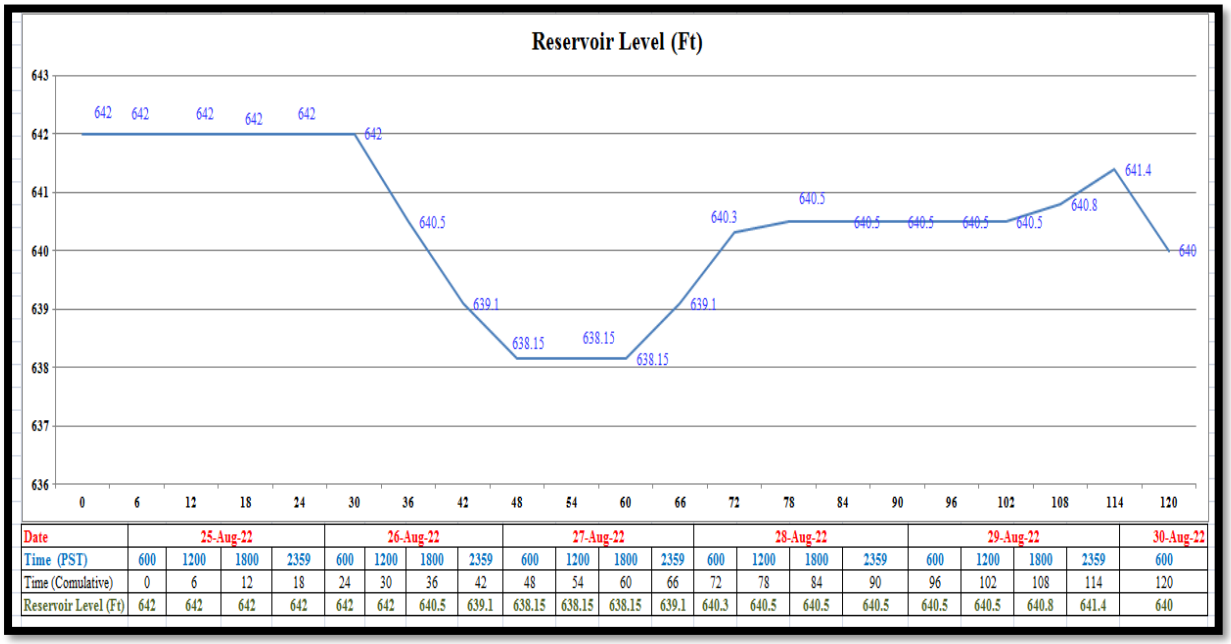
Graphical demonstration of flood routing done at **Tarbela Dam** during High Flows in Indus & Kabul from August 25-30, 2022 seen in **Figure 3.5**.



Date	25-Aug-22				26-Aug-22				27-Aug-22				28-Aug-22				29-Aug-22				30-Aug-22
Time (PST)	600	1200	1800	2359	600	1200	1800	2359	600	1200	1800	2359	600	1200	1800	2359	600	1200	1800	2359	600
Time (Hrs)	0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120
Reservoir Level (Ft)	1550	1549.9	1549.68	1549.65	1550	1550	1549.87	1549.5	1549.27	1549.5	1549.82	1550	1550	1549.9	1549.96	1550.11	1550	1550	1549.98	1549.94	1550

Figure 3.6: Flood Routing through Tarbela Dam during High Flows in Indus & Kabul from August 25-30, 2022

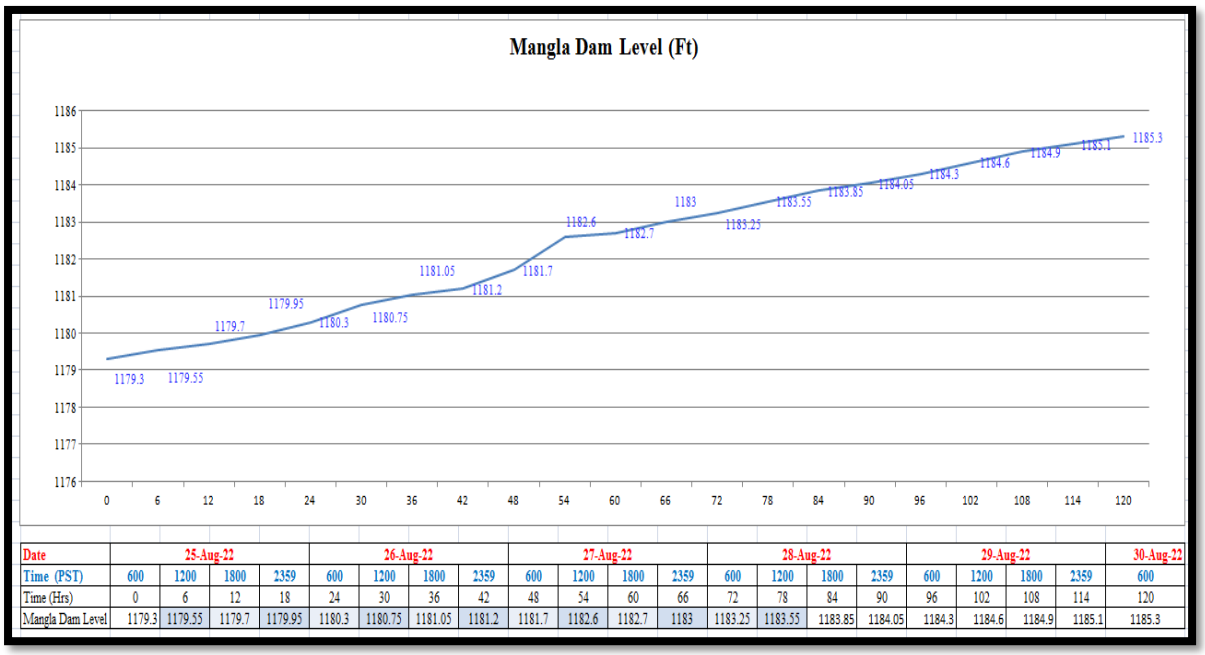
FFC also effectively ensured Flood Routing through Chashma Reservoir during the period from August 26-30, 2022 in order to absorb upstream flood peaks. **Chashma reservoir** was emptied on August 26, 2022 and operated with minimum possible water levels during last week of August 2022 in order to ensure minimum possible amount of downstream flows towards Sindh province where torrential flash floods and pluvial flooding had already struck the communities at large. In parallel, FFC also strictly advised all concerned organizations including field formations of Irrigation Departments Punjab and Sindh to remain on "High Alert" and ensure unhalted flood fighting as and when needed owing to intense pressure of flood water on existing flood protection infrastructure that may cause breaches in the flood protection bunds. Reservoir Level variations from August 25-30, 2022 regarding Flood Routing done through **Chashma Reservoir** are demonstrated in **Figure 3.7.**



Date	25-Aug-22				26-Aug-22				27-Aug-22				28-Aug-22				29-Aug-22				30-Aug-22
Time (PST)	600	1200	1800	2359	600	1200	1800	2359	600	1200	1800	2359	600	1200	1800	2359	600	1200	1800	2359	600
Time (Comulative)	0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120
Reservoir Level (Ft)	642	642	642	642	642	642	640.5	639.1	638.15	638.15	638.15	639.1	640.3	640.5	640.5	640.5	640.5	640.5	640.8	641.4	640

Figure 3.7: Flood Routing through Chashma Reservoir during High Flows in Indus & Kabul from August 25-30, 2022

Mangla Dam storage remained much below the expectation of IRSA due to less rainfall in its catchment upstream during the monsoon season 2022. Mangla Dam Authorities managed to also retain inflows at Mangla Reservoir which could reach at El: 1193.10 feet against its MCL of 1242.00 feet on 16th August 2022 at 1800 hours. Filling of Reservoir helped to retained inflows upstream. Water level variations at Mangla Dam from August 25, 2022 to August 30, 2022 are illustrated in **Figure 3.8.**



Date	25-Aug-22				26-Aug-22				27-Aug-22				28-Aug-22				29-Aug-22				30-Aug-22
Time (PST)	600	1200	1800	2359	600	1200	1800	2359	600	1200	1800	2359	600	1200	1800	2359	600	1200	1800	2359	600
Time (Hrs)	0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120
Mangla Dam Level	1179.3	1179.55	1179.7	1179.95	1180.3	1180.75	1181.05	1181.2	1181.7	1182.6	1182.7	1183	1183.25	1183.55	1183.85	1184.05	1184.3	1184.6	1184.9	1185.1	1185.3

Figure 3.8: Retention of Inflows at Mangla Dam during August 25-30, 2022

3.5.5 Flood Position in Indus River Tributaries

River Chenab attained peak discharge of 210,936 cusecs (High Flood) at Marala Barrage on 28th July 2022. On 12th August 2022, the Chenab flowed with peak discharge of 210,945 cusecs (High Flood stage) at Khanki and peak discharge of 202,000 cusecs (High Flood stage) at Qadirabad. The Chenab at Trimmu & Panjnad flowed in normal condition with peak discharge of 112,891 cusecs & 112,564 cusecs respectively. Other main Rivers (**Rivers Jhelum & Sutlej)** had been flowing in Normal Flow Conditions. **Ravi River** flowed in Low Flood at Jassar on 16th August 2022; however, it remained in Normal Flow conditions at Sulemanki and Islam.

3.5.6 Escapages below Kotri during 2022 Monsoon

Escapages below Kotri Barrage observed during the Monsoon Season 2022 are given in **Table 3.11**

Table 3.11: Downstream Kotri Escapages Kharif 2022 (April-September 2022)

Month	Releases in MAF
April	0.008
May	0.01
June	0.01
July	1.99
August	13.95
September	22.35
Total	**38.315 MAF** *(including Flows from Manchar Lake)*

Source: IRSA

Hill torrents generated about 9 MAF of water during monsoon season 2022. Detail is given below:

→ 1.691 MAF from Tarbela-Chashma Reach
→ 4.618 MAF from Chashma –Taunsa Reach
→ 0.702 MAF from Taunsa-Guddu Reach
→ 0.874 MAF from Guddu-Sukkur Reach
→ 1.083 MAF from Sukkur-Kotri Reach

Total = 8.968 MAF

3.5.7 Flood Peaks Recorded during Major Historical Floods

Highest ever recorded flood peaks at various control points of Indus Basin are given in the **Table 3.12**. Flood peaks recorded at important control structures across major rivers during 2022 Monsoon Season are given in **Table 3.13.**

The details about flood flows (inflows & outflows) of major rivers observed during Monsoon Season 2022 at important control structures i.e. Reservoirs & Barrages are attached as **Appendix-II,** whereas rainfall data of Monsoon Season 2022 is attached as **Appendix-III**.

Historic Escapages below Kotri Barrage (1976 to 2021) as received from IRSA are also attached as **Appendix-IV**.

Table: 3.12: Historic Peak Discharges (Cusec) in Major Rivers -Continued

Site	Design Capacity	Historic Max. Flood	Max of 1973	Max of 1975	Max of 1976	Max of 1988	Max of 1992	Max of 1993	Max of 1994
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
River Indus									
Tarbela	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	
Kalabagh	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	
Chashma	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	
Taunsa	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	
Guddu	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	
Sukkur	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	
Kotri	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									
Mangla	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	
Rasul	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									
Marala	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	
Khanki	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	
Qadirabad	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	
Trimmu	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	
Panjnad	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									
Madhopur	----------	9,20,000 25-9-88	----------	----------	----------	9,20,000 25-9-88	1,55,000 10-9-92	4,50,000 10-7-93	
Jassar	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	
Ravi Syphon	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	
Shahdara	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	
Balloki	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	
Sidhnai	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									
Sulemanki	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	
Islam	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: 3.12: Historic Peak Discharges (Cusec) in Major Rivers (Continued)

Site	Max of 1994	Max of 1995	Max of 1996	Max of1997	Max of 1998	Max of 1999	Max of 2000	Max of 2001	Peak 2002
1.	10.	11.	12.	13.	14.	15.	16.	17.	18.
River Indus									
Tarbela	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	
Kalabagh	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	
Chashma	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	3,00500 25-7-2017	
Taunsa	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	
Guddu	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	
Sukkur	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	
Kotri	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									
Mangla	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	
Rasul	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									
Marala	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	
Khanki	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	
Qadirabad	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	
Trimmu	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	
Panjnad	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									
Madhopur	1,75,000 7-7-94	3,32,000 5-9-95	1,32,000 23-8-96	1,21,000 28-8-97	----------	----------	----------	----------	
Jassar	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	
Ravi Syphon	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	
Shahdara	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	
Balloki	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	
Sidhnai	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									
Sulemanki	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	
Islam	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 27-7-200	3,500 23-8-2017	

Table continuing ahead on the subsequent page

Table: 3.12: 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											
Tarbela	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	
Kalabagh	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	
Chashma	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	
Taunsa	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	
Guddu	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	
Sukkur	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	
Kotri	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											
Mangla	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	
Rasul	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											
Marala	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	
Khanki	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	
Qadirabad	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	
Trimmu	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	
Panjnad	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											
Madhopur	-	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	
Jassar	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	
Ravi Syphon	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	
Shahdara	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	
Balloki	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	
Sidhnai	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											
Sulemanki	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	
Islam	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: 3.12: Historic Peak Discharges (Cusec) in Major Rivers

Site	Max of 2012 Outflow	Max of 2013 Outflow	Max of 2014 Outflow	Max of 2015 Outflow	Max of 2016 Outflow	Max of 2017 Outflow	Max of 2018 Outflow	Max of 2019 Outflow	Max of 2020 Outflow	Max of 2021 Outflow
1.	28.	29.	30.	31.	32.	33.	34.	35.	36.	37.
River Indus										
Tarbela	278000 05-8-12	338,100 14-8-13	240,100 15-8-14	486,900 26-7	3,02,900 17-7	3,36,000 03-8	242,300 2-8	311700 9-8	3,35,800 02-9	2,70,000 22-07
Kalabagh	277000 17-7-12	472,303 13-8-13	249,992 25-7-14	528,698 02-8	3,51,490 05-7	419,460 03-8	311,154 15-8	354830 15-8	4,57,031 02-9	2,91,309 01-08
Chashma	285500 08-7-12	620,672 14-8-13	257,632 22-6-14	636,512 3-8	3,73,659 05-7	446,361 05-8	319,912 15-8	370823 2-8	4,73,447 04-9	3,44,907 02-08
Taunsa	235400 10-9-12	516,017 17-8-13	233,110 18-7-14	604714 5-8	3,43,024 05-7	423,861 06-9	276,215 17-8	378194 14-8	4,79,866 06-9	3,06,489 04-08
Guddu	236100 10-9-12	542,100 20-8-13	34,0864 18-9-14	735,246 3-8	2,97,928 11- 7	428,640 09-8	227,270 20-8	386041 21-8	5,40,750 09-09	2,66,344 07-08
Sukkur	210000 14-9-12	454,995 24-8-13	26,8935 20-9-14	660216 5-8	2,25,205 19-8	333,108 11-8	156,025 21-8	303625 22-8	4,58,390 10-9	19,3,045 07-08
Kotri	138800 21-9-12	344,866 30-8-13	11,0345 25-9-14	603084 5-8	1,38,455 10-8	210,923 18-8	60,740 26-8	198579 29-8	2,83,910 19-9	95,085 12-08
River Kabul										
Nowshera	1,00,700 8-712	155,100 15-6-13	1,18,100 4-7-14	165800 NR	80,700 04-7	87,000 12-7	1,05,300 24-7	1,05,000 29-8	1,51,000 02-9	87,400 22-07
River Jhelum										
Mangla	44700 05-8-12	45,214 13-8-13	500,000 5-9-14	109232 26-7	62,701 07-8	67,882 22-9	69,127 7-7	125171 17-6	1,25,803 28-8	80,315 01-08
Rasul	31400 05-8-12	23,610 19-9-13	516,000	99100 27-7	46,562 27-8	39,230 22-9	39,230 8-7	90554 19-6	1,26,951 28-8	43,135 15-06
River Chenab										
Marala	149200 04-8-12	369,690 15-8-13	858,000 6-9-14	153408 12-7	3,93,690 07-8	1,87,472 19-7	168,278 13-8	211000 31-7	2,98,884 27-8	1,71,150 29-07
Khanki	186400 04-8-12	410,331 15-8-13	947,000	152000 13-7	4,18,736 07-8	1,70,021 13-7	182,025 13-8	181944 31-7	2,86,230 28-8	1,83,688 29-07
Qadirabad	180800 05-8-12	403,403 15-8-13	904,000	161100 13-7	4,05,542 08-8	1,57,842 19-7	172,031 14-8	159544 1-8	2,67,540 28-8	1,67,812 29-07
Trimmu	73700 07-8-12	267,609 20-8-13	626,000	135000 13-7	1,53,339 10-8	89,345 05-8	81,680 16-8	93021 22-8	1,96,077 01-9	1,06,967 31-07
Panjnad	65600 17-9-12	3,17,261 25-8-13	45,3570 16-9-14	135866 30-7	116029 13-8	63488 8-8	87383 27-8	70556 26-8	133646 05-9	59,725 03-08
River Ravi										
Jassar	30500 26-8-12	67,700 16-8-13	67,700 7-9-14	36100 15-8	38,400 08-8	46,439 10-8	66,641 25-9	51000 18-8	30690 28-8	20,200 27-08
Ravi Siphon	39800 24-8-12	73,600 18-8	93,300 8-9-14	39200 24-9	45081 28-7	46100 2-8	37,936 14-8	37936 19-8	34,531 28-8	37228 14-7
Shahdara	40800 22-8-12	74,880 17-8-13	91,400 8-9-14	38400 24-9	44,595 08-8	39,313 02-8	37,587 14-8	37200 19-8	34,308 28-8	36,477 14-07
Baloki	29300 23-8-12	97,970 18-8-13	118,000 9-9-14	57700 24-9	37,165 09-8	36,790 11-8	39,310 16-8	34900 19-8	37,250 29-8	32,200 22-07
Sidhnai	24600 14-9-12	73,504 23-8-13	71,112 12-9-14	38500 28-7	12325 1-8	26954 7-8	8857 1-8	15384 2-9	28800 31-8	11,215 25-08
River Sutlej										
Sulemanki	16900 9-9-12	78,846 22-8-13	21,383 7-9-14	49600 17-8	24,492 31-8	20,893 15-8	34772 19-8	66459 24-8	11897 24-7	7,212 15-09
Islam	12700 13-9-12	70,932 25-8-13	17,807 8-9-14	43300 21-3	11145 31-8	14221 16-8	16460 3-10	52355 31-8	6609 26-8	3,971 18-09

Source: FFC/PIDs/WAPDA/IRSA

Table 3.13: Flood Peaks (Cusec) Recorded During 2022 Monsoon Season

Sites	Historic Peaks (Previous Years)		Peak Inflows -2022		Peak Outflows -2022		Classification
	Outflow	Date	Inflow	Date & Time	Outflow	Date & Time	
River Indus							
Tarbela*	604,000	30-7-2010	404,000	26-08 at 2359 hrs	419,600	26-08 at1800 hrs	Medium Flood
Kalabagh	950,000	14-7-1942	427,217	28-08 at 0600 hrs	423,271	28-08 at 0600 hrs	Medium Flood
Chashma^	1036,673	01-8-2010	525,437	28-08 at 1200 hrs	523,937	28-08 at 1200 hrs	**High Flood**
Taunsa	959,991	02-8-2010	622,095	30-08 at 0600 hrs	622,095	30-08 at 1500 hrs	**High Flood**
Guddu	1199,672	15-8-1976	576,075	23-08 at 1800 hrs	576,075	23-08 at 1800 hrs	**High Flood**
Sukkur	1161,000	16-8-1976	579,753	25-08 at 0600 hrs	579,753	25-08 at 0600 hrs	**High Flood**
Kotri	981,000	14-8-1956	626,193	10-09 at 0600 hrs	600,018	10-09 at0600 hrs	**High Flood**
River Kabul							
Nowshera	450,000	29-07-2010	-	-	336,500	28-08 at1800 hrs	**V. High Flood**
Warsak			-	-	139,086	27-08 at 12:30 hrs	**High Flood**
River Jhelum							
Mangla~	1090,000	10-09-1992	100,000	28-07 at1200 hrs	50,171	11-10 at 1800 hrs	Normal
Rasul	952,170	10-9-1992	37,045	28-06 at 1800 hrs	23,610	22-06 at 1200 hrs	Normal
River Chenab							
Marala	1100,000	26-8-1957	226,000	28-07 at 1600 hrs	211,000	28-07 at 1600 hrs	**High Flood**
Khanki	1086,460	27-8-1959	216,907	12-08 at 0500 hrs	210,945	12-08 at 0500 hrs	**High Flood**
Qadirabad	948,530	11-09-1992	221,149	12-08 at 1000 hrs	202,149	12-08 at 1000 hrs	**High Flood**
Trimmu	943,225	08-7-1959	144,147	31-07 at 2359 hrs	122,115	18-08 at 1800 hrs	Normal
Panjnad	802,516	17-8-1973	121,764	03-08 at 0600 hrs	112,564	03-08 at 0600 hrs	Normal
River Ravi							
Jassar	680,000	05-10-1955	-	-	63,720	16-08 at 1500 hrs	Low Food
Shahdara	680,000	22-9-1988	-	-	31,415	02-08 at 0600 hrs	Normal
Balloki	336,200	28-9-1988	55,245	18-08 at1800 hrs	35,235	03-08 at 0600 hrs	Normal
Sidhnai	330,210	02-10-1988	26,552	13-08at 0600 hrs	22,843	28-07 at2359hrs	Normal
River Sutlej							
Suleimanki	598,872	08-10-1955	24,785	20-07 at0600 hrs	17,876	20-07 at0600 hrs	Normal
Islam	492,581	11-10-1955	13,326	23-07 at 1800 hrs	12,501	23-07 at 1800 hrs	Normal

* Max. Water Level = 1550.12 feet on 3-9-2022 at 0600 hrs.
^ Max. Water Level = 649.00 feet on 12-7 at 2359 hrs.
~ Max. Water Level = 1193.10 feet on 16-9 at 1200hrs

Source: FFC/PIDs/WAPDA/IRSA

3.5.8 Post Disaster Assessment of Damages and their Restoration Cost

In order to obtain preliminary physical damage and economic loss assessment from provinces and federal line agencies with respect to 2022-floods, a Flood Coordination Cell was established in Ministry of Planning, Development & Special Initiatives. For Post Disaster Need Assessment (PDNA) exercise, three committees were constituted and focal persons nominated.

An Orientation meeting was organized on different sectors by the Asian Development Bank (ADB) and the World Bank (WB). They also shared templates mutually agreed with development partners for collecting useful information. For Sectoral Technical Committee, Ministry of Water Resources nominated Mr. Ahmed

Kamal, Chief Engineering Advisor/ Chairman Federal Flood Commission as a Focal Person for the PDNA assignment. An online Orientation Meeting for Post Disaster Needs Assessment (PDNA) was held on **9th September 2022**.

All the stakeholder including Provincial Irrigation Departments (Punjab, Sindh, Khyber Pakhtunkhwa, Balochistan), Federal Line Agencies (WAPDA, G-B & AJ&K) were requested for submission of damaged infrastructure details as per finalized proforma by Development Partners on **9th September 2022.**

Interim data regarding Irrigation, Drainage & Flood Protection Infrastructure of WAPDA, PIDs & FLAs (on the template shared by ADB) was forwarded to Ministry of Water Resources and copy to M/o PD&SI, & SUPARCO on **20th September 2022**. Meeting of the Strategic Policy Committee on Post Disaster Needs Assessment (PDNA) was held on **21st September 2022**. Focal Persons of PIDs were requested for submission of finalized damages data to M/o PD&SI under intimation to FFC on **22nd September 2022**. Online PDNA Core Team Meetings were held on **24th September 2022** and 28th **September 2022**.

On the direction of M/o PD&SI, damaged infrastructure details were shared with the World Bank, ADB and Ministry of Planning Commission on **30th September 2022**. Final damaged infrastructure details were shared with the World Bank, ADB, UNDP and Ministry of Planning Commission on **6th October 2022**.

Total damages occurred to Irrigation, Drainage and Flood Protection Infrastructure in Punjab, Sindh, Khyber Pakhtunkhwa (Including Merged Areas), Balochistan, G-B and AJ&K alongwith WAPDA during Monsoon Season 2022 were reported to the tune of **Rs 154.465 billion**. Summary of the damages is given in **Table 3.14**:

Table 3.14: Damages to Irrigation, Drainage & Flood Protection Infrastructure

Sr. #	Province/ Region	No. of Structures Damaged	Estimated Cost (Rs. in Billion)
A.	**WAPDA**		
1.	WAPDA	31	9.393
	Sub-Total (A)	**31**	**9.393**
B.	**PIDs & Federal Line Agencies (FLAs)**		
2.	Punjab	204	5.208
3.	Sindh *(Including Small Dams)*	1,366	94.78
4.	Khyber Pakhtunkhwa	2,885	22.387
5.	Balochistan (Including Small Dams)	974	22.18
6.	Azad Jammu & Kashmir ***(Water Channels, Water storage tanks & Flood Protection Structures)***	82	0.115
7.	Gilgit-Baltistan	464	0.402
	Sub-Total (B)	**5,975**	**145.072**
	Grand Total (A+B)	**6,006**	**154.465**

The above damages to the water related infrastructure caused by the 2022 floods have been indicated in PDNA Report as US$710.6 million. The highest damage was reported to the flood protection infrastructure is US$258.5 million (36 %) followed by damage to Irrigation Channels as US$229.9 million (32 %). The subsequent damages as reported to drainage system are US$96.6 million (14 %); dams, Headworks, and weirs as US$66.4 million (9 percent); and other supporting infrastructure at US$59.3 million (8 percent) besides damages to Tube wells and inspection roads, reported as under assessment.

According to Post-Disaster Needs Assessment (PDNA) Report dated October 28, 2022, total 2022 flood damages have been assessed to exceed **USD 14.91 billion** and total economic losses to reach about **USD 15.23 billion**. Estimated needs for Rehabilitation and Reconstruction in a resilient way are at least **USD 16.26 billion.** Sector-wise details of 2022 Flood Damage, Losses and Restoration/ Rehabilitation & Reconstruction Needs are shown in **Figure 3.9**:

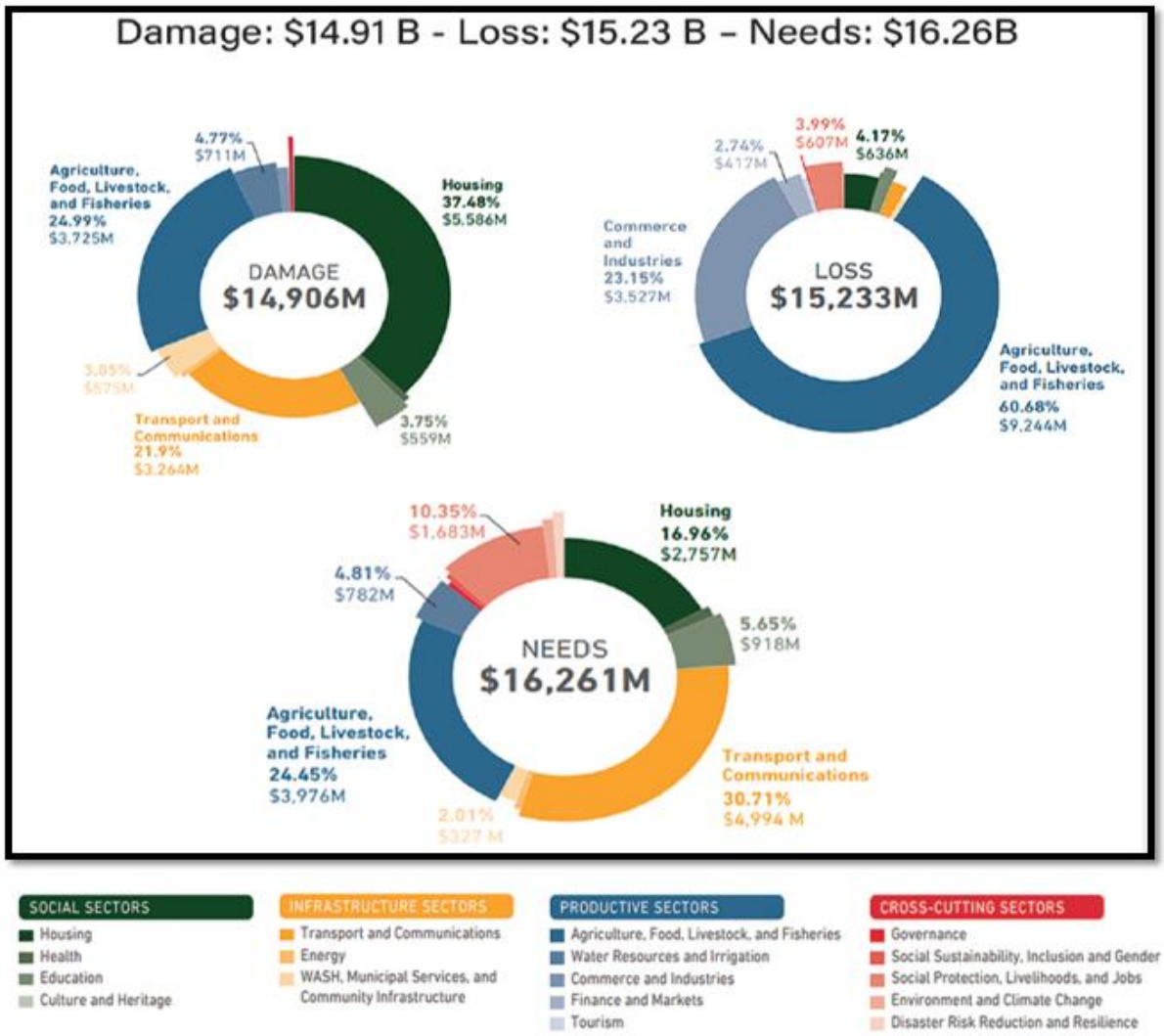


Figure 3.9: Sector wise detail of 2022 Flood Damage, Losses and Restoration/ Rehabilitation & Reconstruction Needs

3.5.9 Country-Wide 2022 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, Khyber Pakhtunkhwa, Balochistan, Gilgit-Baltistan & AJK due to torrential rains & flash floods during Monsoon Season 2022 are given in **Table 3.15.**

Table 3.15: Country-Wide 2022 Flood Damages to Public & Private Properties

Province/ Region	Persons Died	Persons Injured	Houses Damaged	Roads (km)	Bridges	Livestock	Affected Population
Punjab (including ICT)	224	3858	67,981	877	15	205,106	4,844,253
Sindh	799	8422	1,885,029	8,389	165	436,435	14,563,770
Khyber Pakhtunkhwa (incl. Merged Areas)	309	370	91,464	1,575	107	21,328	4,350,490
Balochistan	336	187	241,659	2,222	58	500,000	9,182,616
AJ&K	48	24	555	19	33	792	53,700
Gilgit Baltistan	23	06	1,793	33	61	609	51,500
G. TOTAL	**1739**	**12867**	**2,288,481**	**13,115**	**439**	**1,164,270**	**33,046,329**

*Source; NDMA

3.5.10 Futuristic Measures to avoid 2022 Floods like devastation

Pakistan Engineering Council (PEC) organized a Brainstorming Session on **28th September 2022** regarding 2022 torrential flash floods and assessment of damages occurred to overall Infrastructure in Pakistan. The agenda of the session was to constitute a high profile PEC's Technical Committee under the leadership of Chairman, PEC to identify the root-causes of recent devastating flash floods of 2022 across Pakistan, make recommendations for rapid rehabilitation and recommend Way Forward to avoid such major destruction in future. Accordingly, a Central Technical Committee was constituted by PEC and subsequently two meetings of the Committee were held respectively on **16th November 2022** and **22nd December 2022** at PEC's HQ office at Islamabad.

Based on the above, a Policy Paper was prepared to identify the root-causes of recent devastating flash floods of 2022, make recommendations for rapid rehabilitation and take futuristic measures to avoid such major destruction in future. This paper identifies main causes of 2022 floods as (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. Ever highest rains in Sindh and Balochistan made the situation more devastating. Since concerned authorities were not prepared for such sudden high downpour and drainage system was not operating properly, 2022 flash flood water couldn't be evacuated in time and heavy damage occurred. Encroachments in the waterways were also big obstruction in safe evacuation/ drainage of water. Further, Roads were either seriously damaged or inundated so the heavy machinery could not reach on site in time.

Based on the assessment of causes of 2022 floods stated above, following are some of the important measures recommended to avoid wide-spread flood devastation in the country, in future: -

a. Immediate implementation of Fourth/ 4th National Flood Protection Plan which is already too late and further delay will cause loss to exchequer. The implementation of NFPP-IV has also been strongly recommended under 4RF (Resilient, Recovery, Rehabilitation & Reconstruction) Framework Report prepared by PD&SI Division.

b. Construction of water storages, in particular for hill torrent regions. Early completion of under construction dams and immediate execution of already planned dams.

c. 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.

3.5.11 Post 2022 Floods Recommendations by International Experts

In wake of devastating 2022-floods, Chinese Governmental Flood Control Expert Group and Dutch DRR Mission visited Pakistan respectively in October 2022 & December 2022 and had in-person meetings with the stakeholder departments besides field visit to flood affected areas in Sindh province. With a view to ensure enhanced protection against future floods, Key recommendations made by the **Chinese Governmental Flood Control Expert Group** are given below:

- Construction Management of River-Related projects of Provinces to incorporate flood governance i.e. providing outlets for flood flows and space for flood storage;
- Reinforcement of major Flood Protection Bunds/Dikes;
- Construction of River Regime Control & Deflection Structures for major river reaches of Lower Indus;
- Flood Control through linking/ connecting rivers, drains/ canals etc.;

- Dredging of Drains and improve Drainage Capacity of Farmlands in areas prone to torrential and pluvial flash floods;
- Flood control required for managing floods exceeding design standards;
- Development of rainstorm & flash flood analysis models for small watersheds/ catchments of hill torrents;
- Forecasting Technology for Snow and Glacial Lakes Outburst (GLOFs);
- Measures for improving transmission of flood early warnings at communities' level;
- Build a National High-Resolution Comprehensive Database containing all elements of hydro metrology/ climatology;
- Formulation of an authoritative and binding Flood Prevention Plan and subsequent Flood Control Regulation scheme for Indus River Basin, by the Federal Government.

Likewise, **Dutch Experts,** based on their post 2022 flood analysis, made following key recommendations: -

- Thorough analysis of 2022 floods based on hydrodynamic and 2-dimentional modeling with LiDAR data (with overarching focus on Sindh province);
- Assessment of various flood generation processes and regional climate change analysis (PMD/GCISC etc.);
- Re-assessment of flow capacity and velocity of rivers (Through a separate study);
- Study on watershed management of dry land hill torrents;
- Analysis of existing Flood Management SOPs of important irrigation and drainage structures;
- Review of NFPP-IV and past flood events to formulate a proper NFPP-V including appropriate enhancement of drainage systems and measures for hill torrents flows;
- A planning study on operational requirements and potential of existing and under construction vis-à-vis new feasibility studies on multipurpose dams;
- Linking all the ongoing and upcoming projects with cross cutting issues of flood risk;
- Strengthening water governance at 'sub-basin' and 'basin' scale (through IRSA);
- Providing flood shelters in low lying areas of Sindh province and improving drainage;
- Introduce Nature based solutions through spatial catchment planning in hill torrent areas and land-use rights for community-based rainwater harvesting, improved vegetation/grazing and flood dispersion structures for water use and flood control;
- Updating of existing flood forecasting systems to incorporate the impact of newly introduced major infrastructure works (bridges, dikes etc.);
- Extension of present flood forecasting system to cover pluvial flooding; &

- An audit of legal frameworks and mandates to clarify the mandate of different organizations to eliminate overlaps in national and provincial strategic control.

JICA Experts also visited Pakistan after 2022 floods and recommended that disaster risk reduction should be considered as a development issue through the Sendai Framework. They stressed to recognize importance of intensive development on Flood DRR in Indus River to protect flood plains with concentration of population and assets. Subsequently, Government of Japan through JICA is supporting Pakistan side for conducting dikes' diagnostic survey, installation of 45 flood telemetry stations across the country and also for revamping of flood damaged dikes/ structures located along the Indus River & its tributaries.

Post 2022-flood visit of **US Delegation** was hosted by NDMA. US delegates also visited FFC and suggested for Bilateral cooperation in the field of Hydrological and Hydraulic Modelling for flood forecasting in the Upper Indus Basin using some existing HEC-HMS Rainfall/Snowpack/Snowmelt/Runoff models mostly above Tarbela Reservoir, besides for modelling the watershed above Mangla Reservoir. Accordingly, Pakistan side proposed a long term Capacity Building Program for Flood Managers and Modelers of Pakistan through US Army Core of Engineers for future collaboration. Besides, a comprehensive program for Technical Capacity Development in the field of Water Management, particularly Flood Forecasting, may also be put together that would benefit the Pakistani Government and people.

3.6 Future Vision and Technical Initiatives of FFC

3.6.1 Role of FFC as Member of the National Flood Response Coordination Centre (NFRCC)

Given unprecedented nature of flood situation in Pakistan during current Monsoon Season, the Honourable Prime Minister[1] of Pakistan, on September 01, 2022, directed to establish of a National Flood Response Coordination Center (NFRCC) to better synergize national response to the disaster caused by ever extreme torrential flash flooding of 2022. NFRCC has representation from Federal Ministries (including MoWR), Provincial Governments and Armed Forces. **The CEA/CFFC was designated as Focal Person from MoWR** to attend daily meetings of NFRCC and coordinate various facets of the response to 2022 floods.

NFRCC was established under the headship of the Prime Minister of Pakistan and with Minister for Planning, Development and Special Initiatives as its Deputy Chairman, besides, Commander Army Air Defence Command as National Coordinator. The Secretariat of NFRCC was housed at the NEOC, ERRA Headquarters to function under the National Coordinator. NFRCC performed its functions as a bridge between Government Institutions, Disaster Management Authorities and donors to ensure a seamless rehabilitation process of flood affectees all across Pakistan.

The CEA/CFFC regularly attended the NFRCC meetings held so far. Daily update on overall flood situation including details related to flood situation at Manchar lake, LBOD, RBOD etc., routing of flood peaks through major reservoirs, evacuation of flood water through relief cuts as well as breaches that naturally occurred and subsequent status with regard to plugging of these breaches, was presented to NFRCC by the CEA/CFFC during entire flood/ monsoon season 2022. There held also the presentation sessions relating to structural flood damages that occurred to

[1] Reference PM's Office U.O. No. 3(1)/DS(Cabinet)/2022(559), dated 1st September 2022

existing flood protection, irrigation & drainage infrastructure and flood fighting activities carried out by the field formations in Provinces besides some presentation on other related topics (Like Thar Canal Project), as exclusively assigned by the NFRCC.

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

The 4th National Flood Protection Plan (i.e. NFPP-IV) was approved by CCI in its 31st 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 16th 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.

3.6.3 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.

3.6.4 FFC's Role for Preparation of 4 RF (Resilient, Recovery, Rehabilitation & Reconstruction) Framework and PDNA Report of 2022 floods

Almost all sectors of economy sustained phenomenal damages during the devastating 2022 floods. FFC coordinated with all stakeholder departments for collection of damages occurred to flood protection, irrigation and drainage infrastructure and provided tangible inputs to PDSI Division for preparation of Post-Disaster Needs Assessment (PDNA) Report of the 2022 Floods through ADB, WB etc. In view of historically extreme flood of 2022, PD&SI Division also prepared the 4 RF (Resilient, Recovery, Rehabilitation & Reconstruction) Framework Report highlighting the fiscal requirements to build back better (BBB). During the various meeting held in this regard, it was stressed by O/o CEA/CFFC that funding requirements for NFPP-IV and FPSP-III should be made part of the 4-RF report so that same is available once potential donors are approached through EAD to meet these requirements. Accordingly, implementation of updated FPSP-III and updated NFPP-IV has been strongly recommended under 4 RF (Resilient, Recovery, Rehabilitation & Reconstruction Framework) report.

3.6.5 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 alongwith 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.

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

The Ministry of Climate Change in collaboration with FFC, MoWR, and WWF-Pakistan has launched this 30 years long project, to address the environment challenges such as super floods, droughts and widespread rains and to build climate resilience of the most vulnerable communities living in the areas in the vicinity of Indus Basin. The project consists of three (03) phases with each phase spanning over ten (10) years. This long-term project envisions that by 2050, ecosystem-based adaptation contributes towards better climate resilience, water and food security and sustainable livelihood. More than 10 million people, which makes around 5% of Pakistan's population, will directly benefit from the project, while 20 million people across 50 vulnerable districts of Pakistan will be the indirect beneficiaries.

The Project will be implemented in selected sites, spanning over a stretch of 1,300 km of the Indus River, across Khyber Pakhtunkhwa, Punjab, Sindh and Balochistan. The sites will be selected based on (i) flood risks, (ii) climate projections, (iii) water storage, (iv) recharge potential, and (v) needs of the communities.

The Project will contribute to relevant policies and plans (National Climate Change Policy, National Water Policy, NFPP-IV and SDGs) and will lead to additional water reservoir capacity on the river system to regulate water discharge during high floods and will promote local rainwater harvesting and development of small storages on runoff the rivers during peak flows.

The vision, impact and project's components are described below: -

Vision: Ecosystem-based adaptation to flood risks contributes towards better climate resilience, water and food security and sustainable livelihoods in Pakistan

Impact: Reduction in flood risk and enhancement of water recharge in the Indus Basin, building resilience of approximately 10 million inhabitants of low lying areas and vulnerable ecosystems.

Main **components of the project** as the backbone of this project are as under;

(i) Ecosystem-based Adaptation for integrated Flood Risk Management;
(ii) Enhancing Resilience of vulnerable Communities to climate change; &
(iii) Enabling a paradigm shift Ecosystem-based Adaptation in Pakistan.

Rs. 6.00 Billion has been kept under FPSP-III for the implementation of prospective interventions. A detailed feasibility study/ assessment of the central Indus wetlands (downstream Tarbela Dam to downstream Sukkur Barrage) shall be conducted as a step-1 with one-year through GCF and will result in detailed funding proposal to be submitted to GCF. The purpose is to identify potential sites for flood plain and hill

torrent management in order to store extra flood water, revive the adjoining wetlands, recharge ground aquifers and provide social and economic benefits to the local communities.

3.6.7 Project for Capacity Development of Effective River Dikes Management Response to 2022 Flood

In response to the request from the Government of Islamic Republic of Pakistan (hereinafter referred to as "Pakistan") Japan International Cooperation Agency (hereinafter referred to as "JICA") Head Quarter dispatched Disaster Management Advisory Team on Flood Prospective from **October 31, 2022 to November 11, 2022**. The main purpose of the JICA's Advisory Team was to discuss about the Flood Telemetry GA Project, Rehabilitation work of Damaged Dikes/Embankments on Indus River and new Technical Cooperation scheme especially on Flood Management.

The JICA HQ Team held three (03) meetings with Federal Flood Commission (hereinafter referred to as "FFC") and other stakeholders (Provincial Irrigation Departments of Punjab & Sindh and WAPDA) respectively on **October 31, 2022** and **November 07 & 11, 2022** under the chairmanship of CEA/CFFC.

The JICA HQ Team also made a site visit to flood affected dike (SM Bund) situated downstream of Sukkur Barrage along left side of Indus River in Sindh Province. During the 2nd meeting held on **November 7, 2022**, FFC side presented draft application for a new Technical Cooperation Project "Project for Capacity Development of Effective River Dikes Management Response to 2022 Flood". The same was also discussed during 3rd meeting held on **11th November 2022**.

With regard to objections raised by Japanese Side regarding HR and Equipment support sought by FFC under Technical Cooperation, it was clarified that owing to acute resource constraints presently faced by FFC, it was becoming difficult for FFC to better accommodate the JICA Advisors already deputed to FFC in FFC building Complex, hence HR, Equipment and office space was also included by FFC, to be arranged with the support of Japanese Side under the Technical Cooperation Project. However, with a view to avail JICA's new Technical Cooperation Project facility, JICA Advisory Team's proposed amendments were accepted.

Owing to above, both sides agreed on the application document as suggested by JICA Disaster Management Advisory Team; the same stands submitted on **November 25, 2022** to the Embassy of Japan through EAD for further approval/ action by the Government of Japan.

3.6.8 Development of Climate Change adaptation related Measurement, Reporting and Evaluation (MRE) Guidelines for Water Sector

Ministry of Water Resources has recently (vide its U.O. letter No. 6 (45)/2022/Admn dated **November 22, 2022**) assigned the CEA/CFFC to lead the task for Development of Climate Change adaptation related Measurement, Reporting and Evaluation (MRE) Guidelines for Water Sector, in consultation with Global Change Impact Study Centre (GCISC), MoCC and other Stakeholders including CITEPA i.e. Inter-Professional Technical Centre for the Study of Atmospheric Pollution (*Abbreviated in French as CITEPA i.e.* Centre inter professional technique detrudes de la pollution atmosphérique). CITEPA is going to provide necessary technical assistance to accomplish this important task for water sector.

Earlier CITEPA, in coordination with GCISC has developed similar guidelines for Agriculture Sector in Pakistan, which would be presented in tomorrow's main Workshop. The O/o CEA/CFFC, in collaboration with MoWR, CITEPA and GCISC, organized 1st Workshop on **2nd December 2022** in the Committee Room of O/o CEA/CFFC at Islamabad. Earlier, a Pre-Workshop Discussion/Meeting with Stakeholder Organizations was also organized on **1st December 2022** in the Committee Room of O/o CEA/CFFC at Islamabad. Agenda of the workshops was to discuss potential inputs on Climate Change adaptation related MRE guidelines for the water sector.

During the workshop, CITEPA Representative made presentations about the methodological approaches (Impact Chain and Log frame) adopted for the water sector regarding development of MRE guidelines. Based on the proceedings of workshops, CITEPA has submitted draft outcome of the workshop and Way forward, which is being reviewed. Keeping in view broader scope of work to be covered for water sector, the CEA/CFFC urged CITEPA to plan series of consultations with the concerned departments in future (in addition to only one anticipated physical workshop likely to be held in January 2023) and to also ensure involvement of all stakeholders including from private sector, INGOs and academia etc.

3.6.9 TIKA Grant-in-Aid Project on Installation of Early Flood Warning System (WAPDA, PMD, O/o CEA/ CFFC), Estimated Cost Rs. 884.96 million

Consolidated Concept Clearance Paper (CCP) was framed collectively by PMD, WAPDA and FFC under the overall coordination of FFC. The scope comprises three main components as under;

Component-I;	Installation of Eighteen (18) No. Flood Telemetric Stations (**WAPDA**);
Component-II;	Strengthening of Flood Early Warning System (**PMD**); and
Component-III;	Institutional Strengthening and Capacity Building of Office of CEA/ CFFC.

Joint CCP based on inputs of PMD & WAPDA and in line with the decision taken in the meeting held in M/o (NFS&R) on **January 4, 2021** stands submitted to Ministry of PD&SI enroute MoWR for approval from CCC/ CDWP. FFC shall be the overall Coordination Agency whereas PMD and WAPDA will be the implementing partners. The project is included in the Pakistan-Turkey Strategic Economic Framework (SEF) and shall be taken-up for implementation once the CCP is approved and grant assistance under SEF is secured.

POWER WING

Karot hydropower project

OFFICE OF THE CHIEF ENGINEERING ADVISOR & CHAIRMAN
FEDERAL FLOOD COMMISSION, ISLAMABAD

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 three sanctioned posts of BS-19 remained vacant whereas services of officer of BS-18 were not available due to his attachment with Ministry of Water Resources and later on account of study leave abroad for MS degree further completing his MS degree he joined office and on now Mid-Career Management Course.

The assignments during 2022 were completed by Assistant Engineering Adviser (Power) in time. It is recommended to fill these 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 6.1** shows Organogram of the Power Wing.

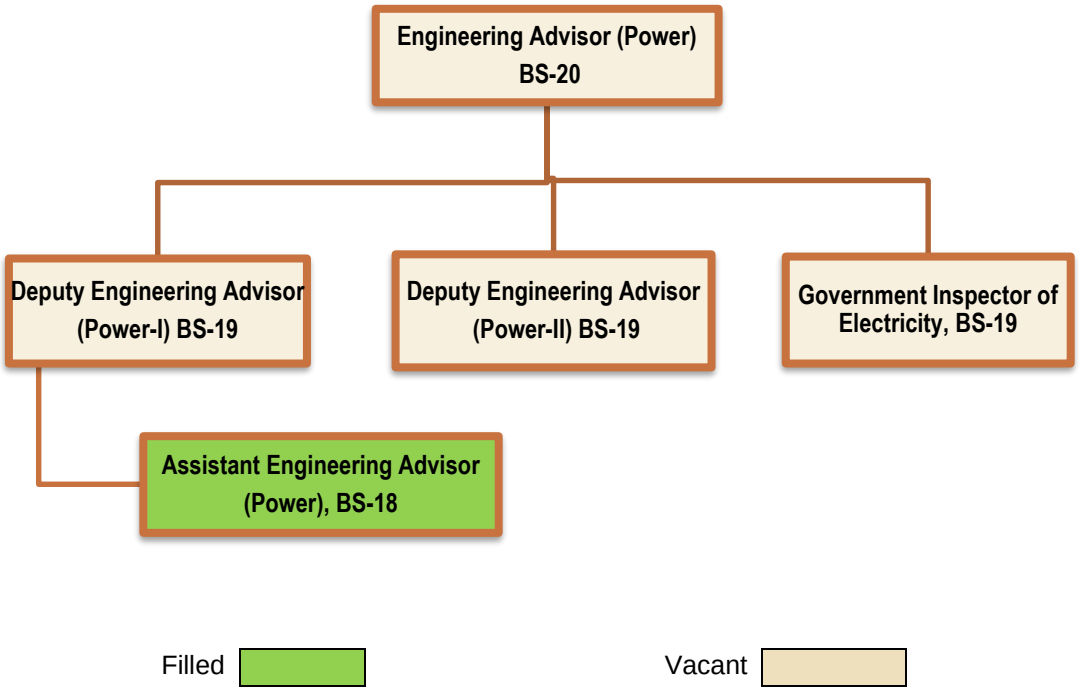


Figure 4.1: Organogram of the Power Wing

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 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 2022

The summary of annual performance of Power Wing for the year 2022 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	08	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 **Table 4.2.**
2.	WAPDA Inquiries	03	WAPDA Inquires involving technical and contractual matters were completed. Detail is given in **Table 4.3.**
3.	Power Transmission & Distribution Projects and Technical Matters.	16	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 **Table 4.4.**
4.	Miscellaneous Matters	09	Comments on certain miscellaneous matters were forwarded. Details are given in **Table 4.5.**
	TOTAL	**33**	

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

Sr. No.	Name of Project
1.	Jabban Rehabilitation Project-Submission of Project Completion Report
2.	Rehabilitation and Capacity Enhancement of Kurram Garhi Hydel Power Station from 04 MW to 5.16 MW.
3.	Submission of 2nd Revised PC-I of Golen Gol Hydropower Project through IPAs.
4.	Invitation to the 10th Expert Working Group on Energy Connectivity (10th EWG-EC), on December, 2022 (Pakistan)
5.	22 MW Jabban Rehabilitation Project – Replies to the Queries of MoWR on Project Completion Report (PC-IV).
6.	Replies - Submission of 2nd Revised PC-I of Golen Gol Hydropower Project through IPAs.
7.	Replies - Rehabilitation and Capacity Enhancement of Kurram Garhi Hydel Power Station from 04 MW to 5.16 MW.
8.	Monthly Progress Report for the month of October, 2022.

Table 4.3: WAPDA Inquiries Completed

Sr. No.	Name of Inquiry
1.	Inquiry Committee regarding Audit Para No.5/ KFW Loan No. 2009 66 309-Keyal Khwar Hydropower Project Pattan loss due to Levy of Commitment Charges on Unused Loan - Rs. 25.787 Million.
2.	Inquiry Report on Para Nos.1&2 of Audit Report 2020-21 for Foreign Aided Projects (Tarbela Power House - WAPDA).
3.	Fact Finding Committee in light of Directives of DAC meeting held on 30th November, 2021 and 27th January, 2022.

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

Sr. No.	Name of the Project
1.	PC-I for Construction of 132kV Grid Station Barthi Khas with 132kV Transmission Line District DG Khan.
2.	Electrification of 123 No. Schemes amounting to Rs. 320 million in various Villages of District Chakwal under Prime Minister Sustainable Development Goals Achievement Programme (SAP) 2022-23.
3.	PC-I of Pak-Iran Electricity Supply Project Makran-Division "Construction of 132KV T/Line from Pak-Iran Border (GABD) to 132KV (AIS) Grid Station Jiwani & 132KV Grid Station Gwadar (old)".
4.	PC-I for Provision of Funds of Village Electrification under NA -172.
5.	Quarterly Progress Report (January to March, 2022).
6.	Revised PC-I for "Electrification of 33 No Works for Village Electrification of District Sanghar".
7.	PC-I for Construction of 132 KV Grid Station Barthi Khas with Transmission Line District DG Khan.
8.	19 X Revised PC-I's for PSDP Works in respect of District Abbotabad,

Sr. No.	Name of the Project
	Mansehra and Kohat.
9.	Revised PC-I for "Construction of 220/132KV Transmission Line from GABD to Jiwani Zero Point (NTDC). Construction of 2nd Circuit Stringing of 132KV T/Line from Jiwani to Gawadar".
10	PC-I for Establishment of 132 KV Grid Station Puran Tehsil Martung District Shangla (*Estimated Cost Rs 896.97 Million).*
11.	PC-I for Construction of 132 KV Grid Station at Sunni (Khuzdar) with Allied 132KV D/C Transmission Line (In & Out Arrangement) (05 KM).
12.	PC-I for Construction of 132KV Grid Station at Garesha with Allied 132KV D/C Transmission Line (In & Out Arrangement) (05 Km).
13.	Submission of PC-I for providing HT/LT Line and Transformers at Tribal District North Waziristan.
14.	Submission of PC-I regarding provision of Funds of Village Electrification under NA-172.
15.	PC-I for provision of Funds of Village Electrification under NA-24.
16.	Rough Cost Estimate / PC-Is (10 PC-Is)**.**

Table 4.5: Miscellaneous Matters dealt by Power Wing

Sr. No.	Miscellaneous Matters
1	Minutes DAC meeting held on 30th November, 2021 in respect of Financial Attest Audit Reports of Foreign Aided Projects (FAPs-31 Paras) for the Financial Year 2020-21.
2	2021 Annual Report of Office of CEA/CFFC.
3	PC-II Consultancy Services for Feasibility Study for Conversion of Commissioned Imported Coal Based Power Projects to Thar Coal.
4	Minutes of the first meeting: - Constitution of Fact-Finding Committee in Light of Directives of DAC meeting held on 30th November, 2021 regarding Paras: - (I) IR Para No.1/USAID Grant No. 391-PEPA-ENR-TDR2-00/Rs 186.150 Million GM(P), Tarbela Power House, SWABI. (II)(II) IR Para No.2/USAID Grant No.391-PEPA-ENR-TDR2-00/Rs.13.894 Million GM(P), Tarbela Power House, SWABI.
5	Updating of Bank Account (IBAN) Numbers of Employees.
6	D-8 Project Support Fund (D-8).
7	Provision of Record against Audit Paras of Financial Attest Audit Reports of Foreign Aided Projects for the Financial Year 2020-21.
8	Activities Performed during the Financial Year 2021-22.
9	Prime Minister's Visit to Saudi Arabia (28.04.2022) and Turkey (31.05.2022 to 02.06.2022).

ADMINISTRATION AND ACCOUNTS WING

OFFICE OF THE CHIEF ENGINEERING ADVISOR & CHAIRMAN
FEDERAL FLOOD COMMISSION, ISLAMABAD

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** shows Organogram of the Administration & Accounts Wing.

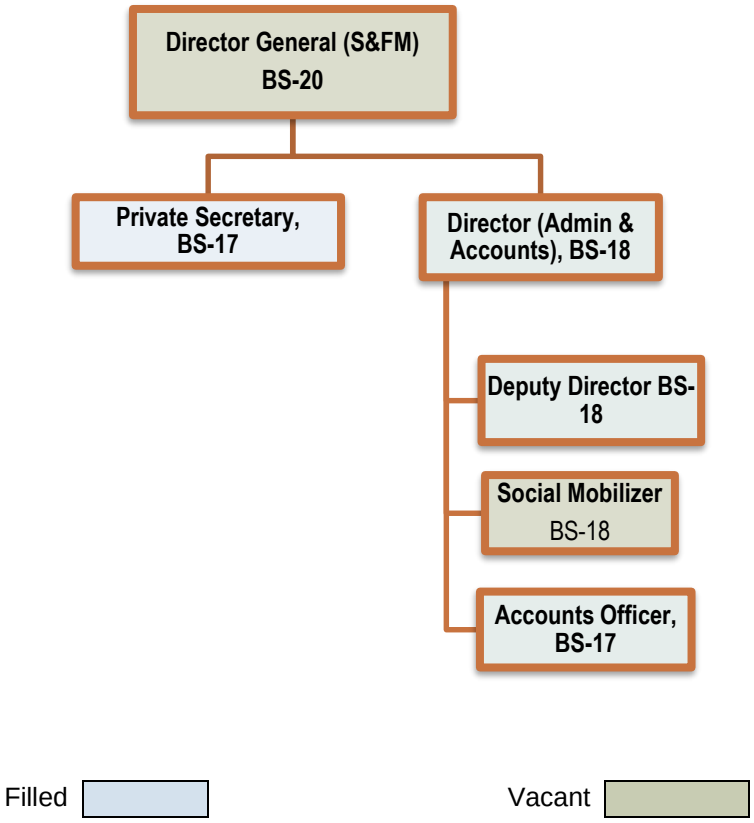


Figure 5.1: Organogram of Admin & Accounts Wing

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 2022

Payment of Pension & other dues to Pensioner

Despite of limited resources/ manpower in the office of CEA/CFFC, pension cases including all other dues whatsoever admissible to the following pensioners have been made successfully during the financial year 2022.

Table 5.1: Payment of Pension & other Dues to Pensioner

Sr.#	Name	Designation
1	Mr. Alamgir Khan	Member (Tech), BS-21
2	Muhammad Zahid Mehmood	Director General (A&FM) BS-20
3	Malik Imtiaz Farooq	Social Mobilizer, BS-18
4	Manzoor Ahmed	APS, BS-17
5	Asif Ali Shigri	Head Draughtsman BS-13
6	Raidullah Khan	Daftari, BS-03

Recruitment Process

07(seven) posts of different cadres in BS-14 and below viz. (02 Steno typist (BS-14), 01-Draughtsman (BS-11), 01-Driver (BS-04) & 03 Chowkidars (BS-01) have been filled through initial appointment after obtaining NOC from Establishment Division. Further, NOC for filling the 04 (four) vacant posts in BS-16 and below have been obtained from the Establishment Division. Out of these, the 03 non gazetted posts have been advertised in the press for its direct recruitment which is in process.

Promotion of officers (BS-18 to BS-19) During the year- 2022:

The three (03) officers of BS-18 of engineering cadre have been promoted to the posts of BS-19 through the Departmental Selection Board (DSB). Detail is given in **Table 5.2.**

Table 5.2: Promotion of Officers (BS-18 to BS-19) During 2022

Sr.#	Name & Designation	Promoted as
1.	Dr. M. Ejaz Tanveer, DD(S&M)	Superintending Engineer (Floods)
2.	Mr. M. Hanif Chachar, DD(S&M)	Principal River Engineer
3.	Mr. Zafar Iqbal, Senior Engineer(Floods)	Dy. Engineering Adviser(Civil)

Grant of Time Scale Promotion:

As per policy of the Federal Government, time scale promotion was granted to 14 officers in BS-16 and 11 officials in BS-04. They all proved as eligible employees of this office. Their detail is given in **Table 5.3:** -

Table 5.3: Promotion of Officers/Official During 2022

Sr.#	Name & Designation	Promoted as
1.	Mr. Manzoor Ahmed APS BS-16	APS(BS-17)
2.	Mr. Mukhtar Ahmed APS BS-16	APS (BS-17)
3	Mr. Tanveer Bhatti APS BS-16	APS(BS-17)
4	Mr. Abdul Qudoos APS BS-16	APS(BS-17)
5	Mr. Zahid Nadeem APS BS-16	APS(BS-17)
6	Mr. Abdul Hameed Channa APS BS-16	APS (BS -17)
7	Mr. Tahir Ali APS BS-16	APS (BS-17)
8	Mr. Kaleem ullah Khan APS BS-16	APS(BS-17)
9	Mr. Muhammad Aksar APS BS-16	APS (BS-17)
10	Mr. Imran Nawaz APS BS-16	APS (BS-17)
11	Mr. Irfan Ali Bahtti Sub-Engineer BS-16	Sub-Engineer (BS-17)
12	Mr. Abdual Rashid Shah Sub-Engineer BS-16	Sub-Engineer (BS-17)
13	Mr. Raza Waheed AAO BS-16	AAO (BS-17)
14	Mr. Nadeem-ur-Rahman Computer Operator BS-16	Computer Operator (BS-17)
Detail of 11 Officials promoted in BS-04		
1.	Ghulam Hanif Naib Qasid BPS-02	Naib Qasid BPS-03
2.	Muhammad Ramzan Naib Qasid BPS-02	Naib Qasid BPS-03
3.	Muhammad Sajid Iqbal Naib Qasid BPS-2	Naib Qasid BPS-03
4.	Ibrar Hussain Naib Qasid BPS-02	Naib Qasid BPS-03
5.	Toheed Sarwer Naib Qasid BPS-02	Naib Qasid BPS-03
6.	Syed Mohsin Abbass Shah Chowkidar BPS-02	Chowkidar BPS-03
7.	Amin Masih Sanitary Worker BPS-02	Sanitary Worker BPS-03
8.	Muhammad Sharif Naib Qasid BPS-02	Naib Qasid BPS-03
9.	Ghulam Haider Chowkidar BPS-01	Chowkidar BPS-02
10.	Asif Mehmood Farooqi Naib Qasid BPS-01	Naib Qasid BPS-02
11.	Abdul Nabi Farash BPS-01	Farash BPS-02

Promotion of Staff (BS-15 & below):

Mr. Muhammad Ibrahim, Draughtsman (BS-11) to the vacant post of Head Draughtsman (BS-13) and Mr. Ehsan Ellahi, Naib Qasid (BS-03) to the vacant post of Daftari (BS-03) have been promoted through the Departmental Promotion Committee.

Requisition to FPSC:

Requisition for filling up the vacant post of Assistant Private Secretary (BS-16) after getting NOC from Establishment Division have been sent to the FPSC for its direct recruitment which is in process in the FPSC.

Recruitment of Officers through FPSC:

On the recommendation of FPSC, recruitment against the vacant post of Accounts Officer (BS-17) has been made.

Revision in Recruitment Rules:

The revision in Recruitment Rules for the post of Programmer (BS-17) and Computer Operator (BS-16) has been taken up with the Establishment Division through the Ministry of Water Resources.

Budget and Accounts related Activities:

Clearance of the pending claims from office of the AGPR, Islamabad.

Enhancement of 10.00% (approximate) in the budget allocation from Rs.155.00 million (Financial Year 2021-22) to Rs. 170.00 million (Financial Year 2022-23.

Audit conducted upto the financial year 2020-2021.

5.4 Institutional Strengthening and Capacity Building

5.4.1 Administrative Challenges Faced by the Office of CEA& CFFC

The present staff strength of Office of CEA& CFFC is 153 (37 Number gazetted officers & 116 Support Staff). The existing competencies mainly revolve around the core subjects of civil and electrical engineering mainly focusing on river hydrology, river hydraulics, catchment hydrology, dams & barrage engineering, hydropower engineering with traditional practices being used at country-wide basis. The challenges faced by the Organization are as under:

(i) Being the principal technical arm of Ministry of Water Resources since independence, the organization needs much more attention, resources and reliance at the level of MoWR on its technical inputs;

(ii) No/ exceptionally least and obsolete logistics (related software, transport, equipment);

(iii) Inadequate non-development budget;

(iv) Important vacant positions, still to be filled-in. Around 50% of sanctioned gazetted strength/important post of officers are lying vacant;

(v) Comprehensive and regular technical training, exposure visits and exposure to new tools, technologies, design criteria's etc.;

(vi) Non-provision of special allowances and Medical facilities, perks and privileges as are being provided to IRSA, WAPDA, NHA and AGPR etc.;

(vii) No Engineering Allowance on monthly basis (Equivalent to a running Basic Pay or 1.50 times initial Pay Scale of each Scale), as granted by Governments of Punjab, Khyber Pakhtunkhwa &Balochistan for Engineers working in Provincial Departments besides by the Pakistan Railways;

(viii) Likewise, Executive allowance recently approved by the Federal Government, is also not paid to officers working in O/o CEA/CFFC.

Issues faced with respect to governance, policy, institutional arrangements and possible areas for interventions by the relevant parties, are as under:

(i) Shortage of Technical Staff;

(ii) No new inductions (of the technical officers in particular) since long due to less Perk/ Privileges & Medical facilities as compared to other technical organizations;

(iii) No clear Career Path;

(iv) Being attached Department of Ministry, there is no administrative power;

(v) Lack of professional training facilities.

(vi) Entire setup of Ministry of Water Resources including Minister's Secretariat, besides the contract staff of PPDU Project has been housed in the Office Building Complex of O/o CEA/CFFC. A new Research, Development & Policy Implementation Facility is also being housed in the office building.

(vii) O/o CEA/CFFC is also facing issue of non-availability of the Committee Room present in the Office Building Complex of O/o of CEA & CFFC, for its important meetings. Owing to pre-occupancy of Committee Room regarding MoWR's meetings already planned, official meetings to be organized by O/o CEA/CFFC, sometimes get delayed.

Presently, except for mandatory training (MCMC and SMC) there is no road map for technical training under various categories (junior, middle, senior, strategic level) based on continued technology advancement, new techniques, subjects etc. Further, it is matter of fact that there is no any research Programme carried out in the field of water and other sub-sectors including floods in the past neither under Ministry nor-through office of CEA/ CFFC, thus the technical professionals lack necessary skills and innovative techniques being practiced elsewhere in the region or at global level.

Further on number of occasions, relevant training facilities/ slots offered through GoP channels/ EAD were not utilized on the pretext of staff shortage and work load etc. Additionally, obligatory attendances at international commissions (ICOLD, ICID) have not been made possible due to lengthy approval processes.

Due to shortage of staff, non-filling of vacant posts and new emerging and challenging water sector issues in the country and impact of global climate change, there is dire need to strengthen and restructure organization as National Engineering and Flood Management Authority (NEFMA) through provision of new tools/ technologies to handle water sector issues more profoundly and render engineering advisory services and carry out holistic flood management using latest and innovative approaches (hydrologic and hydraulic modeling, real time simulation of flood water in the hill torrents/ rivers across the country). To this effect, O/o CEA/CFFC had been submitting proposal, time and again to Ministry of Water Resources for strengthening/ restructuring of the organization, however, no fruitful action has so far been taken.

Additional competencies would be required to extensively broaden the technical & professional capacities to match with national, regional and global quality and performance indicators well in alignment to the scope/spirit of related visions/ frame-works/ policies etc. like vision 2025 of Planning, Development & Special Initiatives Division, National Climate Change Policy, National Flood Security Policy, National

Water Policy, International River Laws, trans-boundary water issues, Paris Climate Change Agreement, Sendai Framework on Disaster Risk Reduction (SFDRR), Sustainable Development Goals (SDGs) etc. The enhanced capacity would enable the office to provide better inputs on the policies of the Government with specific reference to National Water Policy, Vision-2025 of Planning, Development &Special Initiatives Division, National Climate Change Policy, National DRR Policy and Vision-2030 of WAPDA in addition to better complying with the global frameworks like SFDRR, Climate Agreement and SDGs etc. with regard to management of all sub-sectoral and cross cutting issues relating to water.

The prevailing Recruitment Rules of Office of CEA/ CFFC need to be revised in order to provide a career path to the professionals working in the organization. Existing HR policy lacks equitable approach to both promotion and direct recruitment. As the field of water & flood sector is specialized one, hence experienced technical officials from open market on normal pay, perks and privileges are not available.

Instead of repeated requisitions made to Federal Public Service Commission, technical posts (BS-18, BS-19) are lying vacant since long due to insufficient incentives being offered. Further, experienced professional staff has to wait long for realization of their promotions/ benefits. Resultantly, despite good interventions and determination, overall effectiveness of the organization is being affected. This calls for revision in the existing career path so as to make it more conclusive and clear.

5.4.2 Recommendations to address Organizational Issues and Challenges

(i) The Non-development budget being provided to the Office of CEA/CFFC must be enhanced as per its demand in order to cater not only its mandatory needs relating to the Employee Related Expenses, but also to cater its O&M expenditure;

(ii) Provision of special allowances and medical facilities, perks and privileges as being provided to organizations like NDMA, IRSA, NHA, AGPR etc. OR;

(iii) Grant of **Engineering Allowance** on monthly basis (Equivalent to a running Basic Pay or 1.50 times initial Pay Scale of each Scale), as granted by Governments of the Punjab and Khyber Pakhtunkhwa for Engineers working in Provincial Departments;

(iv) Grant of **Executive Allowance** on monthly basis, recently approved by the Federal Government for Engineers/Officers working in the main Ministries & ICT Administration;

(v) Revision in the recruitment rules for a better career path to the Engineers working in the organization;

(vi) Filling in of all vacant gazetted & Non-gazetted posts on immediate basis;

(vii) Sufficient logistic support (Latest related software, equipment, vehicles for senior officers and transport for pick & drop facility);

(viii) Creation of Authority for more empowerment i.e. Establishment of National Engineering Advisory & Flood Management Authority (NEFMA) needs to be relooked into;

(ix) On the job, short as well as long term local and foreign trainings for technical staff in the following fields are essentially required for optimized utility and output of professional inputs:

- Flood management, construction, cost & projects management;
- Design of hydraulic & flood protection structures;
- River hydraulic modelling;
- Use of GIS/RS etc. in flood and water management;
- Climate risk assessment and management;
- Flood risk mitigation & adaptation;
- Use of ICT in water & flood management;
- Geo-tech aspects of mega water sector projects;
- EIRR of mega water management programs vs the social considerations;
- Ground water regulatory frame-work;
- Compliance of international water laws vs the local river laws in practice;
- Precise flood forecasting & now-casting;
- Water data base management and its utility in efficient design & implementation,
- Dams and barrage safety & inspection protocols etc. and
- Project Management;
- Hydro-met vulnerability and risk assessment;
- Integration of SFDRR, SDGs, Climate Change impacts in project planning, designing, implementation and management; and
- Other related research fields

LIST OF APPENDICES

I. Schemes to be executed under Normal/ Emergent Flood Programme of Financial Year (2022-23)

II. Major Rivers Flow Data of Monsoon Season 2022

III. Monthly Rainfall Data (July-September 2022) (Source: PMD)

IV. Escapages below Kotri Barrage (Source: IRSA)

Appendix-I

SCHEMES UNDER NORMAL/ EMERGENT FLOOD PROGRAMME

(Financial Year 2022-23)

Schemes Proposed to be executed under Normal/ Emergent Flood Programme during Financial Year (2022-23)

(Rs. Million)

Sr. No.	Name of Scheme	Estimated Cost	Status
I	**Punjab**		
1.	Construction of J-Head Spur along left bank U/S Existing Stone Stud RD-13+000 of Khanwah Flood Bund, River Indus, District Muzaffargarh, D.G Khan Zone	394.138	Approved by DDWP on Feb 18, 2023
	Sub-Total (Punjab):	**394.138**	
II	**Sindh**		
2.	Construction of Stone Pitching & Strengthening Earthwork along S.M Bund Mile 38/2 to 40/0, 42/0, to 42/5. Recoupment of Stone Pitching from mile 40/0 to 42/0and Stone Apron 42/0 to 42/5 (Dad Wah)	306.377	Approved by DDWP on Feb 18, 2023
	Sub-Total (Sindh):	**306.377**	
III	**Khyber Pakhtunkhwa**		
3.	**Ongoing schemes, carried forward under Normal/ Emergent Flood Programme 2021-22 from previous financial year (2021-22), (Est. Cost Rs. 100.00 million)**		
(i)	Construction of flood protection works for protection of village abadies and agricultural land of Sadakhel and Sol villages from Kurram River and Kasho Nullah, District Bannu	100	• On-Going Scheme: • Physical Progress: 70% • Financial Progress: 68%
(ii)	Construction of flood protection works for protection of village abadies and agricultural land on Chashma Algad Kasho Nullah, Speenatangi Nullah and Pirba Khel, District Bannu		
(iii)	Construction of flood protection works for protection of village abadies and agricultural land at village Khalif Khel alongwith right bank of Tochi River, District Bannu		
(iv)	Flood protection scheme for protection of village abadies at village Malik Shahi and adjoining agricultural lands located along eroded banks of Khaisoor Nullah in reaches, District Bannu		

Sr. No.	Name of Scheme	Estimated Cost	Status
	New Schemes (Khyber Pakhtunkhwa)		
4.	Flood protection works right bank of Swat River in Adenzai Dir Lower	25.00	Un-Approved
5.	Flood protection works along Kohistan Nullah Dir Upper	20.00	
6.	Construction of flood protection works for protection of agricultural lands and abadies on right side of Tochi River Village Bakka Khel, District Bannu	15.00	Un-Approved
7.	Construction of flood protection wall for protection of land of Shakar Man Khel Area, Gutt Algad Sub-Division, D.I Khan	19.62	Un-Approved
	Sub-Total (KP):	**179.62**	
IV	**Balochistan**		
8.	Construction of flood protection bunds and walls along Thal River, District Duki, *(Ongoing scheme, carried forward from previous financial year 2021-22)*	319.725	On-going Scheme Physical progress: 30%
	Sub-Total (Balochistan):	**319.725**	
V	**Gilgit-Baltistan**		
9.	Construction of flood protection bund at District Shigar (Phase-I)	223.949	Un-Approved
	Sub-Total (Gilgit-Baltistan):	**223.949**	
VI	**AJ&K**		
10.	Flood protection structure at Khun Bundway along left bank of River Jhelum, District Muzaffarabad	50.120	Un-Approved
	Sub-Total (AJ&K):	**50.120**	
	Grand Total:	**1,473.929**	

Appendix-II
(25-Pages)

MAJOR RIVERS FLOW DATA OF MONSOON SEASON 2022

(JULY - OCTOBER 2022)

Discharge in Cusecs

Date and Time		River Indus at Tarbela			Kabul Nowshera Bridge	River Indus				
						Kalabagh		Chashma		
Date	Time (PST)	Reservoir Level (ft)	U/S	D/S		U/S	D/S	Reservoir Level (ft)	U/S	D/S
01/07/2022	0600	1405.84	148500	120000	33800	122400	119400	639.40	136200	129000
02/07/2022	0600	1412.80	180800	120000	39500	135000	131000	641.10	157700	140000
03/07/2022	0600	1420.82	211700	128200	43700	140200	135700	641.40	162100	155000
04/07/2022	0600	1428.82	234800	140000	48000	142100	137600	641.80	163100	155000
05/07/2022	0600	1437.10	247700	142600	50900	132400	127400	642.20	193300	185000
06/07/2022	0600	1445.30	258200	150000	52800	160200	154000	640.80	177200	185000
07/07/2022	0600	1452.30	278200	170000	65900	180200	173100	641.40	215400	205000
08/07/2022	0600	1459.08	293100	160000	67000	180400	172900	643.40	230800	205000
09/07/2022	0600	1465.58	293900	160000	67900	179500	172000	644.10	224600	210000
10/07/2022	0600	1471.24	278400	160000	70800	184000	177000	644.70	224000	210000
11/07/2022	0600	1477.00	283400	160000	65100	183300	176300	646.30	239500	210000
12/07/2022	0600	1482.00	265300	157700	72200	210900	203400	647.80	243800	210000
13/07/2022	0600	1486.00	231700	145000	68900	201900	194400	649.00	256600	221600
14/07/2022	0600	1489.82	212800	130000	58500	190700	183200	649.00	278000	271000
15/07/2022	0600	1493.70	208800	120000	65400	157800	150300	649.00	260100	247300
16/07/2022	0600	1496.74	189700	120000	59400	137900	130400	649.00	233500	219900
17/07/2022	0600	1498.72	165400	120000	56800	130400	122600	647.20	182400	210000
18/07/2022	0600	1499.06	152500	144700	49700	131500	123500	645.70	189500	200000
19/07/2022	0600	1498.81	149300	155000	39900	164700	156700	644.80	191000	190000
20/07/2022	0600	1499.00	161600	157200	51500	138100	130100	645.50	212200	190000
21/07/2022	0600	1499.73	178300	161600	48700	156400	148400	643.70	192800	200000
22/07/2022	0600	1501.31	201500	163100	54500	180700	175200	644.40	205100	200000
23/07/2022	0600	1503.86	212700	150000	52700	166900	162500	644.00	250700	244600
24/07/2022	0600	1507.19	221900	140000	55500	150300	146300	643.00	250100	250900
25/07/2022	0600	1511.23	240400	140000	94800	150300	146300	642.00	211100	212700
26/07/2022	0600	1514.49	244100	161300	72400	187600	184600	640.50	222800	227800
27/07/2022	0600	1517.89	250600	164200	61300	174100	171100	639.00	259900	262800
28/07/2022	0600	1521.00	282000	202000	67300	163600	160000	639.00	270000	261800
29/07/2022	0600	1524.00	298200	219100	67700	220200	216700	639.00	279900	271800
30/07/2022	0600	1527.00	323600	244500	101100	241300	237800	639.00	327400	319400
31/07/2022	0600	1529.00	310600	257900	99300	271600	268100	639.00	341400	333400

Discharge in Cusecs

Date and Time		River Indus at Tarbela			Kabul Nowshera Bridge	River Indus				
						Kalabagh		Chashma		
Date	Time (PST)	Reservoir Level (ft)	U/S	D/S		U/S	D/S	Reservoir Level (ft)	U/S	D/S
01/08/2022	0600	1531.00	297000	243000	75100	287300	283500	639.00	375800	367800
02/08/2022	0600	1532.00	270000	242400	75300	285100	281300	639.00	395700	387700
03/08/2022	0600	1534.00	228000	172700	61300	209200	204700	641.50	365900	337500
04/08/2022	0600	1536.00	200500	145200	52900	194800	190300	645.00	287500	233900
05/08/2022	0600	1537.56	165500	122000	46900	101600	96000	648.50	211400	130200
06/08/2022	0600	1539.31	163500	114900	42300	119900	113900	648.50	159100	141900
07/08/2022	0600	1540.31	165100	136800	43500	103900	97400	648.50	169100	151700
08/08/2022	0600	1541.00	174600	154200	39400	150300	143800	648.10	166800	160000
09/08/2022	0600	1541.70	178600	157900	38200	155100	148600	648.50	187000	160000
10/08/2022	0600	1542.70	186800	157500	48900	154700	147700	648.50	205800	189000
11/08/2022	0600	1543.70	209000	179700	45900	144700	137500	645.70	189400	226400
12/08/2022	0600	1544.20	224200	209300	40800	220400	213900	642.60	208500	228400
13/08/2022	0600	1544.70	240600	225700	50400	186800	180300	642.00	290000	278300
14/08/2022	0600	1545.70	233700	204400	52300	187600	181100	642.00	257500	239300
15/08/2022	0600	1546.70	244800	215500	41800	196700	190200	642.00	263500	245100
16/08/2022	0600	1547.20	284300	269300	55700	235100	229400	640.30	269500	266700
17/08/2022	0600	1548.20	268200	239000	54900	259900	254200	639.00	344400	328300
18/08/2022	0600	1548.70	294100	279700	83300	271400	266400	640.50	355200	329600
19/08/2022	0600	1549.20	295500	281100	78600	281100	276600	640.00	379400	368400
20/08/2022	0600	1550.00	262300	239200	61300	258500	254200	640.90	386000	363700
21/08/2022	0600	1550.00	267300	267300	60300	263300	258800	642.00	350000	324300
22/08/2022	0600	1550.00	257800	257800	116900	269000	264500	642.00	319100	301100
23/08/2022	0600	1550.00	256300	256300	93500	260600	256100	642.00	377000	359000
24/08/2022	0600	1550.00	224700	224700	71300	270900	266400	642.00	375000	357000
25/08/2022	0600	1550.00	203000	203000	77700	258200	254200	642.00	341000	323000
26/08/2022	0600	1550.00	261600	261000	116400	274200	270200	642.00	302800	284800
27/08/2022	0600	1549.27	353800	374900	263300	320200	316200	638.15	362900	383300
28/08/2022	0600	1550.00	311200	290100	305000	425400	424400	640.30	461200	446600
29/08/2022	0600	1550.00	264700	264700	298800	410600	406600	640.50	518100	513300
30/08/2022	0600	1550.00	247600	247600	211900	384700	380200	642.00	526000	502500
31/08/2022	0600	1550.00	202300	202400	116900	303600	298600	642.00	488000	470800

Discharge in Cusecs

Date and Time		River Indus at Tarbela			Kabul Nowshera Bridge	River Indus				
						Kalabagh		Chashma		
Date	Time (PST)	Reservoir Level (ft)	U/S	D/S		U/S	D/S	Reservoir Level (ft)	U/S	D/S
01/09/2022	0600	1550.00	187800	187800	80000	251700	245700	644.30	357400	316200
02/09/2022	0600	1550.00	168900	168900	70800	193900	187000	648.10	262200	184100
03/09/2022	0600	1550.00	170300	169500	73000	191400	183400	648.60	236000	205300
04/09/2022	0600	1550.00	176000	175200	55700	181700	173700	648.60	228300	210300
05/09/2022	0600	1550.00	163700	162900	51300	180900	172900	648.60	227600	209600
06/09/2022	0600	1550.00	155900	155100	51800	161800	153800	648.60	202400	184400
07/09/2022	0600	1550.00	163700	162900	47800	169700	161700	648.60	225300	207300
08/09/2022	0600	1550.00	155800	155000	44400	167100	159100	648.60	214500	196500
09/09/2022	0600	1550.00	161500	160700	42800	165600	157600	648.60	201100	183100
10/09/2022	0600	1550.00	156900	156100	41100	153200	145200	648.60	202600	184600
11/09/2022	0600	1550.00	165400	164600	39300	174800	174800	648.60	197300	179100
12/09/2022	0600	1550.00	162500	161700	39500	194600	194600	648.60	200300	181900
13/09/2022	0600	1550.00	156600	155800	39100	173200	173200	648.60	220800	202100
14/09/2022	0600	1550.00	150200	149400	37500	150200	142200	648.60	211900	193200
15/09/2022	0600	1550.00	110700	109900	35800	152100	144100	648.60	193200	174500
16/09/2022	0600	1550.00	105800	105000	31800	111200	103200	648.60	174000	116700
17/09/2022	0600	1550.00	104900	104100	29500	108400	100400	648.60	135400	126000
18/09/2022	0600	1550.00	105200	104400	26900	120200	112200	648.60	144800	116900
19/09/2022	0600	1550.00	103900	103100	28000	119700	111700	648.60	135600	122400
20/09/2022	0600	1550.00	94800	94000	26100	110500	102500	648.60	135200	90000
21/09/2022	0600	1550.00	87900	87100	25600	89000	81000	648.60	141200	90000
22/09/2022	0600	1550.00	88100	87300	23800	88000	80000	648.20	98700	88000
23/09/2022	0600	1550.00	89300	88500	22600	96200	88200	648.10	106100	88000
24/09/2022	0600	1550.00	85700	84900	21200	91800	83800	648.30	112900	88000
25/09/2022	0600	1550.00	80100	79300	21200	85100	77100	648.30	109000	88000
26/09/2022	0600	1550.00	79000	78300	20500	101500	93500	648.40	111500	88000
27/09/2022	0600	1550.00	75300	74500	20100	91800	83800	648.10	101100	88000
28/09/2022	0600	1550.00	72600	71800	19600	85200	77200	647.90	104300	88000
29/09/2022	0600	1550.00	72700	71900	19400	78500	70500	647.30	96600	88000
30/09/2022	0600	1550.00	65700	64900	18700	90500	82500	646.50	94500	88000

Discharge in Cusecs

Date and Time		River Indus at Tarbela			Kabul Nowshera Bridge	River Indus				
						Kalabagh		Chashma		
Date	Time (PST)	Reservoir Level (ft)	U/S	D/S		U/S	D/S	Reservoir Level (ft)	U/S	D/S
01/10/2022	0600	1549.14	66600	90600	17600	79400	71400	645.00	89500	91000
02/10/2022	0600	1578.10	65800	95000	17400	74400	66400	643.00	98300	91000
03/10/2022	0600	1547.00	64100	95000	17800	87300	79100	645.00	125300	91000
04/10/2022	0600	1546.16	61600	85000	18700	88000	80000	645.00	110300	91000
05/10/2022	0600	1515.17	57200	85000	17400	77300	69300	645.00	120900	91000
06/10/2022	0600	1544.20	52800	80000	17000	78300	70300	645.00	102600	91000
07/10/2022	0600	1543.20	52000	80000	16000	75400	67400	645.00	98300	91000
08/10/2022	0600	1542.27	48800	75000	15700	77300	69300	644.30	97100	91000
09/10/2022	0600	1541.24	45900	75000	14500	66300	58300	644.10	99600	91000
10/10/2022	0600	1540.13	43600	75000	14500	74400	66400	642.50	84400	91000
11/10/2022	0600	1538.96	43200	75000	12700	77300	69300	643.00	95400	80000
12/10/2022	0600	1537.85	44900	75000	12700	74300	67300	643.80	95500	80000
13/10/2022	0600	1536.99	44400	67600	11900	80400	73400	645.20	88400	66000
14/10/2022	0600	1536.28	40700	60000	12600	63400	56400	646.40	87700	66000
15/10/2022	0600	1536.45	40000	35000	11900	52000	45000	647.20	83100	65900
16/10/2022	0600	1536.58	38900	35000	11700	55800	48800	646.20	47400	63000
17/10/2022	0600	1536.63	36700	35000	11200	43000	36000	645.30	50700	63000
18/10/2022	0600	1536.65	36500	35600	11100	55100	48100	643.80	45000	63000
19/10/2022	0600	1536.46	35100	40000	11100	42000	35000	642.70	44900	56000
20/10/2022	0600	1536.43	39500	40000	10100	60900	53900	641.40	41200	53000
21/10/2022	0600	1535.96	37300	50000	10400	62600	55600	640.60	46800	53000
22/10/2022	0600	1535.45	36000	50000	11700	73600	67600	639.80	44600	50000
23/10/2022	0600	1535.03	33700	45000	11400	81200	75700	641.70	66800	50000
24/10/2022	0600	1534.36	33300	40000	10300	50600	44600	642.40	54700	46900
25/10/2022	0600	1534.50	33400	40000	10000	46100	40100	642.20	45800	47000
26/10/2022	0600	1534.22	33000	40000	9700	64400	58400	642.20	44700	44000
27/10/2022	0600	1533.89	31600	40000	9100	41200	35200	642.20	44600	43900
28/10/2022	0600	1533.16	32500	52000	9000	77600	71600	642.00	42600	44000
29/10/2022	0600	1532.32	29300	52000	8900	74200	68200	642.00	49800	42000
30/10/2022	0600	1531.58	30100	50000	8200	67300	61300	643.50	61300	52000
31/10/2022	0600	1530.95	30200	47000	8400	67300	61300	643.50	52700	52000

Discharge in Cusecs

Date & Time		River Indus							
Date	Time	Taunsa		Guddu		Sukkur		Kotri	
		U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S
01/07/2022	0600	96600	94300	81700	64100	59000	24400	16300	200
02/07/2022	0600	99200	93500	72600	56100	57500	23700	19300	300
03/07/2022	0600	103200	97300	74500	58000	55200	22700	21300	400
04/07/2022	0600	108900	102400	74500	58000	54000	21900	21600	400
05/07/2022	0600	108900	102400	71600	55000	54000	21900	20700	400
06/07/2022	0600	121300	107000	72200	55600	54000	21900	20300	400
07/07/2022	0600	156600	138500	92100	72300	55100	22500	20100	400
08/07/2022	0600	177600	157100	96800	71700	58200	24600	22300	400
09/07/2022	0600	185100	165900	103400	75100	68600	33100	22000	400
10/07/2022	0600	196900	176100	121100	89300	73400	35100	21200	400
11/07/2022	0600	203000	177100	142600	110500	82200	43700	20600	400
12/07/2022	0600	201500	176200	145200	111900	90100	50400	20100	400
13/07/2022	0600	201500	175600	156200	123000	100100	59100	19300	400
14/07/2022	0600	202800	176500	168800	133700	107400	66700	20000	400
15/07/2022	0600	211400	188600	184600	164800	128600	96200	20400	400
16/07/2022	0600	239700	221400	200400	173300	156300	129200	25300	6500
17/07/2022	0600	230800	211500	197500	170200	167700	138700	33300	16900
18/07/2022	0600	211200	191900	218000	189900	165000	132200	39500	20000
19/07/2022	0600	201000	181200	219000	183400	165100	128800	49800	28200
20/07/2022	0600	195500	170000	203400	166500	181400	141100	63000	32600
21/07/2022	0600	181300	157200	166300	128600	174100	135800	83400	49900
22/07/2022	0600	190200	169900	170200	143400	157700	125000	97200	63700
23/07/2022	0600	188800	168500	151200	124100	134900	106800	102700	71500
24/07/2022	0600	213900	202600	209600	188200	134600	111200	99500	78700
25/07/2022	0600	272700	266400	216400	197500	179500	158700	97700	93300
26/07/2022	0600	258900	253600	274000	268900	190500	169400	95000	95000
27/07/2022	0600	254100	249100	283100	272900	258600	238500	90000	78700
28/07/2022	0600	250200	245200	312500	291800	269200	248100	98300	79200
29/07/2022	0600	268900	263900	306100	283200	280100	251100	102400	79800
30/07/2022	0600	274000	269000	291100	267500	275000	240600	118400	91000
31/07/2022	0600	298900	292900	311600	286100	261600	222000	141000	114600

Discharge in Cusecs

DATE & TIME		RIVER INDUS							
DATE	TIME	TAUNSA		GUDDU		SUKKUR		KOTRI	
		U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S
01/08/2022	0600	336000	329000	332500	303600	277800	236700	154300	127500
02/08/2022	0600	353800	346800	357600	329300	294800	258900	174200	174200
03/08/2022	0600	381200	381200	361100	331900	304900	269600	181000	153500
04/08/2022	0600	365600	365600	379500	347600	312800	276600	181000	153500
05/08/2022	0600	284300	284300	397900	367500	330000	293600	184400	156600
06/08/2022	0600	140800	138800	417000	386600	355700	316300	188100	170600
07/08/2022	0600	126200	124200	409100	386600	384600	350100	182600	184200
08/08/2022	0600	133400	126400	286300	260600	383300	340700	199500	187800
09/08/2022	0600	143700	127700	212700	180500	329100	288100	205300	191900
10/08/2022	0600	152300	135600	202200	167700	174200	138300	206100	194700
11/08/2022	0600	152300	136300	182600	146200	162700	126100	212900	200700
12/08/2022	0600	171000	154300	180300	143000	139100	101900	220900	204500
13/08/2022	0600	223900	203600	183600	149500	131500	94200	229400	210700
14/08/2022	0600	223900	203200	207800	201600	140000	105800	232300	220200
15/08/2022	0600	399700	394400	264200	261200	192400	161700	223200	210100
16/08/2022	0600	290900	290900	29400	292900	250100	227700	212700	202700
17/08/2022	0600	269200	269200	347700	343400	279700	276200	199400	196300
18/08/2022	0600	438500	438500	329800	329800	325500	322000	176800	176800
19/08/2022	0600	461400	461400	345700	345700	344000	344000	198800	198800
20/08/2022	0600	435100	435100	361800	361800	351100	351100	219300	219300
21/08/2022	0600	490400	490400	403400	403400	369200	369200	234000	234000
22/08/2022	0600	535300	535300	482900	482900	417900	417900	246800	247100
23/08/2022	0600	435700	435700	550100	550100	474400	474400	257500	257700
24/08/2022	0600	445400	445400	547000	547000	559800	559800	271000	271200
25/08/2022	0600	470700	470700	470700	470700	517400	517400	297200	297200
26/08/2022	0600	483000	483000	505000	505000	576000	576000	305000	305000
27/08/2022	0600	504200	504200	490400	490400	569800	569800	315300	315300
28/08/2022	0600	515700	515700	485300	485300	562200	562200	334900	334900
29/08/2022	0600	567100	567100	500900	500900	530800	530800	338400	336900
30/08/2022	0600	622100	622100	512600	512600	530800	530800	353100	350600
31/08/2022	0600	336000	329000	332500	303600	277800	236700	154300	127500

Discharge in Cusecs

DATE & TIME		RIVER INDUS							
DATE	TIME	TAUNSA		GUDDU		SUKKUR		KOTRI	
		U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S
01/09/2022	0600	580100	580100	531400	531400	529800	529800	408700	403900
02/09/2022	0600	416500	416500	558200	558200	531900	531900	447000	440400
03/09/2022	0600	296000	296000	553200	553200	560000	560000	513700	503500
04/09/2022	0600	205100	198600	484800	484800	544700	544700	584700	572400
05/09/2022	0600	215000	201000	389500	389500	498900	498900	599000	584300
06/09/2022	0600	222900	206900	298000	298000	419100	419100	604100	584300
07/09/2022	0600	191500	176000	211300	207700	323200	323200	604100	583800
08/09/2022	0600	198800	182800	193300	185800	273400	273400	604100	583900
09/09/2022	0600	202400	185400	167900	163400	205900	205900	604100	583900
10/09/2022	0600	181200	164200	165200	158500	185000	185000	626100	600000
11/09/2022	0600	181300	163500	163000	156100	177700	176100	626200	600000
12/09/2022	0600	187400	170400	169500	162100	168000	165800	607800	581900
13/09/2022	0600	181400	164400	165200	153700	162100	160000	575400	555200
14/09/2022	0600	187500	170500	166400	154700	158000	155500	525700	509000
15/09/2022	0600	191500	172500	166400	153700	155900	153800	452300	428900
16/09/2022	0600	177600	158600	167500	152600	154700	152500	410100	386300
17/09/2022	0600	159100	140100	155000	140000	153400	151200	351400	326900
18/09/2022	0600	131400	114400	147600	135900	150700	147000	294500	268500
19/09/2022	0600	132800	114500	138400	128700	164400	139200	272900	243100
20/09/2022	0600	119500	100100	117500	109800	134400	124300	245900	212200
21/09/2022	0600	118500	97100	85100	74600	110000	101000	237400	202300
22/09/2022	0600	110100	88700	87300	76000	92200	82800	231000	199300
23/09/2022	0600	102800	78600	83200	71900	80000	70400	222000	191600
24/09/2022	0600	88000	64500	85500	71200	77600	67400	218500	186400
25/09/2022	0600	97400	72300	83400	68100	70900	61000	217900	186400
26/09/2022	0600	85100	63800	72500	56800	66700	57500	210200	179400
27/09/2022	0600	81500	61100	60300	43500	56700	48500	197700	166900
28/09/2022	0600	82700	62000	64600	47400	49600	40900	187600	156800
29/09/2022	0600	82700	62000	64700	49700	45800	36300	161900	130500
30/09/2022	0600	82700	62000	62600	46700	45000	33900	144700	113800

Discharge in Cusecs

DATE	TIME	RIVER INDUS							
		TAUNSA		GUDDU		SUKKUR		KOTRI	
		U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S
01/10/2022	0600	82700	62000	60400	46800	45200	33900	131400	100600
02/10/2022	0600	82700	62000	60200	50200	45500	33900	113600	82500
03/10/2022	0600	84300	59500	59400	45900	47100	35600	103700	72700
04/10/2022	0600	85700	60800	59900	48600	46400	35600	102500	72700
05/10/2022	0600	85700	60900	58000	46700	45900	33800	95200	66100
06/10/2022	0600	85700	60900	56300	45600	45400	33600	88300	59100
07/10/2022	0600	75400	67400	59400	48400	45500	33600	86900	57500
08/10/2022	0600	85700	60900	57200	46200	45500	35600	86800	57500
09/10/2022	0600	84300	59500	59800	49900	46600	36500	86200	57500
10/10/2022	0600	84300	59500	59300	49900	47500	37000	86200	57500
11/10/2022	0600	85700	60900	59300	49900	48100	37000	79200	49800
12/10/2022	0600	84300	59500	58600	48400	48000	34700	78400	48400
13/10/2022	0600	74600	54000	58200	47600	47000	34700	75700	45100
14/10/2022	0600	74500	54000	59700	52000	46900	29900	75600	45100
15/10/2022	0600	67300	57400	59800	52000	48200	29900	74900	45100
16/10/2022	0600	62500	53300	55200	46700	18600	27500	74900	45100
17/10/2022	0600	62600	53400	53100	44700	47100	26000	74500	45100
18/10/2022	0600	58300	49000	52200	44700	45200	25000	67200	37800
19/10/2022	0600	58300	49000	55100	46300	44100	25000	63100	35000
20/10/2022	0600	57700	48500	52900	46100	45600	25000	63000	35000
21/10/2022	0600	54300	46200	52400	44700	44800	25000	63100	35000
22/10/2022	0600	55700	50300	50200	42800	44000	25300	61500	33700
23/10/2022	0600	52600	47500	48300	40900	43500	24600	57000	29100
24/10/2022	0600	52600	47500	47400	40300	42600	23900	53500	28100
25/10/2022	0600	47900	40100	47400	40300	41300	22600	53300	28100
26/10/2022	0600	47300	42400	48400	40600	40700	22000	52300	28100
27/10/2022	0600	45300	40500	46500	38100	39700	20700	52000	28100
28/10/2022	0600	45700	43600	46500	38100	39200	20000	50900	27200
29/10/2022	0600	43200	41200	44000	35700	36600	16100	50900	27200
30/10/2022	0600	43200	41300	42700	34400	35700	14000	48000	27200
31/10/2022	0600	43100	41200	42700	34400	34700	12600	47900	29100

Discharge in Cusecs

DATE & TIME		RIVER JHELUM					RIVER CHENAB	
		MANGLA			RASUL		MARALA	
		Reservoir Level (ft)	U/S	D/S	U/S	D/S	U/S	D/S
01/07/2022	0600	1098.80	42800	40000	33600	11900	73200	55200
02/07/2022	0600	1101.60	45300	25000	27100	5300	70000	49000
03/07/2022	0600	1104.70	44800	20000	12700	NIL	71400	49000
04/07/2022	0600	1107.75	39400	15000	12700	NIL	89300	66100
05/07/2022	0600	1110.75	40900	15000	9700	NIL	79400	55400
06/07/2022	0600	1113.70	45700	15000	7900	NIL	90800	66100
07/07/2022	0600	1115.75	38700	15000	7800	NIL	86000	60600
08/07/2022	0600	1117.35	35200	15000	10300	NIL	64300	38300
09/07/2022	0600	1118.80	38700	15000	8500	NIL	82000	55400
10/07/2022	0600	1120.70	37500	15000	11500	NIL	87000	60600
11/07/2022	0600	1122.35	42900	15000	11500	NIL	87000	60600
12/07/2022	0600	1123.25	34800	15000	9400	NIL	81700	55400
13/07/2022	0600	1124.15	33500	15000	10500	NIL	70600	43600
14/07/2022	0600	1125.55	37600	15000	14600	NIL	71400	43600
15/07/2022	0600	1126.70	31400	15000	16600	NIL	68900	43600
16/07/2022	0600	1127.80	30700	15000	11700	NIL	68700	43600
17/07/2022	0600	1128.70	27800	15000	11300	NIL	63600	38300
18/07/2022	0600	1129.40	25000	15000	11100	NIL	52900	27400
19/07/2022	0600	1130.30	28600	15000	11300	NIL	54400	27500
20/07/2022	0600	1130.95	25900	15000	10300	NIL	61000	32900
21/07/2022	0600	1132.25	36700	15000	12300	NIL	93700	64900
22/07/2022	0600	1134.10	41000	10000	14200	NIL	94600	85700
23/07/2022	0600	1135.40	31700	10000	9400	NIL	74700	65700
24/07/2022	0600	1136.60	30100	10000	7100	NIL	94700	85700
25/07/2022	0600	1138.10	35100	10000	5000	NIL	85700	76700
26/07/2022	0600	1139.60	35100	10000	9000	NIL	104400	95300
27/07/2022	0600	1141.45	44100	10000	6000	NIL	74500	60100
28/07/2022	0600	1143.30	44900	10000	10300	NIL	95300	80300
29/07/2022	0600	1146.65	73200	10000	10700	NIL	118800	103900
30/07/2022	0600	1149.30	60000	10000	11300	NIL	97500	82600
31/07/2022	0600	1151.20	48700	10000	14400	NIL	94300	77000

Discharge in Cusecs

DATE & TIME		RIVER JHELUM					RIVER CHENAB	
		MANGLA			RASUL		MARALA	
		Reservoir Level (ft)	U/S	D/S	U/S	D/S	U/S	D/S
01/08/2022	0600	1153.30	54700	10000	14200	NIL	94200	77100
02/08/2022	0600	1155.80	63200	10000	14500	NIL	72400	55200
03/08/2022	0600	1157.45	45100	10000	8700	NIL	53400	32900
04/08/2022	0600	1158.70	36600	10000	6500	NIL	48200	27500
05/08/2022	0600	1159.90	35500	10000	9300	NIL	63100	38300
06/08/2022	0600	1161.30	42700	10000	7300	NIL	65000	38300
07/08/2022	0600	1162.50	38200	10000	7300	NIL	58700	32900
08/08/2022	0600	1163.60	35900	10000	6700	NIL	64000	38300
09/08/2022	0600	1164.90	40600	10000	7600	NIL	91800	66000
10/08/2022	0600	1165.85	32300	10000	4400	NIL	74800	49000
11/08/2022	0600	1166.70	30000	10000	7000	NIL	88200	62300
12/08/2022	0600	1167.80	35900	10000	17100	5300	141800	129700
13/08/2022	0600	1168.60	28800	10000	9200	NIL	114500	102300
14/08/2022	0600	1169.50	31200	10000	6100	NIL	61100	43600
15/08/2022	0600	1170.60	37200	10000	7100	NIL	89800	72400
16/08/2022	0600	1171.95	44700	10000	12400	NIL	155900	143500
17/08/2022	0600	1172.90	34400	10000	6400	NIL	105500	93000
18/08/2022	0600	1173.90	35700	10000	6000	NIL	94400	81800
19/08/2022	0600	1174.75	31900	10000	6400	NIL	71900	54300
20/08/2022	0600	1175.40	26700	10000	6600	NIL	76100	54300
21/08/2022	0600	1176.15	29300	10000	6600	NIL	111500	86900
22/08/2022	0600	1177.15	35700	10000	6600	NIL	68200	43600
23/08/2022	0600	1177.85	28000	10000	6800	NIL	65700	38300
24/08/2022	0600	1178.45	25400	10000	6400	NIL	60300	32900
25/08/2022	0600	1179.30	31900	10000	7900	NIL	88400	61100
26/08/2022	0600	1180.30	36400	10000	8300	NIL	71000	43600
27/08/2022	0600	1181.70	49200	10000	5400	NIL	65600	38300
28/08/2022	0600	1183.25	53400	10000	5900	NIL	60300	32900
29/08/2022	0600	1184.30	39400	10000	5800	NIL	60300	32900
30/08/2022	0600	1185.30	38000	10000	5800	NIL	54900	27600
31/08/2022	0600	1186.15	33800	10000	6400	NIL	61400	32900

Discharge in Cusecs

DATE & TIME		RIVER JHELUM					RIVER CHENAB	
		MANGLA			RASUL		MARALA	
		Reservoir Level (ft)	U/S	D/S	U/S	D/S	U/S	D/S
01/09/2022	0600	1186.80	28200	10000	3400	NIL	51700	22200
02/09/2022	0600	1187.45	28200	10000	6500	NIL	52100	22200
03/09/2022	0600	1188.00	25400	10000	6500	NIL	47100	16900
04/09/2022	0600	1188.55	25400	10000	3500	NIL	52700	22200
05/09/2022	0600	1189.20	28200	10000	3500	NIL	68800	38300
06/09/2022	0600	1190.05	33900	10000	6600	NIL	63300	32900
07/09/2022	0600	1190.50	23600	10000	6800	NIL	47300	16900
08/09/2022	0600	1191.00	25100	10000	3800	NIL	42000	11500
09/09/2022	0600	1191.30	24100	15000	3900	NIL	42100	11500
10/09/2022	0600	1191.40	18000	15000	12900	NIL	45900	15300
11/09/2022	0600	1191.80	27100	15000	9400	NIL	63400	32900
12/09/2022	0600	1192.30	30100	15000	12500	NIL	52600	22200
13/09/2022	0600	1192.60	24100	15000	11800	NIL	52600	22200
14/09/2022	0600	1192.80	21100	15000	11100	NIL	42000	11500
15/09/2022	0600	1192.95	19500	15000	8300	NIL	42000	11500
16/09/2022	0600	1193.05	18000	15000	9800	NIL	38200	7700
17/09/2022	0600	1193.05	18000	18000	9500	NIL	42000	11500
18/09/2022	0600	1193.00	16500	18000	13500	NIL	36400	5900
19/09/2022	0600	1193.00	18000	18000	13500	NIL	34400	4000
20/09/2022	0600	1192.95	16500	18000	13500	NIL	34000	4000
21/09/2022	0600	1192.75	14000	20000	13500	NIL	30400	4000
22/09/2022	0600	1192.50	14400	22000	15400	NIL	31600	4000
23/09/2022	0600	1192.20	14900	24000	17500	NIL	30800	4000
24/09/2022	0600	1191.70	10900	26000	18400	NIL	31200	4000
25/09/2022	0600	1191.25	12400	26000	19000	NIL	24700	4000
26/09/2022	0600	1191.05	20000	26000	26300	5300	25600	4000
27/09/2022	0600	1190.85	20000	26000	30200	8000	45300	18100
28/09/2022	0600	1190.40	10400	24000	22400	NIL	33600	7400
29/09/2022	0600	1190.05	13400	24000	19400	NIL	26700	4000
30/09/2022	0600	1189.70	14100	24000	19400	NIL	26000	4000

Discharge in Cusecs

DATE & TIME		RIVER JHELUM					RIVER CHENAB	
		MANGLA			RASUL		MARALA	
		Reservoir Level (ft)	U/S	D/S	U/S	D/S	U/S	D/S
01/10/2022	0600	1189.20	12000	26000	19400	NIL	21500	4000
02/10/2022	0600	1188.70	12000	26000	21400	NIL	21100	4000
03/10/2022	0600	1188.15	10600	26000	22400	NIL	20800	4000
04/10/2022	0600	1187.65	12000	26000	27700	8000	20600	4000
05/10/2022	0600	1187.10	10600	26000	24900	5300	18300	4000
06/10/2022	0600	1186.50	11200	28000	24900	5300	17800	5300
07/10/2022	0600	1185.95	12600	28000	28900	8000	17800	5300
08/10/2022	0600	1185.30	9800	28000	29000	8100	17800	5300
09/10/2022	0600	1184.65	9800	28000	26400	5300	14300	1800
10/10/2022	0600	1184.00	9800	28000	26500	5300	17800	5300
11/10/2022	0600	1183.15	9200	32200	29300	8100	15200	2700
12/10/2022	0600	1182.10	8600	38000	29400	8000	20200	7900
13/10/2022	0600	1181.00	7200	38000	33300	11800	16500	5300
14/10/2022	0600	1180.15	14200	38000	33400	11800	15600	5300
15/10/2022	0600	1179.05	9300	38000	33400	11800	14400	5300
16/10/2022	0600	1177.85	7100	38000	32400	11800	12000	4000
17/10/2022	0600	1176.60	5800	38000	32400	11900	11600	3600
18/10/2022	0600	1175.40	7100	38000	32400	11900	14600	6800
19/10/2022	0600	1174.20	7100	38000	36300	15800	11000	3200
20/10/2022	0600	1173.05	8400	38000	36300	15800	10900	3200
21/10/2022	0600	1170.85	9600	38000	35200	15800	10900	3200
22/10/2022	0600	1169.65	6700	35000	31300	11800	15400	7700
23/10/2022	0600	1168.50	4800	35000	35200	15800	12900	4800
24/10/2022	0600	1167.50	7900	35000	35200	15800	12400	4700
25/10/2022	0600	1167.50	11400	35000	27400	7900	12400	4800
26/10/2022	0600	1136.35	4900	32000	27400	7900	14000	6300
27/10/2022	0600	1165.50	10000	30000	31300	11800	10800	3200
28/10/2022	0600	1164.80	9500	26000	24700	5300	10800	3200
29/10/2022	0600	1164.05	8300	26000	19400	NIL	10800	3200
30/10/2022	0600	1163.05	7400	31000	27400	7900	9200	1600
31/10/2022	0600	1161.95	5100	31000	31300	11800	9000	1600

Discharge in Cusecs

DATE & TIME		RIVER CHENAB							
		KHANKI		QADIRABAD		TRIMMU		PANJNAD	
Date	Time	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S
01/07/2022	0600	46600	40600	58200	36200	17200	NIL	10600	46600
02/07/2022	0600	60100	53100	65800	43800	24200	6600	6900	60100
03/07/2022	0600	58500	51600	60700	38700	34000	16400	4500	58500
04/07/2022	0600	71800	64800	65800	43800	43800	26200	4000	71800
05/07/2022	0600	66400	59400	65800	43800	48000	30400	NIL	66400
06/07/2022	0600	81300	74300	65800	43800	42500	24900	NIL	81300
07/07/2022	0600	73700	67500	70800	48800	45300	27800	5600	73700
08/07/2022	0600	65600	59400	65800	43800	44300	26800	9800	65600
09/07/2022	0600	80600	74300	65800	43800	52400	34900	10800	80600
10/07/2022	0600	73800	67500	72300	50300	49900	32500	12900	73800
11/07/2022	0600	65400	59400	72300	50300	45700	28300	19700	65400
12/07/2022	0600	52300	47000	56600	34600	51900	36500	17600	52300
13/07/2022	0600	47800	41500	49900	27900	56500	41200	24100	47800
14/07/2022	0600	50700	44800	50000	27900	56900	41700	26500	50700
15/07/2022	0600	50900	44800	53800	31800	40900	25700	28200	50900
16/07/2022	0600	47000	40900	61300	39300	38000	22800	33900	47000
17/07/2022	0600	53300	47000	59400	37400	44500	29300	39300	53300
18/07/2022	0600	33200	26500	36800	14800	53600	38400	38800	33200
19/07/2022	0600	25300	18500	36800	14800	53200	37900	29400	25300
20/07/2022	0600	29500	22700	28100	6100	47700	32400	26800	29500
21/07/2022	0600	67900	61100	53500	31500	32200	17000	29800	67900
22/07/2022	0600	80900	75300	77200	55200	28000	16300	39400	80900
23/07/2022	0600	67600	62200	88700	69700	31100	20600	40500	67600
24/07/2022	0600	122300	116700	134200	115200	65200	54900	39400	122300
25/07/2022	0600	64500	58700	72500	53500	85500	77800	38000	64500
26/07/2022	0600	160900	154900	137000	118000	94200	86700	31500	160900
27/07/2022	0600	94400	88100	96900	77900	89200	81700	40500	94400
28/07/2022	0600	127700	121300	90600	71600	100000	92000	74700	127700
29/07/2022	0600	195100	195100	210300	191300	98600	90600	100800	195100
30/07/2022	0600	96800	96800	106900	87900	93500	85500	101800	96800
31/07/2022	0600	79800	79800	86500	67500	110600	102600	97000	79800

Discharge in Cusecs

DATE & TIME		RIVER CHENAB							
DATE	TIME	KHANKI		QADIRABAD		TRIMMU		PANJNAD	
		U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S
01/08/2022	0600	98200	92400	90600	71600	112000	104200	103800	96400
02/08/2022	0600	85800	80000	102200	83200	86100	82800	104300	96400
03/08/2022	0600	58800	52900	68800	49800	86100	82800	121800	112600
04/08/2022	0600	44400	38400	50800	31800	94600	90800	110000	99800
05/08/2022	0600	37100	31100	44200	25200	87500	83700	96100	85200
06/08/2022	0600	53000	47000	46200	27200	61200	55400	83600	73200
07/08/2022	0600	41900	35900	46200	27200	54100	48300	76800	65800
08/08/2022	0600	40700	34700	39100	20100	49500	43400	76900	65800
09/08/2022	0600	63200	57200	46200	27200	51900	45800	65000	53900
10/08/2022	0600	61200	55000	67300	48300	50100	44000	65000	53900
11/08/2022	0600	65600	59200	56400	37400	41300	33500	56400	44500
12/08/2022	0600	216900	210900	196000	177000	58300	49500	46400	34200
13/08/2022	0600	95000	88500	127900	108900	70400	61600	37400	26200
14/08/2022	0600	77300	70700	102200	83200	115100	106300	40200	32000
15/08/2022	0600	83100	76600	64700	45700	121700	112900	39700	30500
16/08/2022	0600	173400	167400	182400	166400	105700	96800	47200	37800
17/08/2022	0600	99100	93100	124900	108900	91700	79800	65000	55900
18/08/2022	0600	91800	85200	99200	83200	121000	113300	93800	86900
19/08/2022	0600	65400	58600	75700	59700	126300	118600	96300	90400
20/08/2022	0600	65400	58600	53400	37400	120600	112900	95900	90400
21/08/2022	0600	76300	69500	67000	51000	88000	77200	84000	78000
22/08/2022	0600	66200	59300	75600	59600	73600	62800	96800	90800
23/08/2022	0600	58400	51400	45800	29800	74300	61500	101400	94800
24/08/2022	0600	47900	40600	44800	25200	88200	74200	101100	93500
25/08/2022	0600	58700	51400	47300	27300	74300	60400	70800	64700
26/08/2022	0600	53800	46600	68000	48000	60000	46100	57800	51700
27/08/2022	0600	45300	37900	40100	20100	51300	39300	58100	51700
28/08/2022	0600	48700	41300	37400	17400	72600	60600	60400	53500
29/08/2022	0600	42000	34600	41200	21200	51400	39300	57800	50900
30/08/2022	0600	38400	31200	36100	16100	37400	25200	43700	34600
31/08/2022	0600	38700	31500	37600	17600	40800	28500	42000	31700

Discharge in Cusecs

DATE & TIME		RIVER CHENAB							
DATE	TIME	KHANKI		QADIRABAD		TRIMMU		PANJNAD	
		U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S
01/09/2022	0600	37600	30200	28500	8500	41700	29500	44400	34000
02/09/2022	0600	33600	26200	22300	2300	40300	25100	38300	26400
03/09/2022	0600	31600	24000	29900	9900	38300	23100	27500	15300
04/09/2022	0600	35700	28100	27500	7500	31700	16400	26700	13600
05/09/2022	0600	46800	39200	29900	9900	29500	14200	26900	13600
06/09/2022	0600	43300	35700	39000	19000	29500	14200	23700	10500
07/09/2022	0600	29700	22100	32400	12400	27400	12100	23200	10000
08/09/2022	0600	15000	7500	17000	NIL	29500	14200	22500	9300
09/09/2022	0600	11300	3700	10200	NIL	37300	22000	23200	9300
10/09/2022	0600	15100	7500	22300	2300	30600	15200	23100	9300
11/09/2022	0600	23100	15300	19000	NIL	23400	8100	23300	9300
12/09/2022	0600	25200	17800	31100	11.1	23400	8100	30100	9300
13/09/2022	0600	32000	24400	32400	12400	21600	6300	29000	16100
14/09/2022	0600	17000	9300	26300	6300	22900	7500	22000	15200
15/09/2022	0600	13300	5600	26300	6300	22900	7500	18900	8200
16/09/2022	0600	15200	7500	22000	2300	30100	15000	16600	5100
17/09/2022	0600	17100	9300	11500	NIL	29000	13600	16600	2600
18/09/2022	0600	13400	5600	20000	NIL	24700	7700	16600	2600
19/09/2022	0600	11500	3700	14000	NIL	22300	5200	18100	2600
20/09/2022	0600	7800	NIL	12000	NIL	22300	5200	18100	4100
21/09/2022	0600	7900	NIL	12000	NIL	21100	3900	16100	4100
22/09/2022	0600	7900	NIL	12700	NIL	21100	3900	14200	2100
23/09/2022	0600	7900	NIL	14000	NIL	19800	2600	13900	NIL
24/09/2022	0600	11600	3700	17500	NIL	19900	2600	13200	NIL
25/09/2022	0600	7900	NIL	19000	NIL	19900	2600	13100	NIL
26/09/2022	0600	7900	NIL	18000	NIL	23000	5200	13100	NIL
27/09/2022	0600	34200	26300	32400	12400	22800	5200	12600	NIL
28/09/2022	0600	15300	7500	32400	12400	23000	5200	11100	NIL
29/09/2022	0600	11500	3700	20000	NIL	23000	5200	11100	NIL
30/09/2022	0600	9700	1900	19000	NIL	23000	5200	10700	NIL

Discharge in Cusecs

DATE & TIME		RIVER CHENAB							
DATE	TIME	KHANKI		QADIRABAD		TRIMMU		PANJNAD	
		U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S
01/10/2022	0600	7700	NIL	16000	NIL	29300	11500	44400	34000
02/10/2022	0600	7700	NIL	17000	NIL	29300	11500	38300	26400
03/10/2022	0600	7700	NIL	18500	NIL	25600	7800	27500	15300
04/10/2022	0600	7800	NIL	16000	NIL	23100	5300	11200	NIL
05/10/2022	0600	7800	NIL	16900	NIL	21800	4000	16800	3100
06/10/2022	0600	7700	NIL	16900	NIL	21800	4000	16800	3100
07/10/2022	0600	7700	NIL	18000	NIL	20500	2700	16300	2100
08/10/2022	0600	11500	3700	19200	1300	19200	1300	15000	800
09/10/2022	0600	7700	NIL	19000	NIL	19900	2000	12600	NIL
10/10/2022	0600	7300	NIL	18000	NIL	17900	NIL	11500	NIL
11/10/2022	0600	7700	NIL	18000	NIL	13900	NIL	10900	NIL
12/10/2022	0600	7700	NIL	18000	NIL	12300	NIL	10800	NIL
13/10/2022	0600	9200	1800	22300	2300	9700	NIL	10500	NIL
14/10/2022	0600	9200	1800	22700	2700	8200	NIL	10200	NIL
15/10/2022	0600	6800	NIL	22700	2700	8500	NIL	9800	NIL
16/10/2022	0600	6000	NIL	24100	4100	13800	NIL	5900	NIL
17/10/2022	0600	6000	NIL	20000	NIL	17100	5300	5800	NIL
18/10/2022	0600	6000	NIL	22800	2800	18100	8600	5800	NIL
19/10/2022	0600	6000	NIL	20000	NIL	18200	9600	7900	NIL
20/10/2022	0600	6000	NIL	20000	NIL	18200	9700	10200	NIL
21/10/2022	0600	6000	NIL	19000	NIL	18200	9700	12700	2000
22/10/2022	0600	6000	NIL	20000	NIL	15800	7300	13000	2000
23/10/2022	0600	6000	NIL	22800	2700	18000	8500	13000	2000
24/10/2022	0600	6000	NIL	22700	2700	18000	8500	13000	2000
25/10/2022	0600	6000	NIL	20000	NIL	18000	8500	12300	1300
26/10/2022	0600	6000	NIL	20000	NIL	18000	8500	11700	900
27/10/2022	0600	6000	NIL	22700	2700	16900	7400	13100	2100
28/10/2022	0600	6000	NIL	20000	NIL	16100	5600	14000	3000
29/10/2022	0600	6000	NIL	20000	NIL	14100	2600	14000	3000
30/10/2022	0600	6000	NIL	20000	NIL	15100	2600	12300	1300
31/10/2022	0600	6000	NIL	20000	NIL	10700	NIL	11000	NIL

Discharge in Cusecs

DATE	TIME	RIVER RAVI				RIVER SUTLEJ			
		BALLOKI		SIDHNAI		SULEMANKI		ISLAM	
		U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S
01/07/2022	0600	16500	NIL	10900	NIL	10200	NIL	500	NIL
02/07/2022	0600	18500	NIL	12300	NIL	9900	NIL	500	NIL
03/07/2022	0600	19000	NIL	12900	NIL	9700	NIL	500	NIL
04/07/2022	0600	23300	2300	12600	NIL	10600	NIL	500	NIL
05/07/2022	0600	27300	6300	12600	NIL	11500	NIL	400	NIL
06/07/2022	0600	30600	7100	12900	NIL	10300	NIL	500	NIL
07/07/2022	0600	30100	5400	12900	NIL	11500	NIL	500	NIL
08/07/2022	0600	32400	8000	13000	NIL	13400	1700	400	NIL
09/07/2022	0600	32200	6600	15100	3300	13700	2200	500	NIL
10/07/2022	0600	31500	4900	15400	5300	14200	2900	400	NIL
11/07/2022	0600	32900	6300	15400	5300	13700	3400	400	NIL
12/07/2022	0600	32300	5400	14400	4700	14300	2900	500	NIL
13/07/2022	0600	32300	5400	13800	2000	14300	2600	500	NIL
14/07/2022	0600	32400	6300	16000	4000	13800	3600	300	NIL
15/07/2022	0600	34400	10100	15700	4300	15200	7300	300	NIL
16/07/2022	0600	37600	12800	14900	2600	19100	13000	1400	600
17/07/2022	0600	38400	13700	17500	7300	22000	17500	1500	800
18/07/2022	0600	36700	12000	19200	12400	21300	16100	3700	3700
19/07/2022	0600	34400	9500	21400	14100	20600	14200	7300	7000
20/07/2022	0600	33700	8300	20900	12300	24800	18800	10700	10000
21/07/2022	0600	33900	8300	18000	9200	22600	15700	11700	11000
22/07/2022	0600	42200	16900	17900	12900	18100	12300	12200	11800
23/07/2022	0600	46100	24700	17200	13500	20000	13600	13300	12500
24/07/2022	0600	46100	24700	16900	14100	21400	14900	12900	12500
25/07/2022	0600	41400	23000	21600	21600	22400	16000	12000	11800
26/07/2022	0600	43300	25200	22300	21300	17400	12000	12100	11800
27/07/2022	0600	39300	21200	20600	19900	14600	8900	10700	10000
28/07/2022	0600	36400	17900	22700	21600	13100	6400	10900	10000
29/07/2022	0600	33100	15900	24400	22900	12000	5100	10200	10000
30/07/2022	0600	33100	15900	24400	22800	11900	6700	9400	9000
31/07/2022	0600	44700	27500	19300	15800	12600	7600	7800	7200

Discharge in Cusecs

DATE	TIME	RIVER RAVI				RIVER SUTLEJ			
		BALLOKI		SIDHNAI		SULEMANKI		ISLAM	
		U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S
01/08/2022	0600	47000	29700	18400	14100	13600	8300	5400	5200
02/08/2022	0600	48100	30900	21500	21500	15200	11600	5500	5200
03/08/2022	0600	52400	35200	19800	19800	12700	13000	7000	5200
04/08/2022	0600	50200	33000	21000	13400	18800	15600	7700	7200
05/08/2022	0600	39600	22400	21300	12800	20000	16000	8000	7200
06/08/2022	0600	35500	18000	22300	12800	15000	9800	9800	9000
07/08/2022	0600	40600	22400	24800	15000	12300	6900	11900	11100
08/08/2022	0600	48300	29600	23400	12800	12000	6100	12100	11100
09/08/2022	0600	43900	25200	20200	8800	12300	6100	12100	11200
10/08/2022	0600	37900	18600	20900	8400	12000	5000	10000	9000
11/08/2022	0600	39300	19800	21900	8400	12100	3100	6200	5200
12/08/2022	0600	40200	15700	25600	11700	11200	1300	5400	4200
13/08/2022	0600	41000	15700	26600	12900	14200	3900	4000	2800
14/08/2022	0600	43300	18000	23300	11600	13900	3700	2300	1200
15/08/2022	0600	35100	9200	21200	9100	13800	3200	1800	700
16/08/2022	0600	32300	5800	21900	9100	13800	2900	1500	700
17/08/2022	0600	36800	10300	21500	8800	15200	4500	1700	700
18/08/2022	0600	50700	24800	18000	11100	14700	6800	2100	1200
19/08/2022	0600	48600	22700	14800	5300	16700	6800	2700	1700
20/08/2022	0600	34900	8300	19900	8500	17800	7300	3900	2800
21/08/2022	0600	31800	4600	24500	13500	18700	7300	3900	2800
22/08/2022	0600	35700	8300	22800	11600	16300	4900	3900	2800
23/08/2022	0600	42000	16400	13800	2000	15700	4200	3800	2800
24/08/2022	0600	43100	15700	15900	5300	16100	4200	5400	4300
25/08/2022	0600	40900	13500	20100	9800	16400	4400	5400	4300
26/08/2022	0600	42200	14600	22400	10400	18300	6500	3800	2800
27/08/2022	0600	45600	18000	24500	11700	18500	8000	3900	2800
28/08/2022	0600	42400	14600	21200	7200	21300	10600	3900	2800
29/08/2022	0600	36200	8300	22200	7800	20500	9100	3900	2800
30/08/2022	0600	36200	8300	24200	9500	20000	8200	6500	5400
31/08/2022	0600	35900	8000	21800	6500	19000	7300	7600	6500

Discharge in Cusecs

DATE	TIME	RIVER RAVI				RIVER SUTLEJ			
		BALLOKI		SIDHNAI		SULEMANKI		ISLAM	
		U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S
01/09/2022	0600	35900	7900	18600	2600	19500	7800	8400	7200
02/09/2022	0600	36100	7900	18400	2000	18800	6800	8400	7200
03/09/2022	0600	35100	7900	20100	3300	18100	5900	7700	6500
04/09/2022	0600	34100	6800	20100	2600	17000	4600	6400	5200
05/09/2022	0600	35300	9000	19500	2000	15800	3400	6400	5200
06/09/2022	0600	38900	14600	19200	2000	15000	2600	5500	4200
07/09/2022	0600	39300	14600	19900	2600	14400	1900	5500	4200
08/09/2022	0600	39300	14600	21300	4000	13800	1200	2500	1200
09/09/2022	0600	34000	9000	24600	7200	13800	1200	2500	1200
10/09/2022	0600	29700	4500	25400	7800	13800	1200	2500	800
11/09/2022	0600	34300	9000	24600	7300	13000	400	2000	NIL
12/09/2022	0600	34300	7900	18900	1300	13000	NIL	1200	NIL
13/09/2022	0600	36400	9000	18700	1300	12900	NIL	1200	NIL
14/09/2022	0600	35800	7900	20000	2600	14500	1400	1200	NIL
15/09/2022	0600	33900	5600	20400	3000	15400	2100	1200	NIL
16/09/2022	0600	30800	2300	19400	2000	15600	2400	1200	NIL
17/09/2022	0600	31300	2900	19400	NIL	15900	2800	1200	NIL
18/09/2022	0600	29000	600	17800	NIL	15900	2800	1200	NIL
19/09/2022	0600	32500	4000	17000	NIL	16200	2900	1200	NIL
20/09/2022	0600	30800	2300	17000	NIL	16700	3400	1200	NIL
21/09/2022	0600	28500	NIL	16500	NIL	16600	3400	1200	NIL
22/09/2022	0600	26500	NIL	17000	NIL	16100	2900	1200	NIL
23/09/2022	0600	26500	NIL	17800	NIL	13800	600	1200	NIL
24/09/2022	0600	28000	NIL	15800	NIL	13900	700	1200	NIL
25/09/2022	0600	29800	500	15500	NIL	15400	2100	1200	NIL
26/09/2022	0600	31000	2300	15400	NIL	17500	4300	1200	NIL
27/09/2022	0600	29800	1200	15800	NIL	17900	4800	1200	NIL
28/09/2022	0600	32700	4000	15900	NIL	21400	8600	1200	NIL
29/09/2022	0600	35800	7100	16400	NIL	21500	8600	1200	NIL
30/09/2022	0600	33400	6800	16400	NIL	21100	8600	3000	1700

Discharge in Cusecs

DATE	TIME	RIVER RAVI				RIVER SUTLEJ			
		BALLOKI		SIDHNAI		SULEMANKI		ISLAM	
		U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S
01/10/2022	0600	35900	7900	18600	2600	19500	7800	8400	7200
02/10/2022	0600	36100	7900	18400	2600	18800	6800	8400	7200
03/10/2022	0600	35100	7900	20100	3300	18100	5900	7700	6500
04/10/2022	0600	25500	NIL	17500	NIL	13300	200	6500	5300
05/10/2022	0600	23500	NIL	16700	NIL	13000	NIL	4700	3500
06/10/2022	0600	23500	NIL	15500	NIL	13000	NIL	2000	800
07/10/2022	0600	22500	NIL	15500	NIL	12000	NIL	1200	NIL
08/10/2022	0600	22000	NIL	15300	NIL	11000	NIL	1200	NIL
09/10/2022	0600	21500	NIL	15300	NIL	10500	NIL	1200	NIL
10/10/2022	0600	21500	NIL	14700	NIL	10000	NIL	700	NIL
11/10/2022	0600	21500	NIL	14400	NIL	10000	NIL	700	NIL
12/10/2022	0600	22500	NIL	12600	NIL	10400	NIL	700	NIL
13/10/2022	0600	22000	NIL	12100	NIL	11600	NIL	700	NIL
14/10/2022	0600	24000	NIL	9000	NIL	11900	NIL	300	NIL
15/10/2022	0600	24000	NIL	8000	NIL	12500	NIL	300	NIL
16/10/2022	0600	23000	NIL	8000	1300	12000	4100	700	NIL
17/10/2022	0600	24000	NIL	8700	2000	13900	5800	700	NIL
18/10/2022	0600	21000	3500	8700	2000	14100	6200	700	NIL
19/10/2022	0600	19800	2300	7400	700	12100	4100	700	NIL
20/10/2022	0600	20400	2800	7800	600	10900	2900	700	NIL
21/10/2022	0600	20800	5800	7500	300	9900	1900	1900	800
22/10/2022	0600	19500	3400	9200	1900	9900	1900	2900	1700
23/10/2022	0600	20000	40000	11800	4600	10200	2200	2900	1700
24/10/2022	0600	21100	5100	11800	4600	9300	1300	1200	NIL
25/10/2022	0600	21700	5100	11100	3900	10200	2200	1200	NIL
26/10/2022	0600	21400	7400	11500	4300	9200	1200	1200	NIL
27/10/2022	0600	21400	7400	12400	5200	8200	200	1200	NIL
28/10/2022	0600	20300	6300	13600	5900	8800	800	1200	NIL
29/10/2022	0600	19700	5700	15200	7500	9000	1000	1100	NIL
30/10/2022	0600	20300	6300	15300	2600	8600	600	1000	NIL
31/10/2022	0600	20900	6900	16000	3300	8600	600	900	NIL

Discharge in Cusecs

DATE	TIME	LINK CANALS/CANALS				SKARDU	
		C.J	CRBC	Q.B	T.P	TEMPERATURE	
		Flow	Flow	Flow	Flow	Max	Min
01/07/2022	0600	500	3900	22000	NIL	36.7	23.9
02/07/2022	0600	500	3900	22000	NIL	36.1	20.0
03/07/2022	0600	500	3900	22000	NIL	36.1	19.4
04/07/2022	0600	500	3900	22000	NIL	35.6	22.2
05/07/2022	0600	500	3900	22000	NIL	36.7	27.8
06/07/2022	0600	500	4500	22000	6000	28.9	23.3
07/07/2022	0600	500	4600	22000	4800	27.8	21.7
08/07/2022	0600	1100	4600	22000	7700	29.4	18.9
09/07/2022	0600	2000	4600	22000	4300	33.9	22.2
10/07/2022	0600	2000	4600	22000	6500	35.0	22.8
11/07/2022	0600	2000	4600	22000	11100	25.6	20.0
12/07/2022	0600	2000	3600	22000	10500	25.0	18.3
13/07/2022	0600	2000	3400	22000	10700	29.4	21.1
14/07/2022	0600	3600	3400	22000	11000	26.7	18.3
15/07/2022	0600	9400	3400	22000	12000	23.9	17.8
16/07/2022	0600	10000	3600	22000	5000	24.4	18.3
17/07/2022	0600	10000	4500	22000	5000	26.7	18.9
18/07/2022	0600	10000	4500	22000	5000	30.0	20.0
19/07/2022	0600	8900	4600	22000	5000	32.2	21.1
20/07/2022	0600	8000	4600	22000	9700	36.1	17.2
21/07/2022	0600	11000	4600	22000	7800	36.7	17.8
22/07/2022	0600	12700	4000	22000	12000	34.4	20.0
23/07/2022	0600	8400	2600	19000	12000	36.7	23.9
24/07/2022	0600	8000	2400	19000	5000	35.6	25.6
25/07/2022	0600	8000	600	19000	5000	32.8	22.2
26/07/2022	0600	8000	200	19000	5000	27.8	25.6
27/07/2022	0600	8000	200	19000	5000	30.6	24.4
28/07/2022	0600	8000	200	19000	5000	28.9	20.0
29/07/2022	0600	8000	100	19000	5000	30.0	
30/07/2022	0600	8000	NIL	19000	5000	29.4	20.6
31/07/2022	0600	8000	NIL	19000	5000	30.0	18.9

Discharge in Cusecs

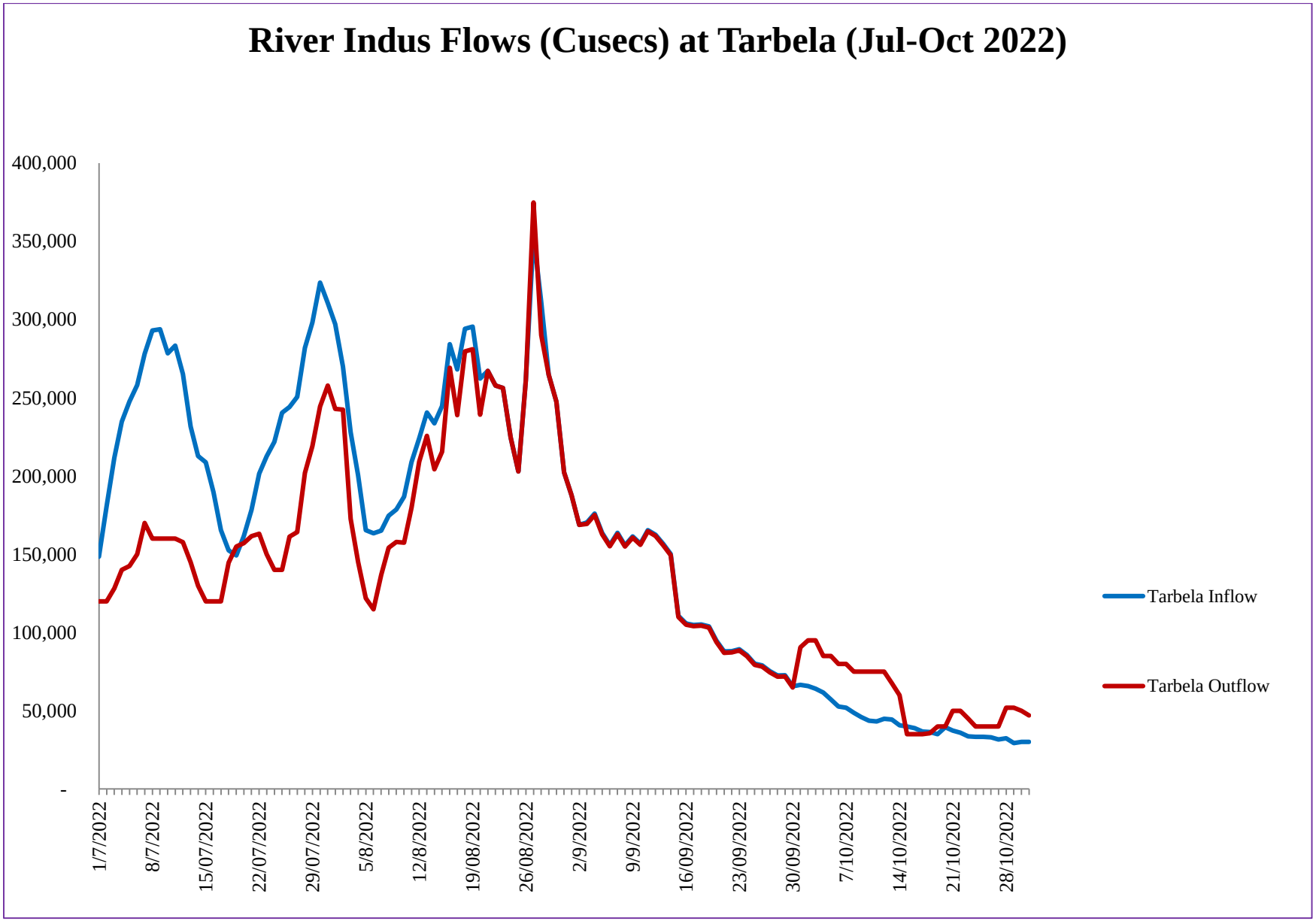
DATE	TIME	LINK CANALS/CANALS				SKARDU	
		C.J	CRBC	Q.B	T.P	TEMPERATURE	
		Flow	Flow	Flow	Flow	Max	Min
01/08/2022	0600	8000	NIL	19000	5000	28.9	14.4
02/08/2022	0600	8000	NIL	19000	5000	29.4	12.8
03/08/2022	0600	8400	300	19000	NIL	26.7	15.6
04/08/2022	0600	11800	1600	19000	NIL	25.6	17.8
05/08/2022	0600	15000	2000	19000	NIL	28.9	21.1
06/08/2022	0600	15000	2100	19000	NIL	30.0	20.0
07/08/2022	0600	15000	2400	19000	NIL	30.6	19.4
08/08/2022	0600	15000	2000	19000	NIL	31.1	19.4
09/08/2022	0600	15000	1800	19000	6800	31.1	21.1
10/08/2022	0600	15000	1800	19000	6500	32.2	22.2
11/08/2022	0600	15000	2300	19000	5700	33.3	23.3
12/08/2022	0600	15000	2600	19000	5400	31.1	21.1
13/08/2022	0600	15000	2800	19000	9000	31.1	20.0
14/08/2022	0600	15000	3100	19000	9500	32.8	22.8
15/08/2022	0600	15000	3400	19000	NIL	32.8	23.3
16/08/2022	0600	15000	2600	16000	NIL	31.7	21.1
17/08/2022	0600	13200	2400	16000	NIL	30.0	20.0
18/08/2022	0600	13700	800	16000	NIL	27.8	18.4
19/08/2022	0600	15000	NIL	16000	NIL	25.6	16.7
20/08/2022	0600	15000	NIL	16000	NIL	24.4	18.9
21/08/2022	0600	15800	NIL	16000	NIL	26.7	18.3
22/08/2022	0600	18000	NIL	16000	NIL	28.3	18.9
23/08/2022	0600	18000	NIL	16000	NIL	25.6	21.1
24/08/2022	0600	18000	NIL	20000	NIL	23.9	18.9
25/08/2022	0600	18000	NIL	20000	NIL	22.8	17.2
26/08/2022	0600	18000	NIL	20000	NIL	21.1	16.7
27/08/2022	0600	9100	NIL	20000	NIL	22.2	17.8
28/08/2022	0600	NIL	NIL	20000	NIL	21.1	18.9
29/08/2022	0600	3100	NIL	20000	NIL	23.3	19.4
30/08/2022	0600	10300	NIL	20000	NIL	24.4	20.0
31/08/2022	0600	17200	NIL	20000	NIL	26.7	21.1

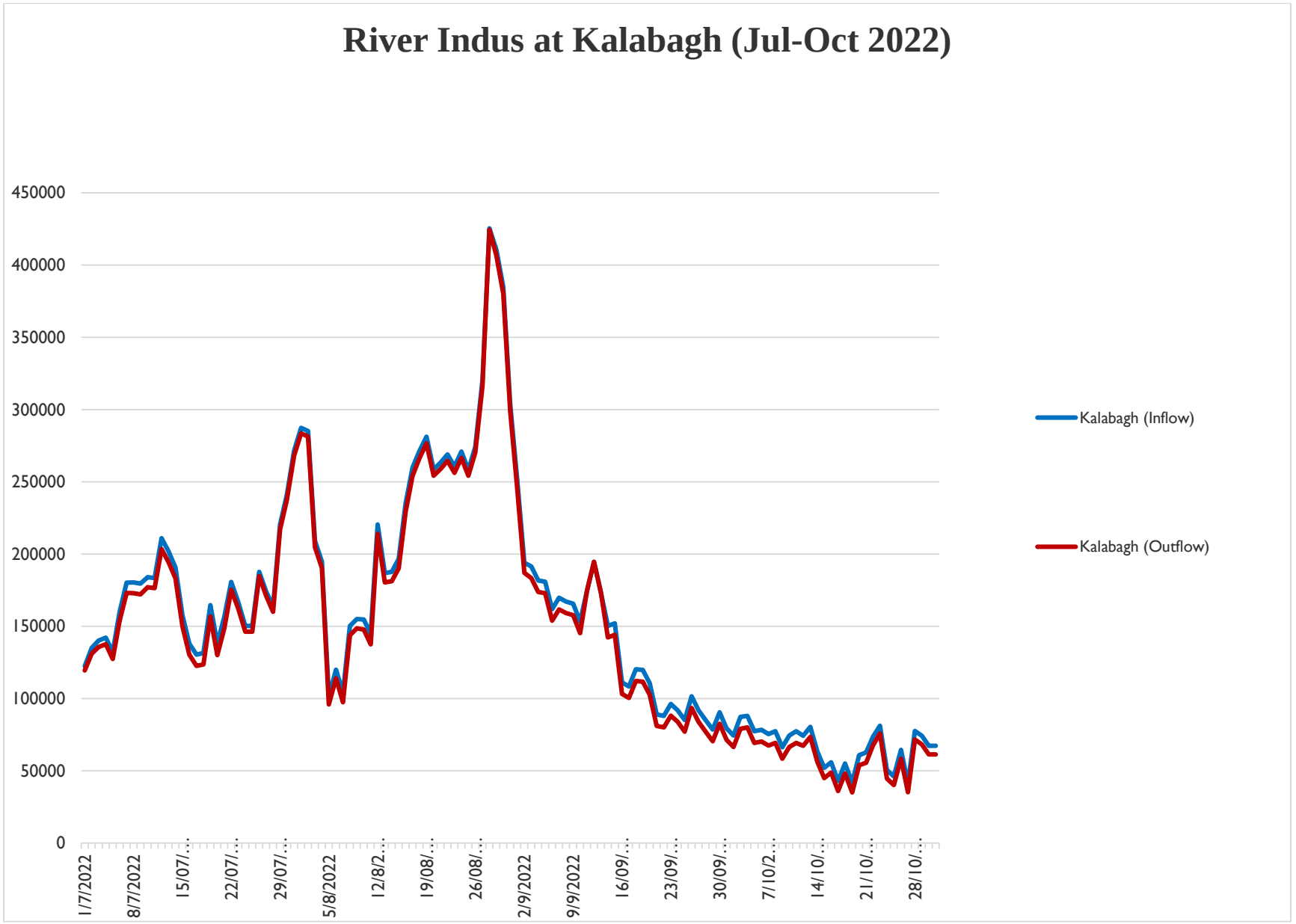
Discharge in Cusecs

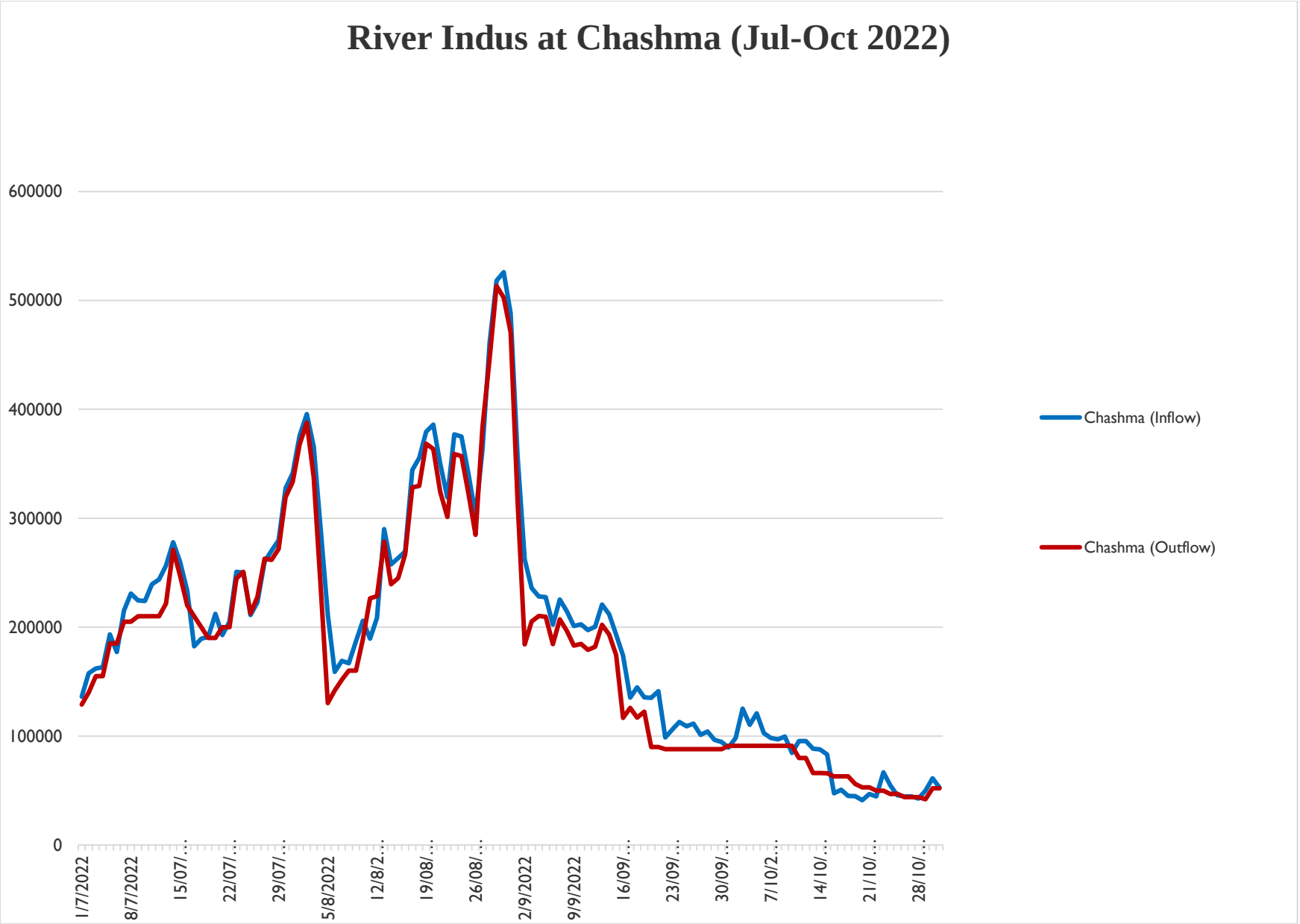
DATE & TIME		LINK CANALS/CANALS				SKARDU	
		C.J	CRBC	Q.B	T.P	TEMPERATURE	
		Flow	Flow	Flow	Flow	Max	Min
01/09/2022	0600	16200	NIL	20000	NIL	30.3	23.3
02/09/2022	0600	17400	NIL	20000	NIL	28.9	22.2
03/09/2022	0600	18000	NIL	20000	NIL	29.4	21.1
04/09/2022	0600	18000	NIL	20000	NIL	31.1	15.6
05/09/2022	0600	18000	NIL	20000	NIL	27.8	17.8
06/09/2022	0600	18000	NIL	20000	NIL	28.9	18.9
07/09/2022	0600	18000	NIL	20000	NIL	29.4	19.4
08/09/2022	0600	18000	NIL	NIL	NIL	31.1	18.3
09/09/2022	0600	18000	NIL	NIL	NIL	31.1	20.0
10/09/2022	0600	18000	NIL	20000	NIL	29.4	19.4
11/09/2022	0600	18000	100	19000	NIL	28.3	18.9
12/09/2022	0600	18000	400	20000	NIL	29.4	17.8
13/09/2022	0600	18000	700	20000	NIL	28.9	17.2
14/09/2022	0600	18000	700	20000	NIL	25.6	16.7
15/09/2022	0600	18000	700	20000	NIL	22.2	14.4
16/09/2022	0600	18000	800	20000	NIL	26.7	17.2
17/09/2022	0600	18000	800	NIL	NIL	27.2	16.7
18/09/2022	0600	18000	800	20000	NIL	26.1	16.1
19/09/2022	0600	18000	800	NIL	NIL	26.7	18.3
20/09/2022	0600	18000	800	NIL	NIL	27.8	17.8
21/09/2022	0600	18000	900	NIL	NIL	26.7	17.2
22/09/2022	0600	18000	900	NIL	NIL	25.6	15.6
23/09/2022	0600	18000	600	NIL	NIL	26.7	18.9
24/09/2022	0600	19000	800	17500	NIL	25.6	14.4
25/09/2022	0600	20000	1000	19000	NIL	27.8	17.8
26/09/2022	0600	20000	900	18000	NIL	22.2	15.0
27/09/2022	0600	20000	700	20000	NIL	22.8	14.4
28/09/2022	0600	20000	1000	20000	NIL	23.3	15.6
29/09/2022	0600	20000	1000	20000	NIL	22.2	15.0
30/09/2022	0600	20000	1000	19000	NIL	22.8	15.6

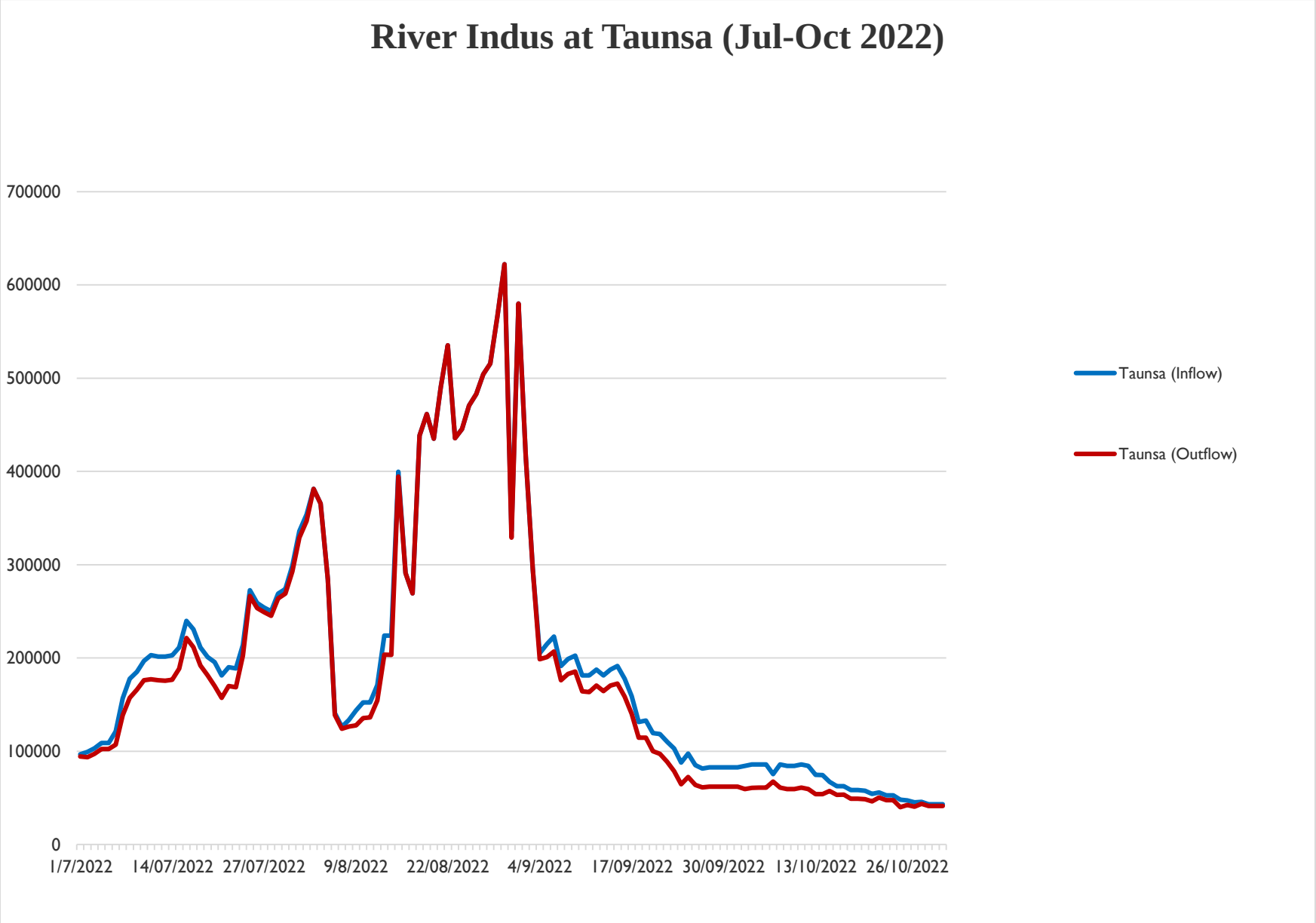
Discharge in Cusecs

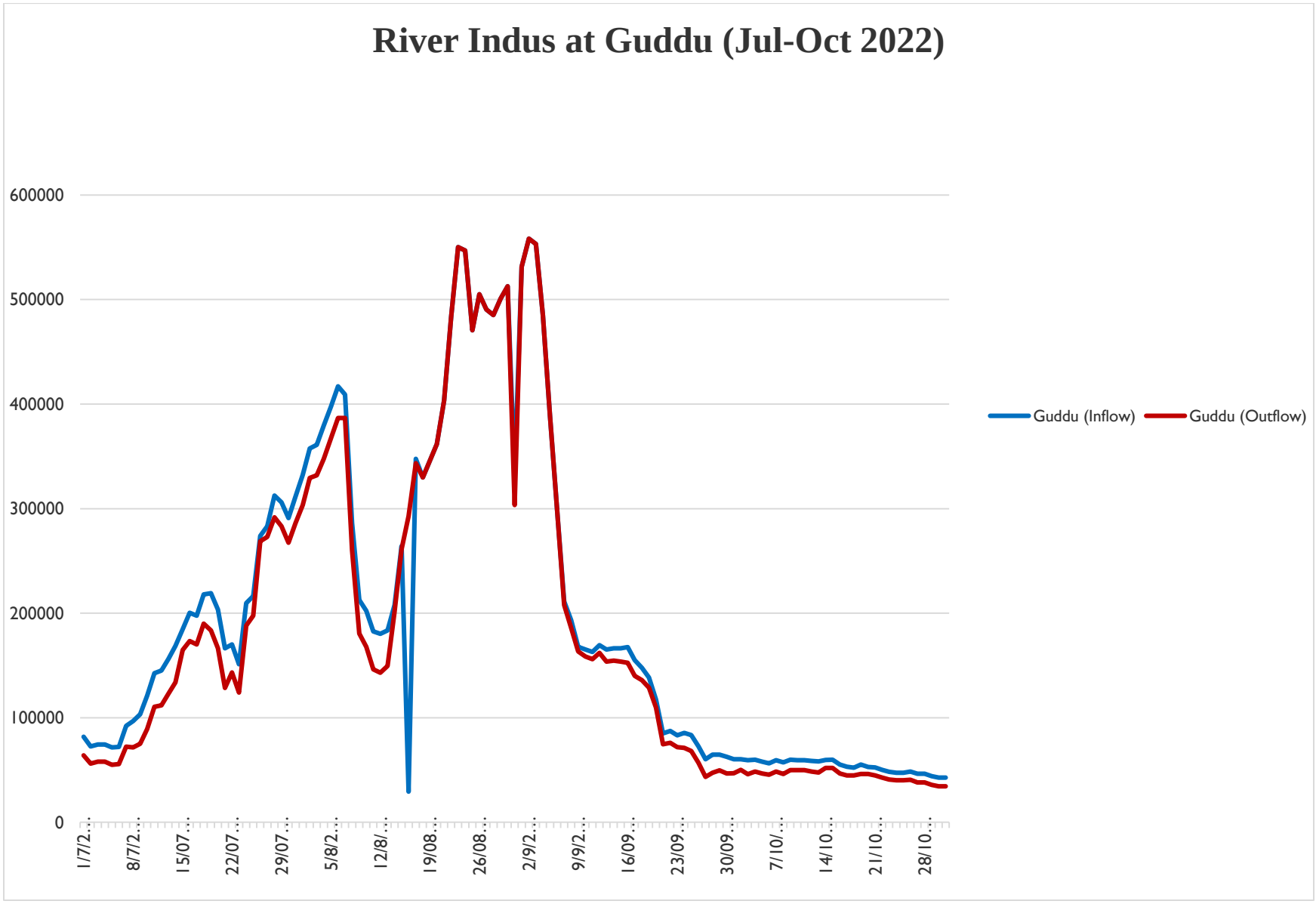
DATE	TIME	LINK CANALS/CANALS				SKARDU	
		C.J	CRBC	Q.B	T.P	TEMPERATURE	
		Flow	Flow	Flow	Flow	Maximum	Minimum
01/10/2022	0600	91000	1000	16000	7900	23.3	15.6
02/10/2022	0600	91000	800	17000	7900	22.2	11.7
03/10/2022	0600	91000	800	18500	12000	22.8	15.6
04/10/2022	0600	91000	800	16000	1200	23.3	14.4
05/10/2022	0600	91000	800	16900	12000	22.8	15.0
06/10/2022	0600	91000	800	16900	12000	23.3	17.8
07/10/2022	0600	91000	800	18000	12000	22.8	18.3
08/10/2022	0600	91000	800	18000	12000	22.2	12.8
09/10/2022	0600	91000	800	19000	12000	21.1	11.7
10/10/2022	0600	91000	900	18000	12000	22.2	10.0
11/10/2022	0600	80000	900	18000	12000	21.1	9.4
12/10/2022	0600	80000	900	18000	12000	20.0	12.2
13/10/2022	0600	66000	400	20000	7700	16.7	13.9
14/10/2022	0600	66000	900	20000	7700	15.6	11.7
15/10/2022	0600	65900	900	20000	7900	15.6	10
16/10/2022	0600	63000	900	20000	7200	17.8	8.3
17/10/2022	0600	63000	900	20000	7200	18.9	6.1
18/10/2022	0600	63000	900	20000	7300	18.9	4.4
19/10/2022	0600	56000	900	20000	7300	17.8	4.4
20/10/2022	0600	53000	800	20000	7200	16.7	5.6
21/10/2022	0600	53000	800	19000	6000	13.9	6.7
22/10/2022	0600	50000	800	20000	3000	15.6	4.4
23/10/2022	0600	46900	900	20000	4100	16.7	4.4
24/10/2022	0600	47000	900	20000	4100	16.1	3.9
25/10/2022	0600	44000	900	20000	3500	16.7	3.3
26/10/2022	0600	43900	700	20000	3900	17.2	3.9
27/10/2022	0600	44000	700	20000	3800	15.6	4.4
28/10/2022	0600	42000	700	20000	NIL	18.3	4.4
29/10/2022	0600	42000	700	20000	NIL	17.2	2.8
30/10/2022	0600	52000	700	20000	NIL	17.8	5.6
31/10/2022	0600	52000	700		NIL	18.3	4.4

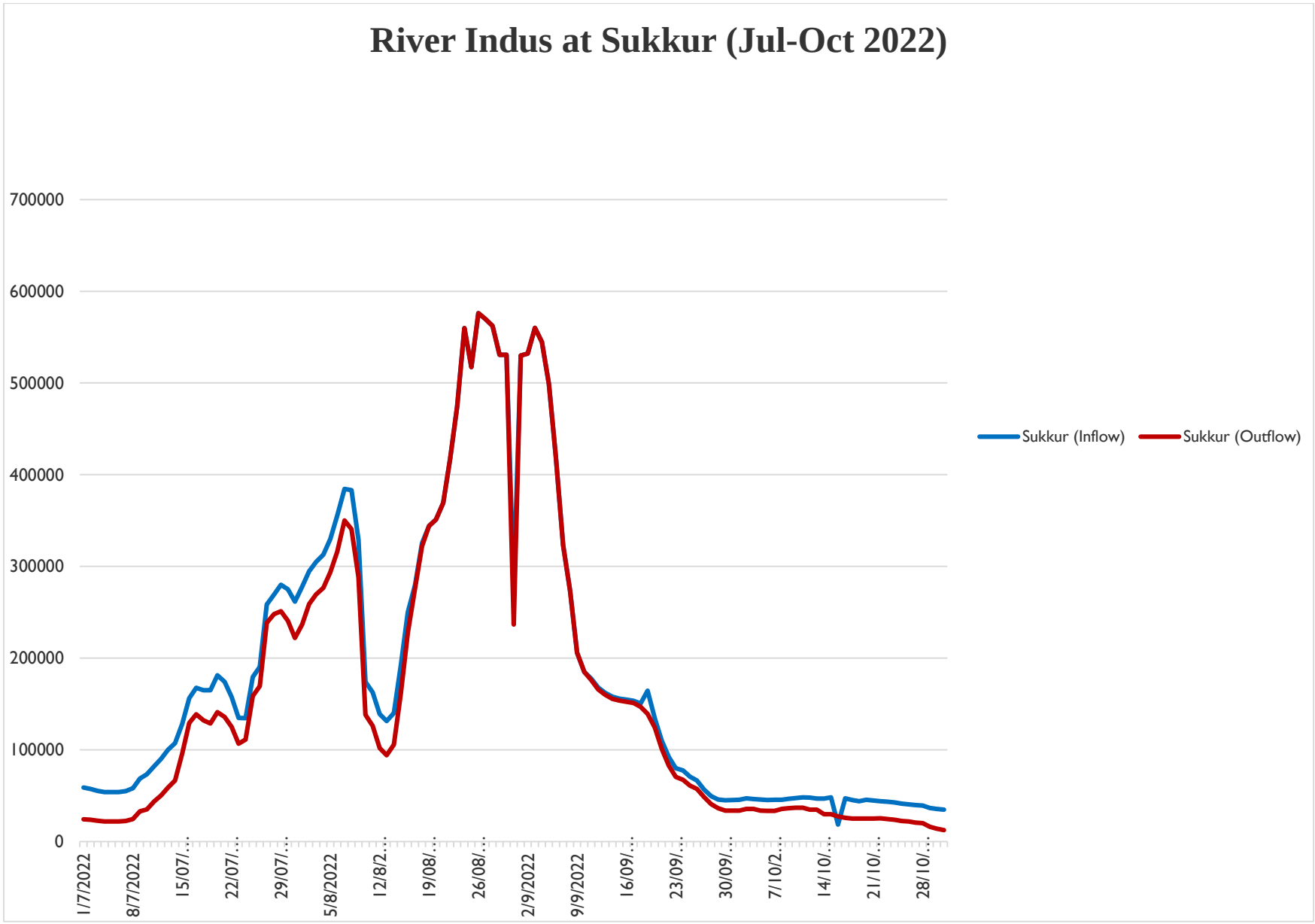

River Indus Flows (Cusecs) at Tarbela (Jul-Oct 2022)
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
-
1/7/2022
8/7/2022
15/07/2022
22/07/2022
29/07/2022
5/8/2022
12/8/2022
19/08/2022
26/08/2022
2/9/2022
9/9/2022
16/09/2022
23/09/2022
30/09/2022
7/10/2022
14/10/2022
21/10/2022
28/10/2022
Tarbela Inflow
Tarbela Outflow

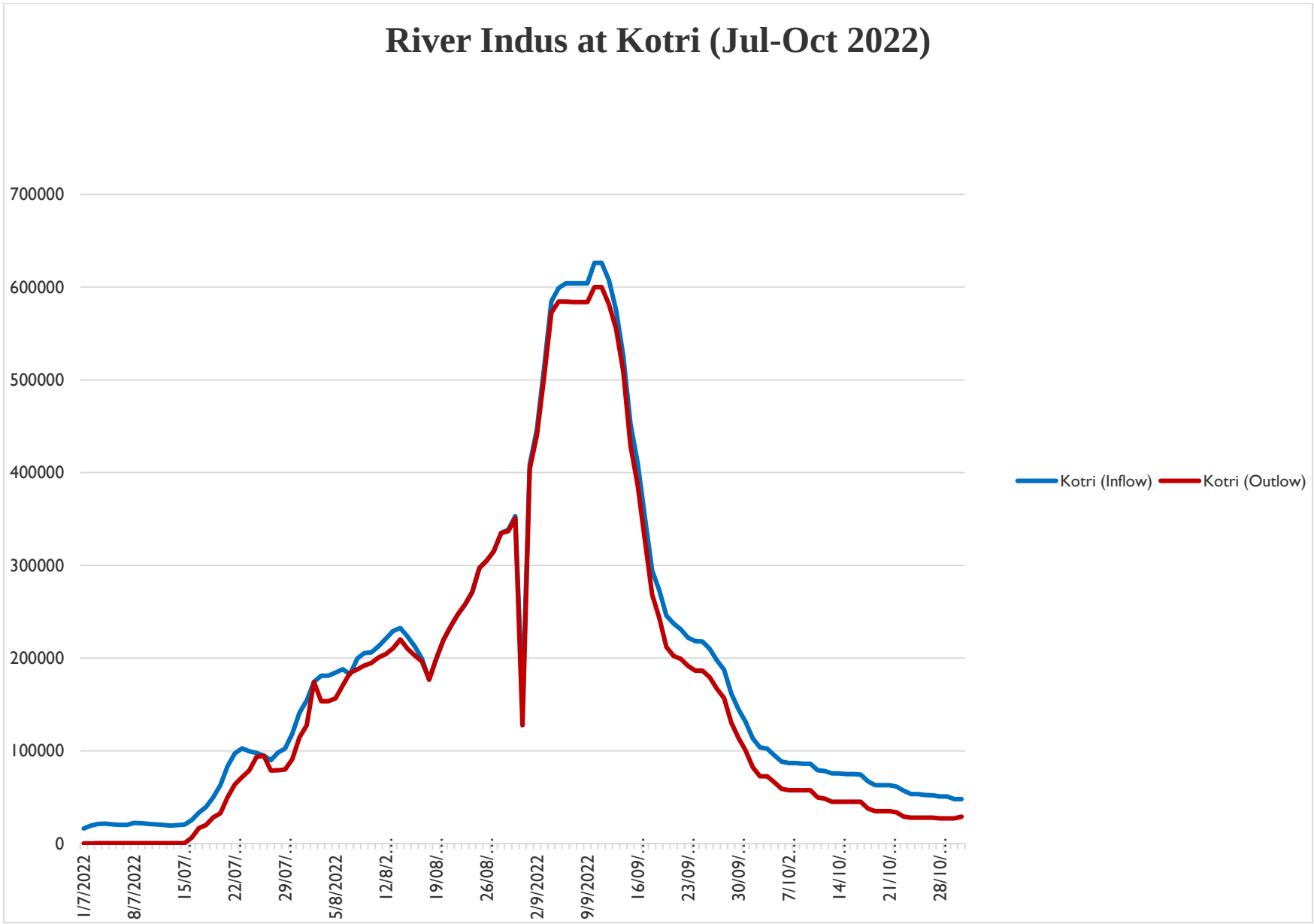

River Indus at Kalabagh (Jul-Oct 2022)
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
1/7/2022
8/7/2022
15/07/...
22/07/...
29/07/...
5/8/2022
12/8/2...
19/08/...
26/08/...
2/9/2022
9/9/2022
16/09/...
23/09/...
30/09/...
7/10/2...
14/10/...
21/10/...
28/10/...
Kalabagh (Inflow)
Kalabagh (Outflow)

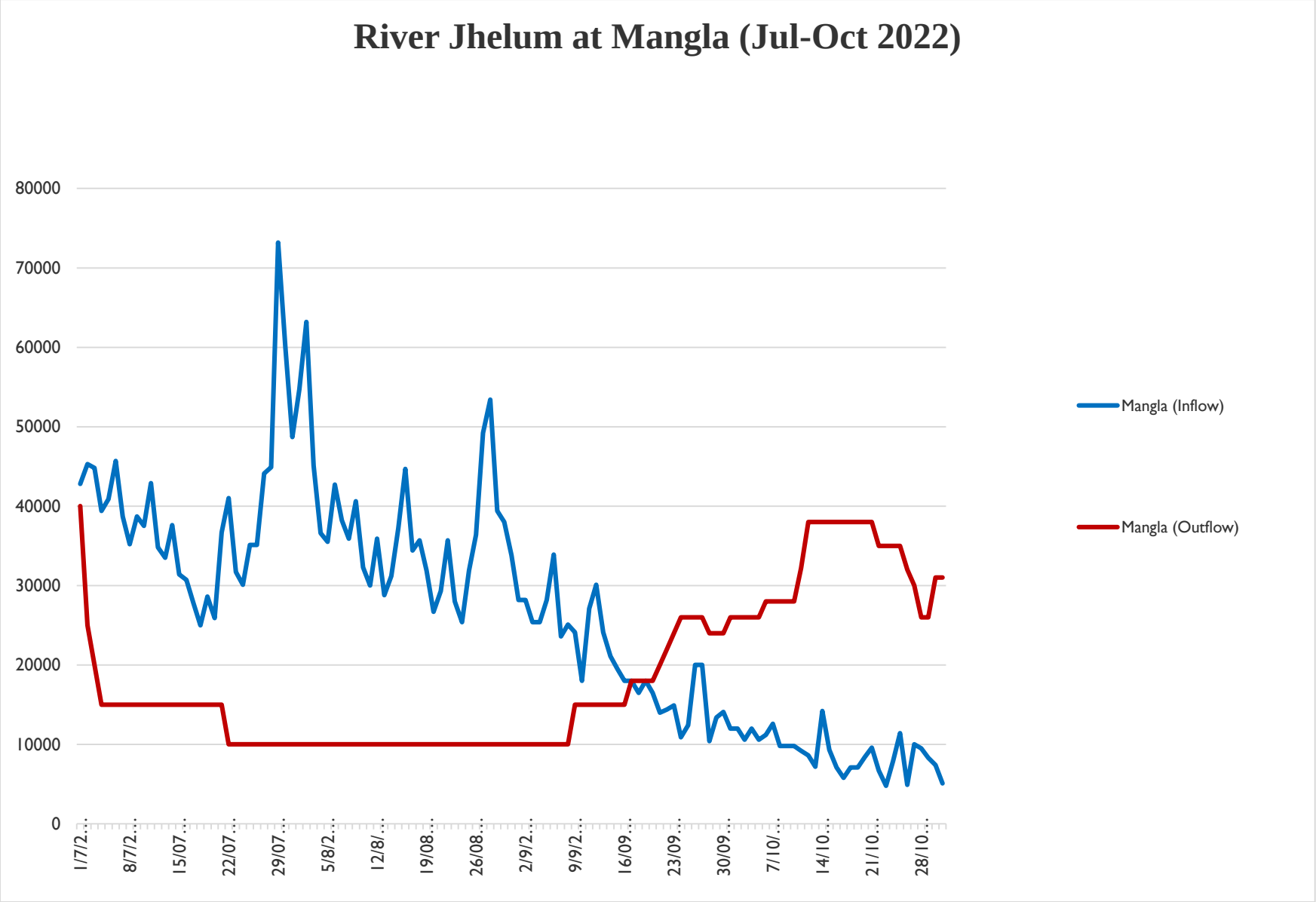

River Indus at Chashma (Jul-Oct 2022)
600000
500000
400000
300000
200000
100000
0
1/7/2022
8/7/2022
15/07/...
22/07/...
29/07/...
5/8/2022
12/8/2...
19/08/...
26/08/...
2/9/2022
9/9/2022
16/09/...
23/09/...
30/09/...
7/10/2...
14/10/...
21/10/...
28/10/...
Chashma (Inflow)
Chashma (Outflow)

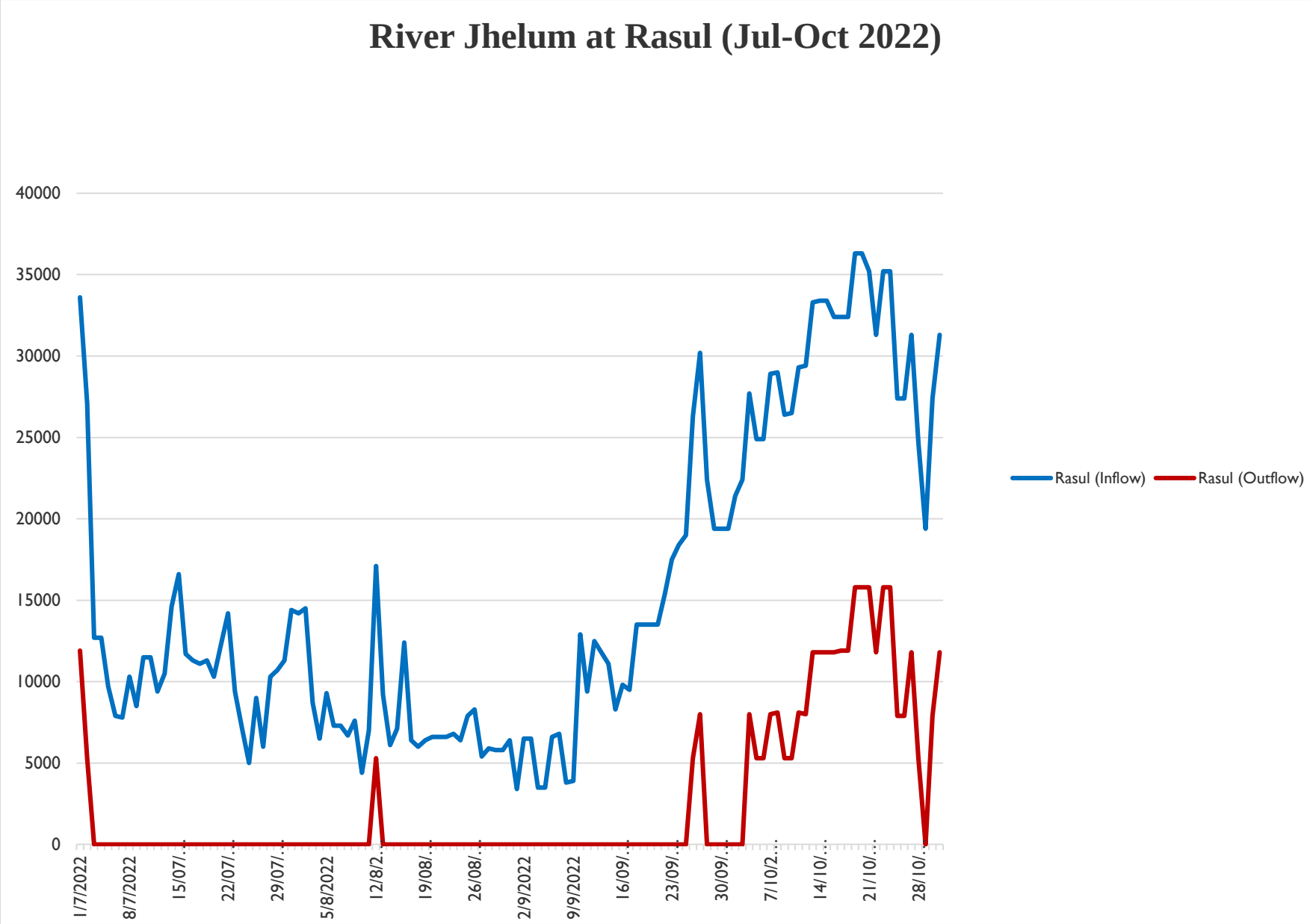

River Indus at Taunsa (Jul-Oct 2022)
700000
600000
500000
400000
300000
200000
100000
0
1/7/2022
14/07/2022
27/07/2022
9/8/2022
22/08/2022
4/9/2022
17/09/2022
30/09/2022
13/10/2022
26/10/2022
Taunsa (Inflow)
Taunsa (Outflow)

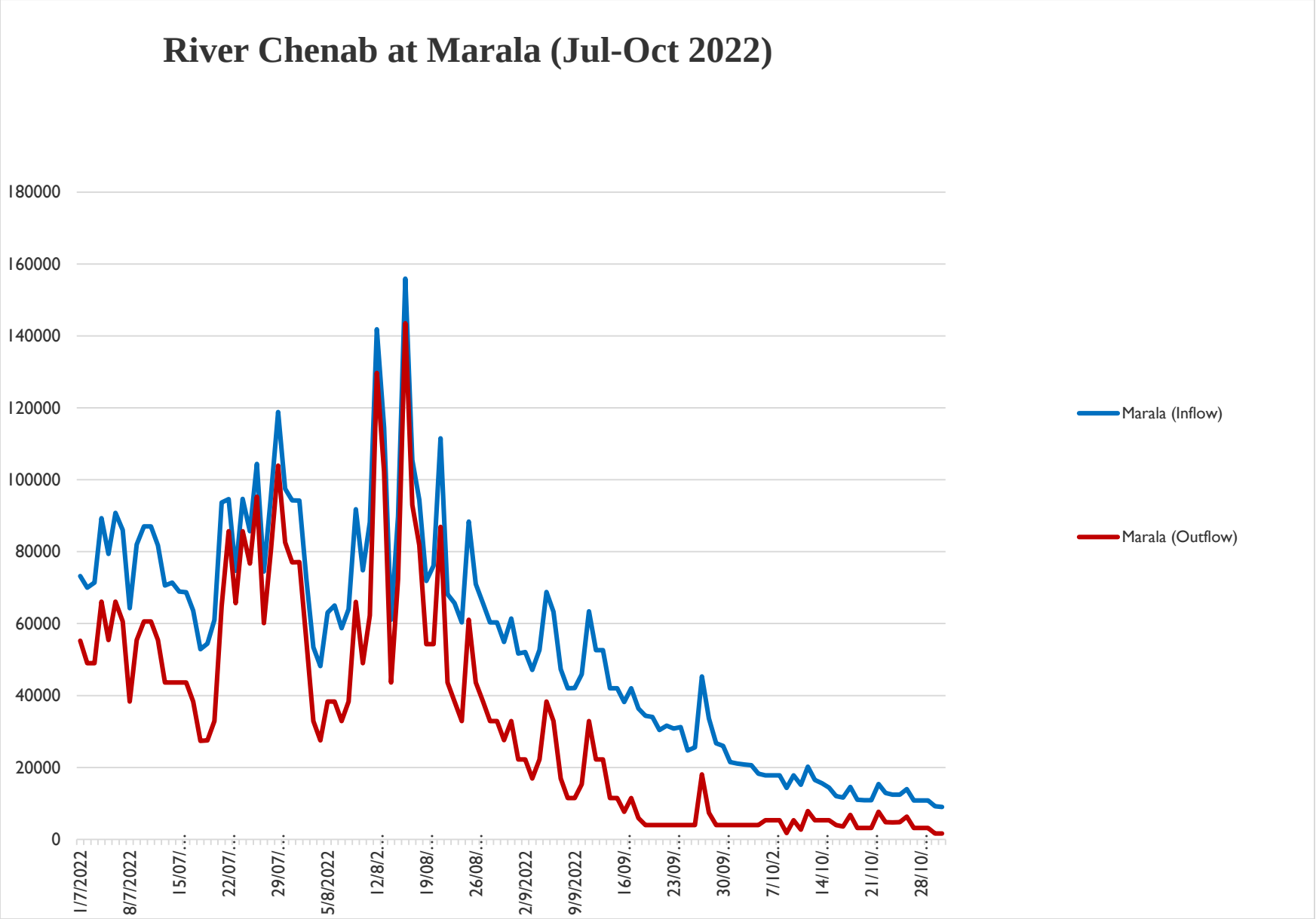

River Indus at Guddu (Jul-Oct 2022)
600000
500000
400000
300000
200000
100000
0
1/7/2...
8/7/2...
15/07...
22/07...
29/07...
5/8/2...
12/8/...
19/08...
26/08...
2/9/2...
9/9/2...
16/09...
23/09...
30/09...
7/10/...
14/10...
21/10...
28/10...
Guddu (Inflow)
Guddu (Outflow)

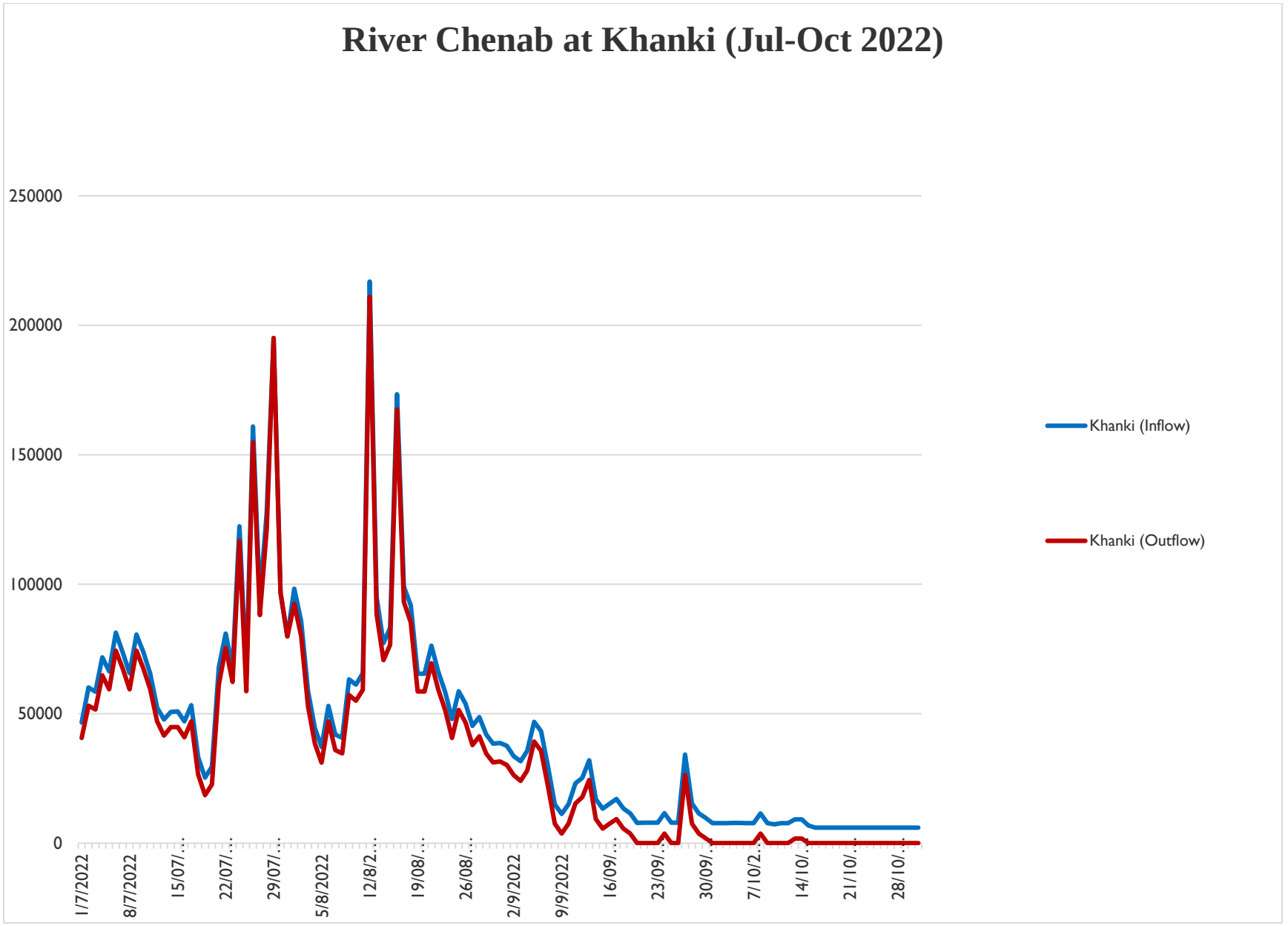

River Indus at Sukkur (Jul-Oct 2022)
700000
600000
500000
400000
300000
200000
100000
0
1/7/2022
8/7/2022
15/07/...
22/07/...
29/07/...
5/8/2022
12/8/2...
19/08/...
26/08/...
2/9/2022
9/9/2022
16/09/...
23/09/...
30/09/...
7/10/2...
14/10/...
21/10/...
28/10/...
Sukkur (Inflow)
Sukkur (Outflow)

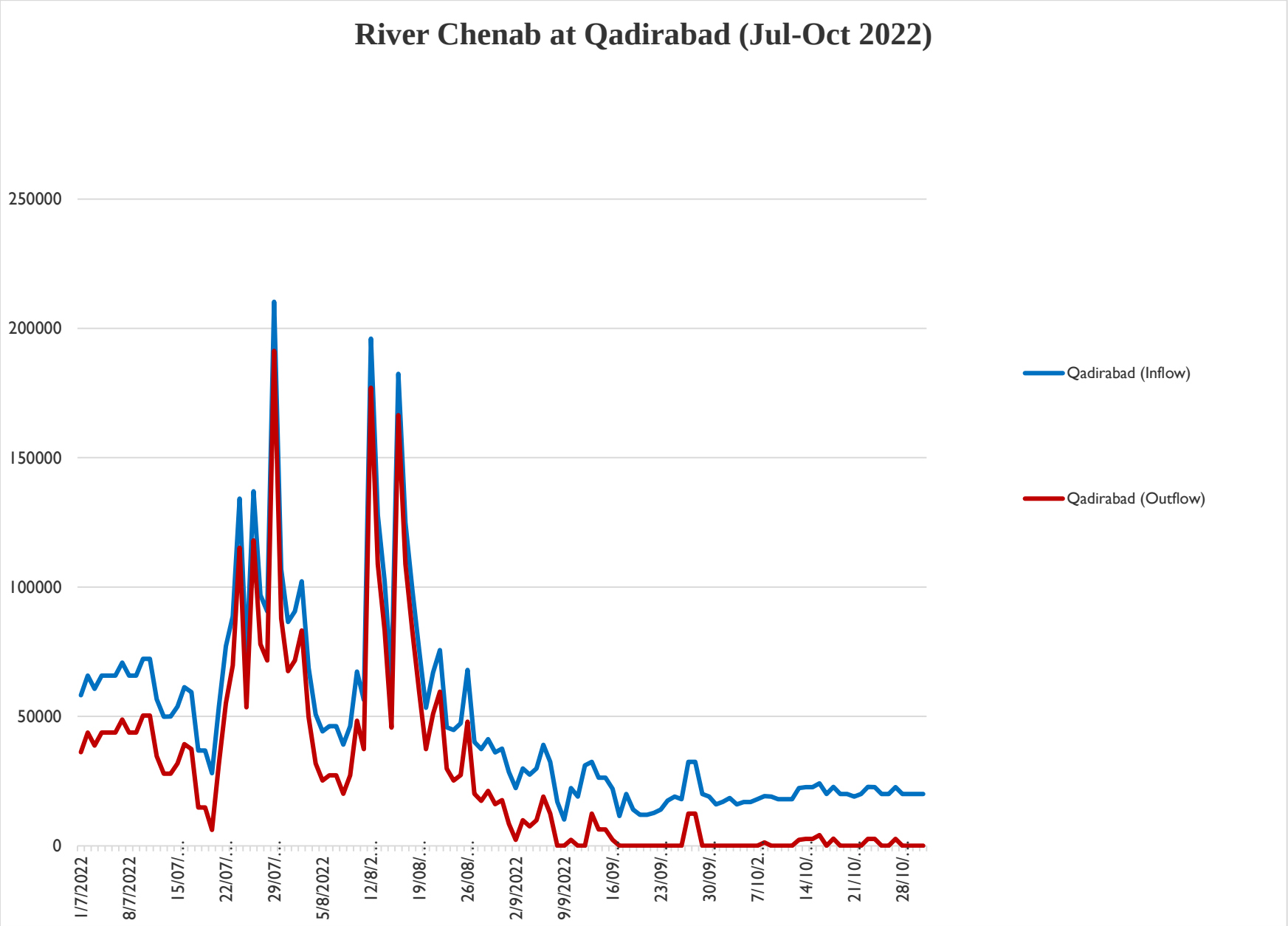

River Indus at Kotri (Jul-Oct 2022)
700000
600000
500000
400000
300000
200000
100000
0
1/7/2022
8/7/2022
15/07/...
22/07/...
29/07/...
5/8/2022
12/8/2...
19/08/...
26/08/...
2/9/2022
9/9/2022
16/09/...
23/09/...
30/09/...
7/10/2...
14/10/...
21/10/...
28/10/...
Kotri (Inflow)
Kotri (Outlow)

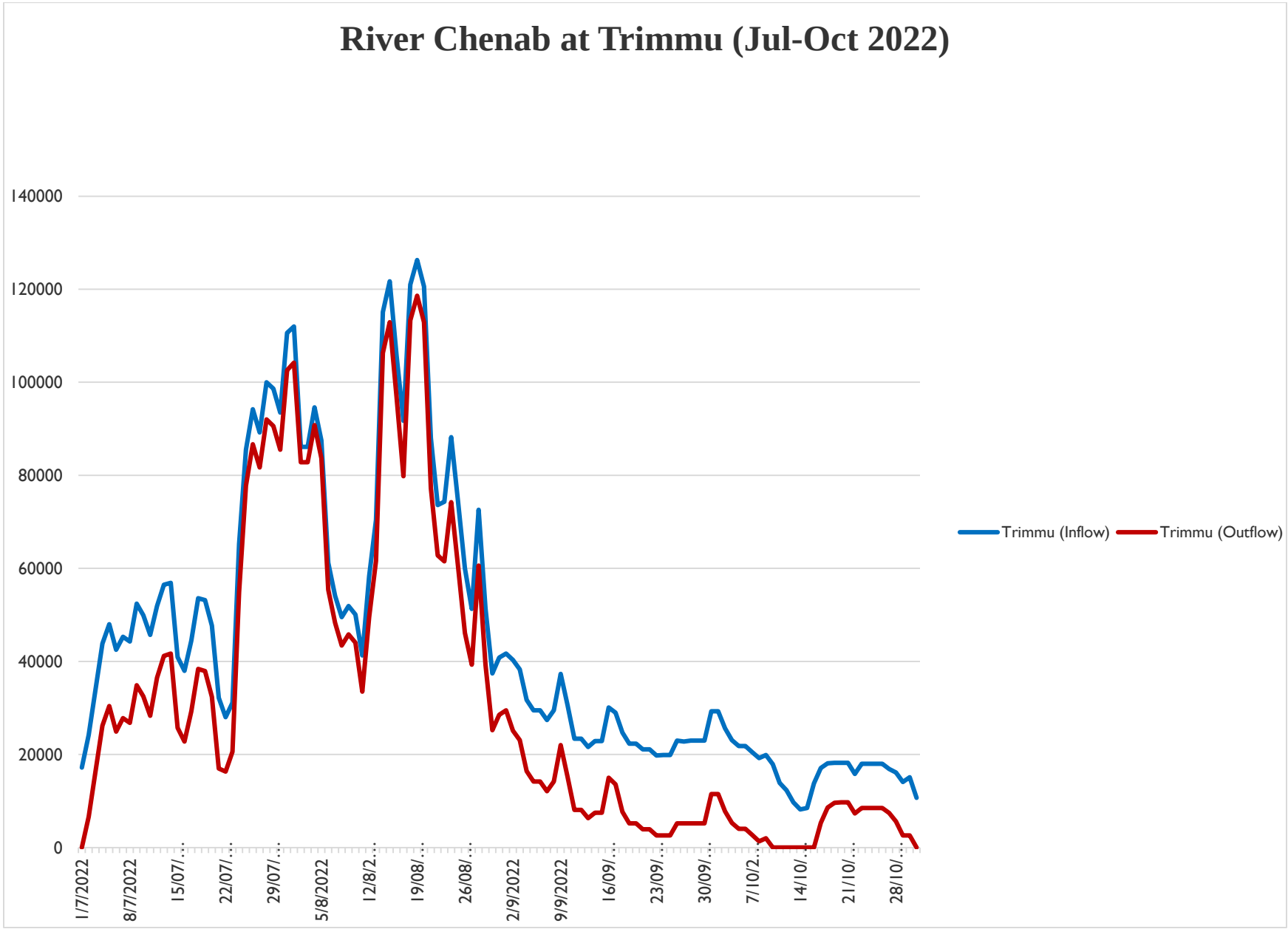

River Jhelum at Mangla (Jul-Oct 2022)
80000
70000
60000
50000
40000
30000
20000
10000
0
1/7/2...
8/7/2...
15/07...
22/07...
29/07...
5/8/2...
12/8/...
19/08...
26/08...
2/9/2...
9/9/2...
16/09...
23/09...
30/09...
7/10/...
14/10...
21/10...
28/10...
Mangla (Inflow)
Mangla (Outflow)

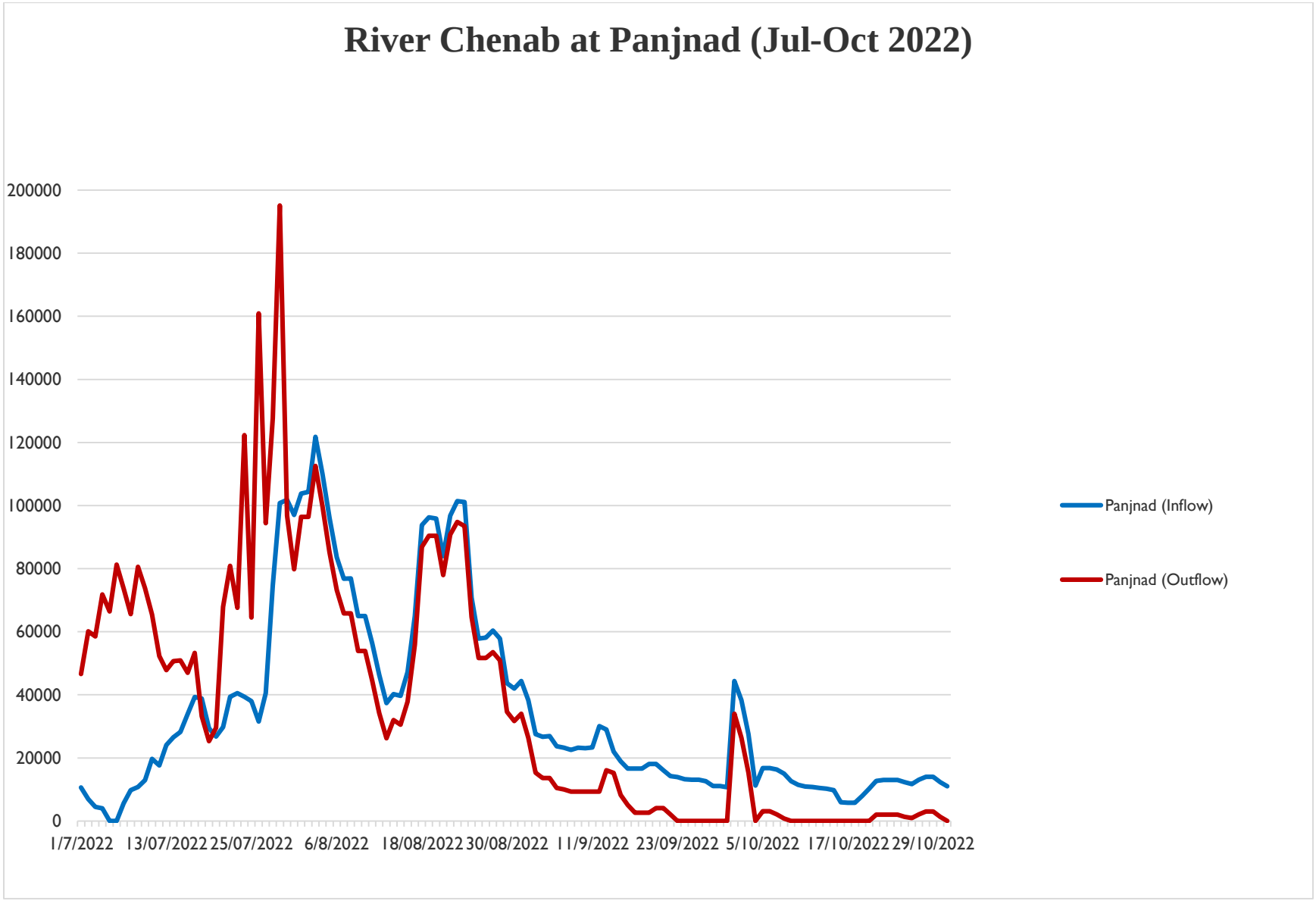

River Jhelum at Rasul (Jul-Oct 2022)
40000
35000
30000
25000
20000
15000
10000
5000
0
1/7/2022
8/7/2022
15/07/...
22/07/...
29/07/...
5/8/2022
12/8/2...
19/08/...
26/08/...
2/9/2022
9/9/2022
16/09/...
23/09/...
30/09/...
7/10/2...
14/10/...
21/10/...
28/10/...
Rasul (Inflow)
Rasul (Outflow)

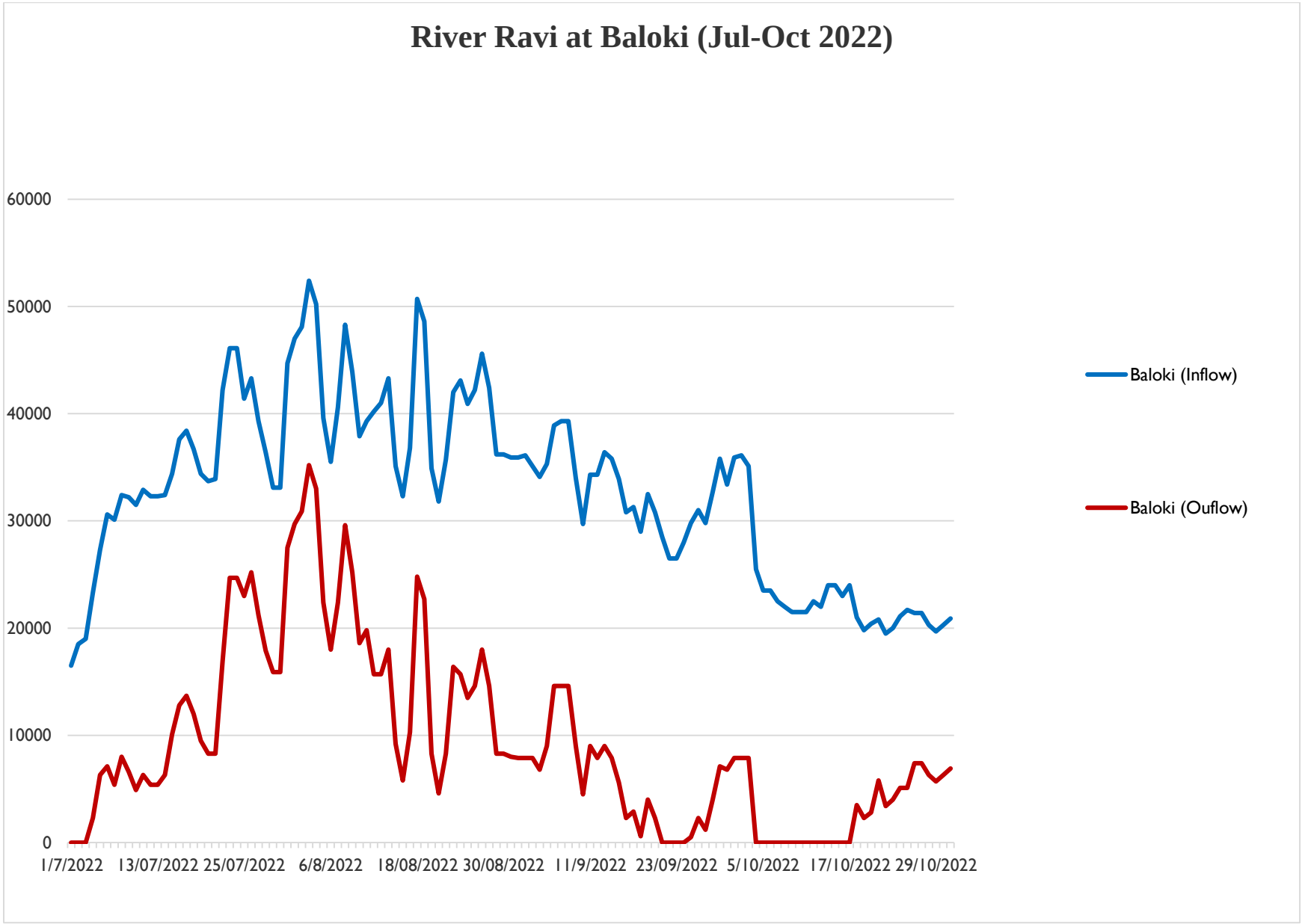

River Chenab at Marala (Jul-Oct 2022)
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
1/7/2022
8/7/2022
15/07/...
22/07/...
29/07/...
5/8/2022
12/8/2...
19/08/...
26/08/...
2/9/2022
9/9/2022
16/09/...
23/09/...
30/09/...
7/10/2...
14/10/...
21/10/...
28/10/...
Marala (Inflow)
Marala (Outflow)

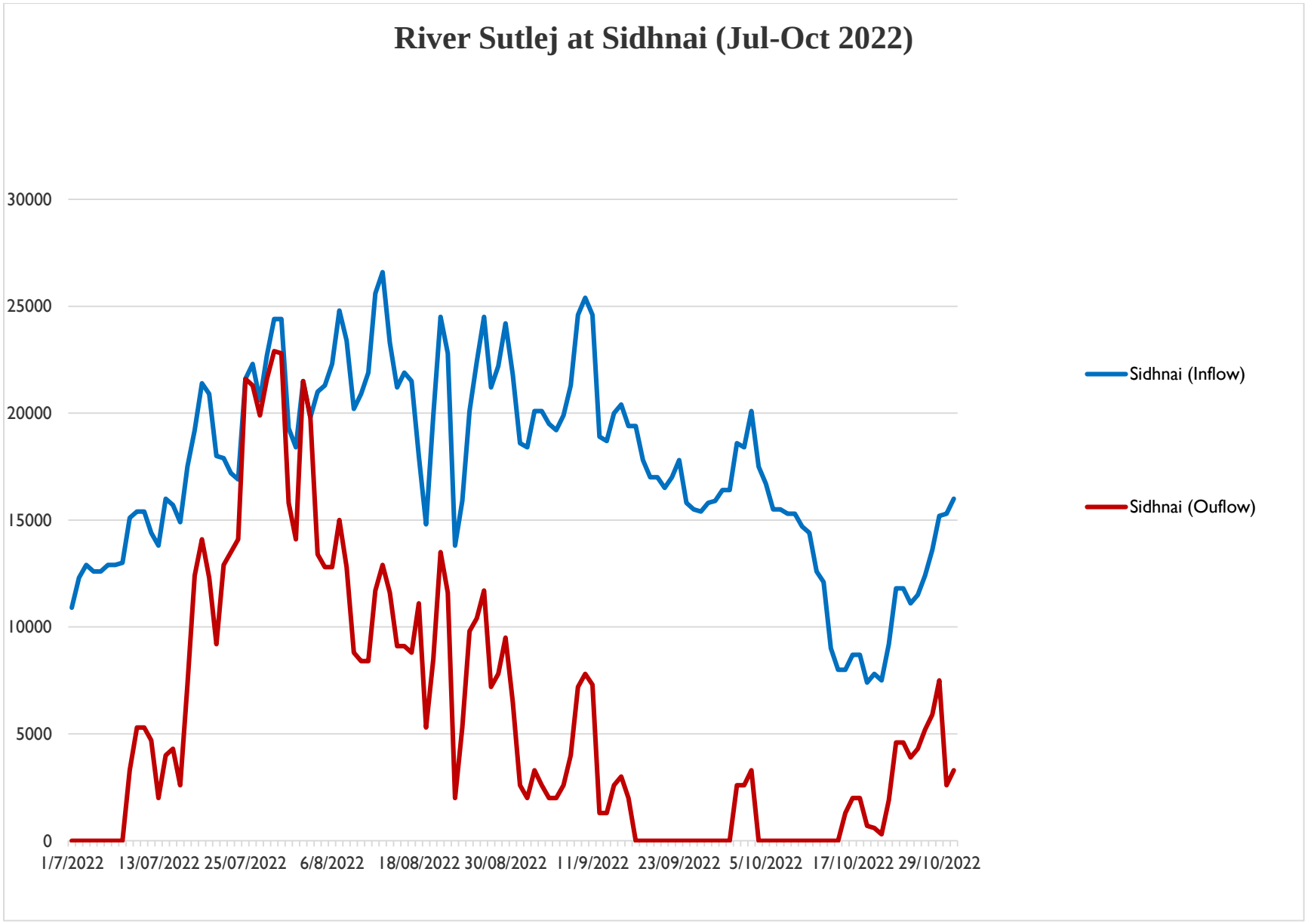

River Chenab at Khanki (Jul-Oct 2022)
250000
200000
150000
100000
50000
0
1/7/2022
8/7/2022
15/07/...
22/07/...
29/07/...
5/8/2022
12/8/2...
19/08/...
26/08/...
2/9/2022
9/9/2022
16/09/...
23/09/...
30/09/...
7/10/2...
14/10/...
21/10/...
28/10/...
Khanki (Inflow)
Khanki (Outflow)

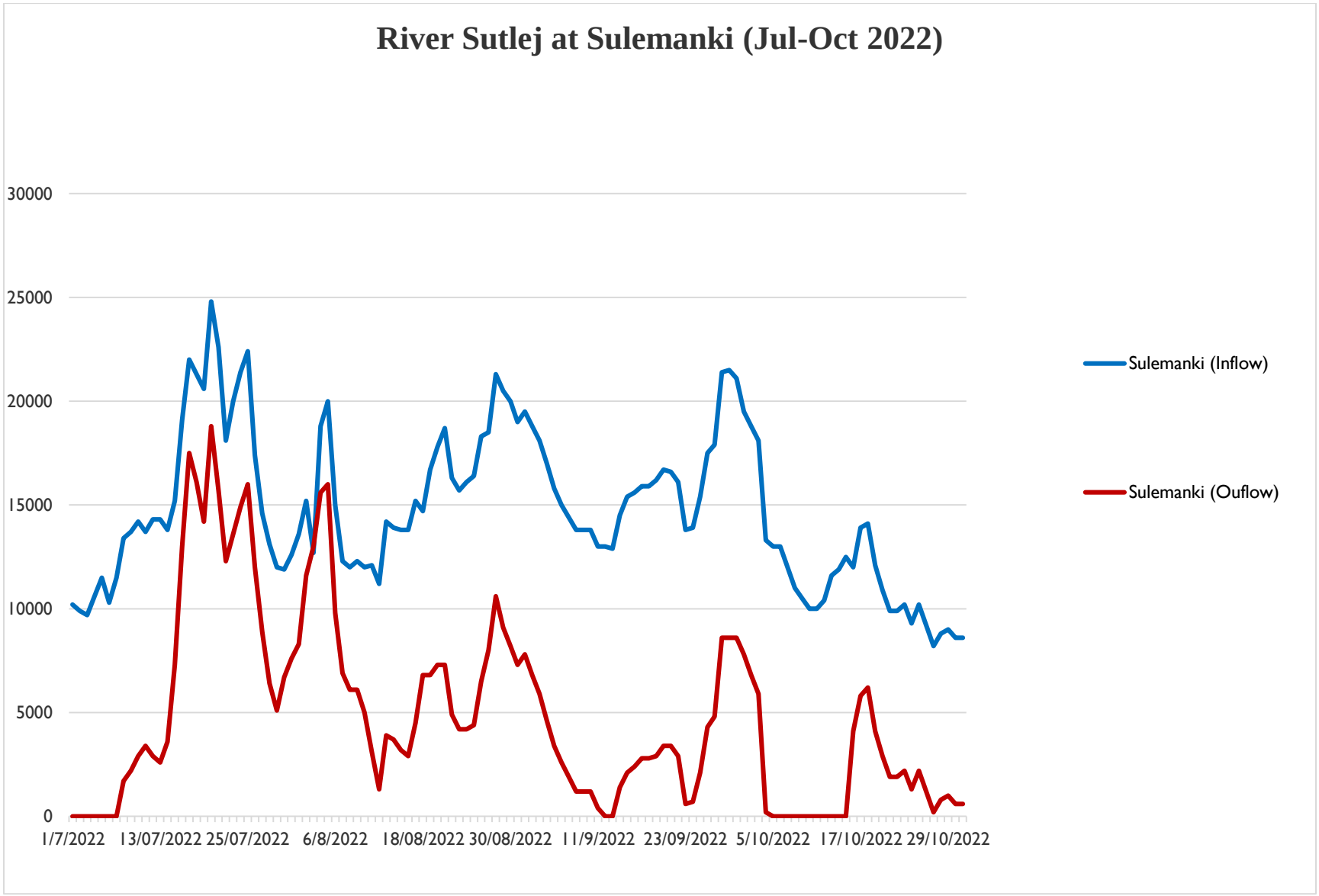

River Chenab at Qadirabad (Jul-Oct 2022)
250000
200000
150000
100000
50000
0
1/7/2022
8/7/2022
15/07/...
22/07/...
29/07/...
5/8/2022
12/8/2...
19/08/...
26/08/...
2/9/2022
9/9/2022
16/09/...
23/09/...
30/09/...
7/10/2...
14/10/...
21/10/...
28/10/...
Qadirabad (Inflow)
Qadirabad (Outflow)

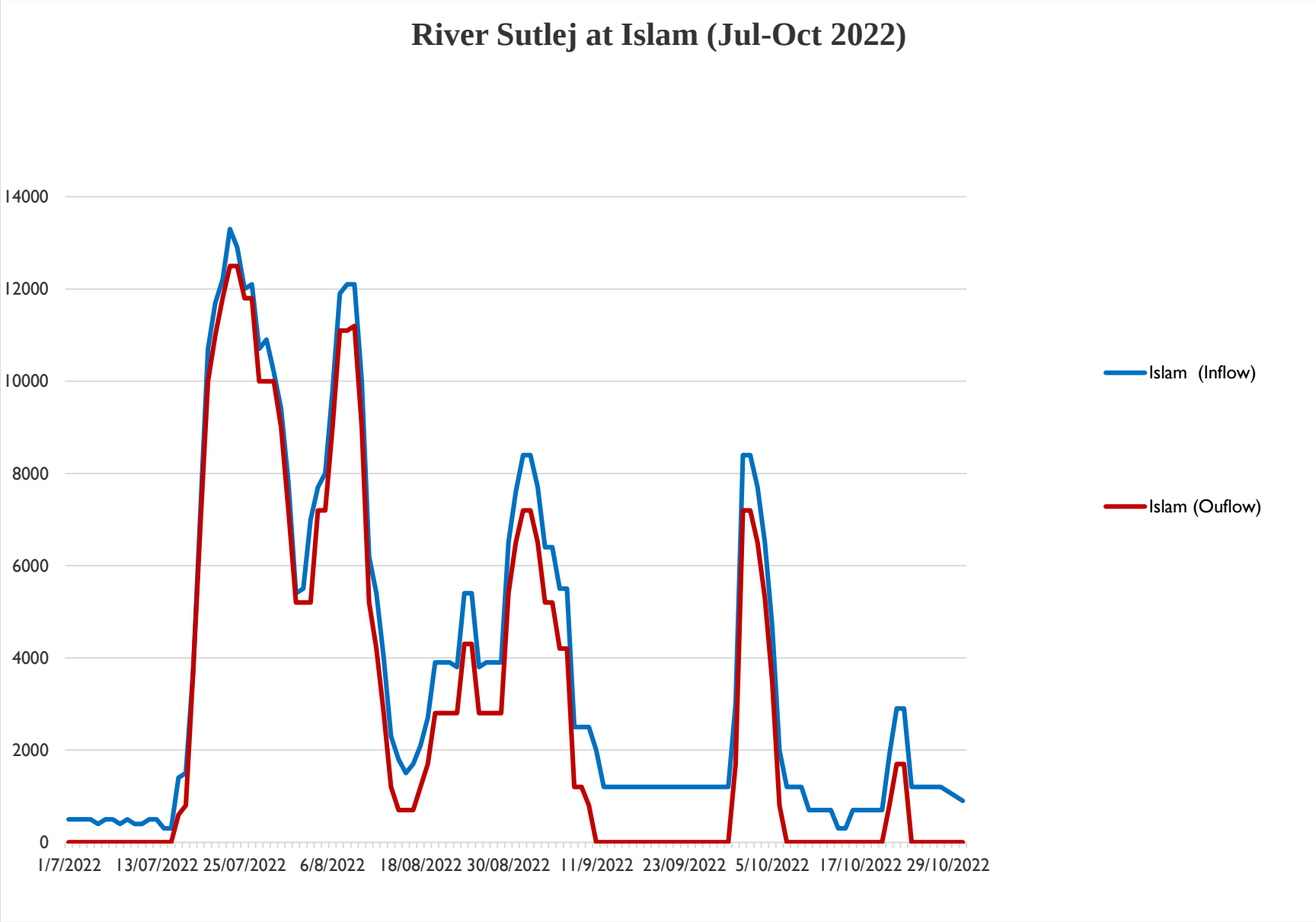

River Chenab at Trimmu (Jul-Oct 2022)
140000
120000
100000
80000
60000
40000
20000
0
1/7/2022
8/7/2022
15/07/...
22/07/...
29/07/...
5/8/2022
12/8/2...
19/08/...
26/08/...
2/9/2022
9/9/2022
16/09/...
23/09/...
30/09/...
7/10/2...
14/10/...
21/10/...
28/10/...
Trimmu (Inflow)
Trimmu (Outflow)


River Chenab at Panjnad (Jul-Oct 2022)
200000
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
1/7/2022
13/07/2022
25/07/2022
6/8/2022
18/08/2022
30/08/2022
11/9/2022
23/09/2022
5/10/2022
17/10/2022
29/10/2022
Panjnad (Inflow)
Panjnad (Outflow)


River Ravi at Baloki (Jul-Oct 2022)
60000
50000
40000
30000
20000
10000
0
1/7/2022
13/07/2022
25/07/2022
6/8/2022
18/08/2022
30/08/2022
11/9/2022
23/09/2022
5/10/2022
17/10/2022
29/10/2022
Baloki (Inflow)
Baloki (Ouflow)


River Sutlej at Sidhnai (Jul-Oct 2022)
30000
25000
20000
15000
10000
5000
0
1/7/2022
13/07/2022
25/07/2022
6/8/2022
18/08/2022
30/08/2022
11/9/2022
23/09/2022
5/10/2022
17/10/2022
29/10/2022
Sidhnai (Inflow)
Sidhnai (Ouflow)


River Sutlej at Sulemanki (Jul-Oct 2022)
30000
25000
20000
15000
10000
5000
0
1/7/2022
13/07/2022
25/07/2022
6/8/2022
18/08/2022
30/08/2022
11/9/2022
23/09/2022
5/10/2022
17/10/2022
29/10/2022
Sulemanki (Inflow)
Sulemanki (Ouflow)


River Sutlej at Islam (Jul-Oct 2022)
14000
12000
10000
8000
6000
4000
2000
0
1/7/2022
13/07/2022
25/07/2022
6/8/2022
18/08/2022
30/08/2022
11/9/2022
23/09/2022
5/10/2022
17/10/2022
29/10/2022
Islam (Inflow)
Islam (Ouflow)

Appendix-III
(3-Pages)

MONTHLY RAINFALL DATA

(JULY-SEPTEMBER 2022)

(Source: PMD)

MONTHLY RAINFALL DATA (JULY-SEPTEMBER 2022)

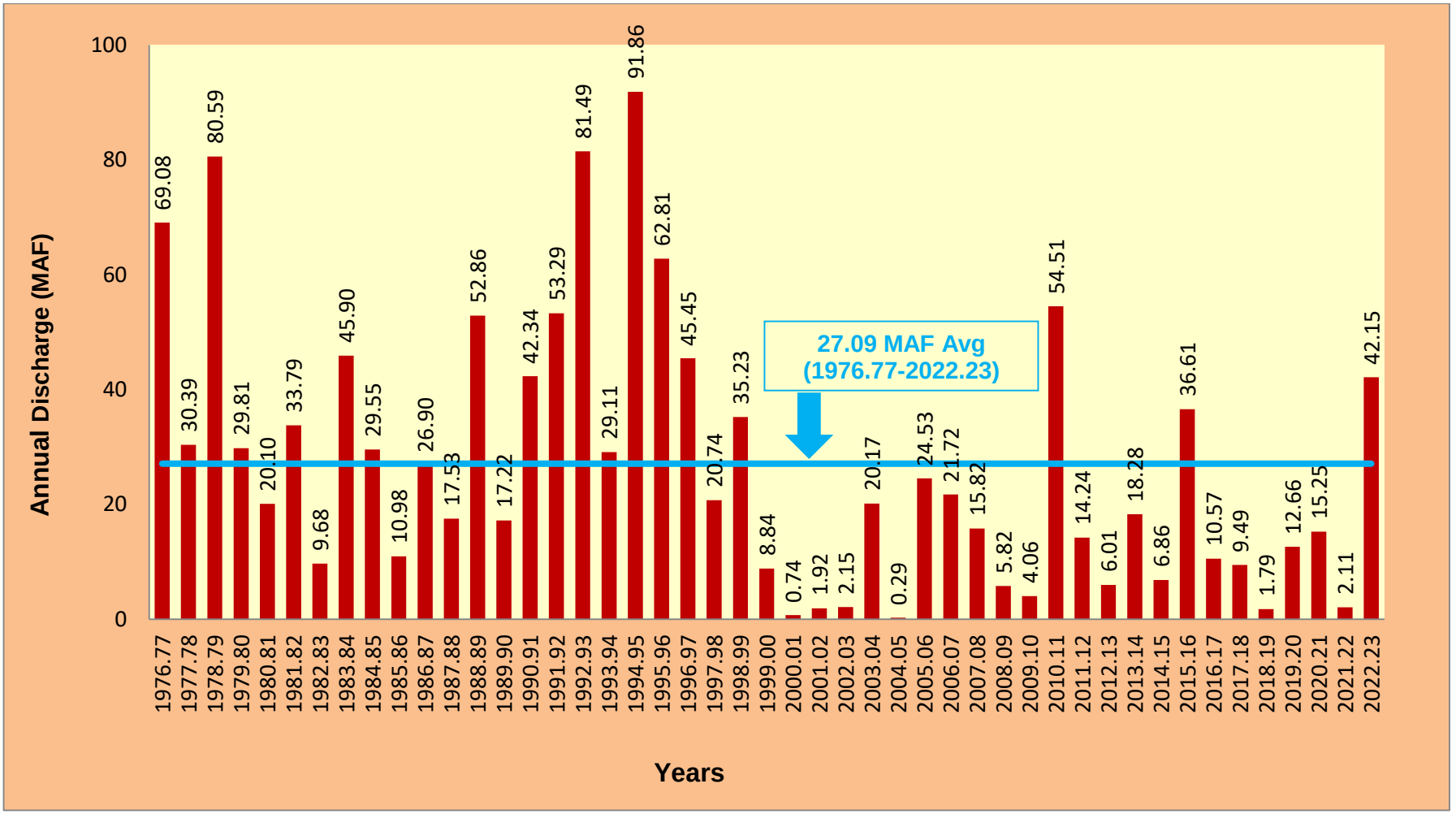
Stations	July 2022	August 2022	September 2022
	Monthly total	Monthly total	Monthly total
PUNJAB			
Bahawalnagar	297.01	48.03	8.01
Bahawalpur (City)	212.34	91.23	0
Bahawalpur (Airport)	192.87	110.2	0
Bhakkar	171.04	284.23	3.01
Chakwal	383.6	108.1	35.81
D.G. Khan	184.83	155.02	2
Faisalabad Airport	105.13	25.43	22.01
Chaklala Airbase	481.94	143.14	141.03
Islamabad (Zero point)	449.03	122.11	102.02
Islamabad (Airport)	573.34	32.04	120.8
Jhang	220.61	57	21.6
Joharabad	145.92	101	51.21
Jhelum	383.7	96	89.8
Kasur	344.53	180	57.01
Khanpur	300.41	189.8	0
KotAddu	198.02	225	50
Kamra Airbase	348.95	86.52	86.41
Lahore (Airport)	317.4	145.65	67.24
Lahore (City)	207.03	240.93	27.41
Layyah	184.72	237.52	42.01
Mandi Bahauddin	327.62	169.51	56.71
Mianwali Airbase	199.07	83.02	60
Multan (Airport)	183.12	94.44	9.61
Multan (City)	102.03	71.42	3.01
Mangla	391.21	73.8	85.02
Murree	356.01	402.5	85.71
NoorpurThal	116.32	76.6	14.4
Okara	160.14	139.93	50.1
Rahim Yar Khan	191.83	224.42	0
Gujranwala	494.02	64.41	45.41
Gujrat	424	115	71
Sahiwal	132.84	98.03	51.01
Shorkot (Airbase)	71.45	121.91	6.91
Sargodha (Airbase)	189.06	91.08	67.01
Sargodha (City)	133.53	98.1	102.2
Sialkot (Cantt)	423.11	158.23	111.13
Sialkot (Airport)	352.43	207.44	91.13
T.T. Singh	110.43	54.61	25.2
Hafizabad	328.22	185.02	15.01
Khanewal	170.05	154	1

Stations	July 2022	August 2022	September 2022
	Monthly total	Monthly total	Monthly total
Narowal	312.73	112.83	51.1
Attock	247.4	154.21	59.5
SINDH			
Badin	335.79	307.54	22
Chhor	254	503.9	24
Hyderabad	247.01	243.02	2.01
Jacobabad	290.04	493.01	0
Karachi Airport	348.36	127.96	43.42
Larkana	155.05	738.31	0
Mithi	116	273	57
Shaheed Benazirabad	158.83	488.21	1
Padidan	535.46	1228.52	0
Rohri	232.03	420.01	0
Sukkur	175.02	377.51	0
Moen Jo Daro	211.03	779.51	0
Thatta	297.3	208.81	24
Dadu	239.01	337.02	0
Mirpurkhas	125	304	28
Tandojam	198.91	603	7
Sakrand	212	617.02	0.01
Khairpur	227	615.3	0
KHYBER PAKHTUNKHWA			
Balakot	352.41	157	103
Bannu	91.2	113.5	20
Cherat	123	146.7	16
Chitral	15.4	110	0.01
D.I.Khan (City)	66.9	223.01	31
D.I.Khan (Airport)	40.06	237.01	2
Dir	132.01	361.01	27.5
Lower Dir	65	278	54
Drosh	10.81	142.3	1.4
Kakul	300.04	297	229
Kalam	46.9	268.1	11
Kohat (Airbase)	117.05	72.04	70.03
Malamjabba	234	256	98
Mirkhani	6	213.01	18.01
Parachinar	102	166.11	36.71
Peshawar (Airbase)	73.76	106.78	13.71
Peshawar (City)	68.08	56.26	5.43
Bacha Khan Airport	61.36	98.45	8.04
Pattan	34	112.01	1
Risalpur	146.08	156.04	28.02
Saidu Sharif	148.3	178	43.5
Takht Bai	456.22	123.62	19.11
BALOCHISTAN			
Barkhan	141	312.01	18

Stations	July 2022	August 2022	September 2022
	Monthly total	Monthly total	Monthly total
Dalbandin	32.23	33.02	0
Gawadar	151.21	5	0
Jiwani	63	0	0
Kalat	140	361	0
Khuzdar	237.11	227.1	0.4
Lasbela	404.71	131.51	2
Nokkundi	0.02	0	0
Panjgur	186	69	0
Pasni	167.3	5	0
Quetta (Shmanda)	67.07	207.04	0
Quetta (Samungli)	63.04	208.03	0
Sibbi	159.01	243	4
Turbat	119.01	10	0
Ormara	221	22	0
Zhob	139	161	11
GILGIT BALTISTAN/ AJ&K			
Astore	13.61	54.3	33.8
Bunji	11.01	51.02	7
Babusar	23.85	92.09	40.02
Bagrote	64.43	149.95	20.85
Chilas	0.04	26.07	6.3
Garhi Dopatta	191.8	278.3	60
Gilgit	22.24	60.75	3.92
Gupis	24.8	98.81	1.2
Kotli	360	216.4	144
Muzaffarabad (Airport)	214.02	289.33	143.8
Muzaffarabad (City)	215.12	272.91	166
Rawalakot	192.52	196.11	116.21
Hunza	10.61	105.1	5.2
Skardu	11.53	14.69	6.4

Appendix-IV

ESCAPAGE BELOW KOTRI HYDROLOGICAL YEAR FROM APRIL TO MARCH



Source: IRSA