

**OFFICE OF THE CHIEF ENGINEERING ADVISER &
CHAIRMAN, FEDERAL FLOOD COMMISSION**



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2021**

**Government of Pakistan
Ministry of Water Resources**

**6-Ataturk Avenue, G-5/1,
Islamabad, Pakistan
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**GOVERNMENT OF PAKISTAN
MINISTRY OF WATER RESOURCES**

ANNUAL REPORT 2021



**OFFICE OF THE CHIEF ENGINEERING ADVISER &
CHAIRMAN FEDERAL FLOOD COMMISSION**

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

JANUARY 2022

CHAIRMAN'S MESSAGE

Pakistan faces major social, environmental, and economic development issues as a result of growing water scarcity. Climate-related disasters including floods and droughts have highlighted the importance of implementing climate-resilient solutions for improved water governance at all levels in recent years. All major cities, including Rawalpindi and Islamabad, rely on groundwater for about 90% of their drinking water supply. COVID-19 has emphasized further the significance of improving the resilience of potable water delivery infrastructure even further. Pakistan's growing water scarcity and climate change susceptibility underscores the urgent need to manage climate-related risks and enhance water use at the national and local levels.

The office of Chief Engineering Advisor & Chairman Federal Flood Commission (O/o CEA & CFFC) is an **Executive Department** of Ministry of Water Resources, Islamabad. At national level, O/o CEA & CFFC provides technical advisory services to the Ministry of Water Resources on issues like Engineering, Water and Hydropower sector, including flood control, dams safety, irrigation, drainage, and hydro-power, besides, other allied engineering matters. It has played an instrumental role in formulation and approval of the **National Flood Protection Plans (NFPPs)** and **National Water Policy (NWP)** and their subsequent implementation in the country through the concerned provincial and federal level organizations/ departments. It is now the secretariat of NWP-Steering Committee headed by the Federal Minister for Water Resources.

Although **subdued Monsoon was observed in 2021**, yet unprecedented urban flooding was experienced in Sector E-11 of Islamabad and in Abbotabad city of Khyber Pakhtunkhwa. The factors causing increased vulnerability to urban floods include unplanned urbanization, outdated water sewerage system, encroachments along the waterways and over & above the visible impacts of climate change. Keeping in view the increased discomfort to urban population and damages caused to public and private property during the heavy rainfall and subsequent urban and flash flooding events attributed to climate change, multi-hazards vulnerability and risk assessment is the need of the hour, besides, drainage system of major cities need to be rehabilitated. Management of hill torrents duly in line with National Water Policy requires priority for conservation and mitigation of floods.

Foregoing in view, I am glad to present the **O/o CEA/CFFC Annual Report for the Calendar Year 2021**. The performance information of several Wings of O/o CEA/CFFC has been included in our Annual Report, which is aligned with the principles of integrated reporting. We are certain that it gives us a complete and consistent picture of our performance and prospects. I'd like to express my gratitude to the entire team. I would like to thank them for their support, hard work and dedication to work.

By continuing to work together, we can better contribute in managing the issues pertaining to country's water sector, related concerns to scarcity of water by reducing risks to the communities, manage the flood problems and helping the country to be more climate-resilient. I would also continue to aspire greater support of Ministry of Water Resources towards ever needed institutional strengthening and capacity building of O/o CEA/CFFC - the oldest office providing advisory service in water and its allied sectors.

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Chief Engineering Advisor & Chairman
Federal Flood Commission



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Mr. Zahid Mahmood Qureshi
Director General
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EXECUTIVE SUMMARY

The leading engineering body established by the Government after creation of Pakistan as ‘*Central Engineering Authority*’ under the Chief Engineering Adviser. It was re-designated as Chief Engineering Advisor’s Office after establishment of 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 Office of Chief Engineering Adviser. In 1977, **Federal Flood Commission (FFC)** was established for the purpose of Integrated Flood Management at National level and it was decided that Chief Engineering Advisor’s Office will be the Secretariat of FFC. In 1987, **Dam Safety Council** was added to the office of CEA in 1981 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 above stated 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 a study on Indus River Regime, O/o CEA & CFFC 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 IRSA Act and Water Apportionment Accord of 1992.

The office has the following core wings:

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

Civil Engineering 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.

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

Since its creation, FFC has successfully served at national level in improving the Flood Forecasting and Warning System; ensured implementation of SOPs for regulation of Tarbela & Mangla reservoirs, execution of various flood protection sector projects on-ground based on river-reach wise feasibility studies; and of flood-related infrastructure damage restoration activities.

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 Flood Warning Manual.

FFC undertook NFPP-IV formulation in the aftermath of devastating floods of 2010. NFPP-IV was formally approved by the CCI in May 2017, after a rigorous consultative process both at technical and political levels. The NFPP-IV envisages reclamation of land 154,176 hectares, erosion protection of 779,250 hectares land and protection of 2,479,555 hectares land from inundation. Based on NFPP-IV, Flood Protection Sector Project –III (FPSP-III) was developed for which CCP was approved by the CDWP on March 03, 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 organization 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, M/o WR was requested for taking-up of 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 M/o WR 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 has been prepared in consultation with all the stakeholders and forwarded to EAD through Ministry of Water Resources for exploring external funding.

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. An amount of Rs. 1500.00 million has been allocated under PSDP (2021-22) for Normal/ Emergent Flood Programme.

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, NTDCL, GENCOS, DISCOs, PPIB & AEDB, Render expert technical advice to Ministry of Energy on Hydel, Thermal and 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 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.

O/o CEA & CFFC and the Floods 2021

Pakistan Meteorological Department (PMD) issued Seasonal Outlook for Summer Monsoon (July-September 2021) for Pakistan on 11th June 2021. The Outlook for Monsoon Season 2021 is as under:

- Monsoon rainfall is expected to remain near to normal during July to September 2021 in Pakistan.
- The upper half of Punjab, northern Balochistan and Kashmir are likely to receive moderately above normal rainfall during the season.
- Area weighted normal rainfall of Pakistan during Jul - Sep is 140.8 mm.

PMD forecasted impacts of above normal rainfall as below:

- Potential for Riverine Floods
- High probability of urban flooding in metropolis cities.
- High probability of flash flooding in hill torrents of Punjab.
- Sufficient water availability for irrigation and power sectors.

During Monsoon Season 2021 (July to September), the rainfall remained close to normal. Due to lesser rainfall and low snow melting, Dam Management Authorities of WAPDA filled Tarbela Dam for only one day whereas the Mangla Reservoir could not achieve its Maximum Conservation Level. Monsoon Season 2021 passed without any much trouble mainly due to lesser rains. However, urban flooding was experienced in Sector E-11 of Islamabad and in Abbotabad city of Khyber Pakhtunkhwa.

On 28th July 2021, heavy rains started after the cloudburst in Islamabad, Pakistan, caused flood situation in many parts of the federal capital and killed two people. Several vehicles were swept away in the floods and water entered the basement of houses and plazas in Sector E-11, F-10 and D-12. 116 mm of rain was recorded at the personal weather station in E-11/4 Islamabad. Also, two bridges i.e. Ayub Bridge & Nowshera Bridge in District Abbotabad (Khyber Pakhtunkhwa) and one bridge in District Sibbi (Balochistan Province) were damaged. Moreover, the **GLOF event in Gilgit Biltistan** had damaged the roads and area was cut off from the main Highways that had hampered the rescue & relief efforts. Karakoram Highway was also blocked at various locations due to land sliding. As per NDMA, **198 lives** were lost during Monsoon Season 2021 despite normal rains.

The twin cities of Islamabad- Rawalpindi experienced heavy downpour on 28th July 2021, which generated high flood flows in Lai Nullah. The Nullah attained 21.00 feet (Evacuation Level) at Kattarian Bridge at 0810 hours and 17.00 feet (Evacuation Level) at Gawal Mandi Bridge at 0910 hours on that morning. Afterwards, the rainfall stopped and the situation

became normal. Apart from that, on **11th September 2021**, due to heavy rainfall in Islamabad- Rawalpindi, water level in Lai Nullah at Kattarian Bridge was raised upto 19.00 feet (Alert Level) and 15.00 feet at Gawalmandi Bridge (Alert Level). The flood flows were safely passed and no damages were reported by the concerned field formation.

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 radar and Flood Telemetry Networks well in time so as to be fully prepared well before the start of Monsoon Season 2022. The encroachments in the flood plains and waterways may be removed by the PIDs & FLAs so as to avoid loss of human lives and damages to the property in future floods.

PIDs & FLAs may expedite action on the decisions taken in the Post Monsoon Meeting of FFC held on 13th December 2021 for timely completion of proposed works, so as to combat Monsoon Season 2022 with full preparation in a much better way. The decisions taken in FFC's Post Monsoon 2021 meeting held on 13th December 2021 are re-produced as under;

- (i) **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 2022 Monsoon Season.
- (ii) **PIDs and FLAs** to pursue the matter with respective Provincial Authorities regarding approval and enactment of River Act 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 nullahas, 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, 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.
- (vii) **FFC** to write D.O letter to Chief Secretary AJ&K for timely release of funds to project authority concerned for restoration of damaged Flood Protection infrastructure in AJ&K.

- (viii) **PMD** to ensure procurement & installation of the Weather Radar at D.I. Khan as per approved Implementation Plan.
- (ix) **Engineers Directorate, GHQ, Rawalpindi** to peruse the case with concerned quarters for making arrangements for relocation of Pak Army buildings from waterway of Barakas Nullah in Mangla Garrison, as per results of topographic survey being conducted by MDO, WAPDA so that the waterway is cleared before Monsoon Season 2022 to pass surplus flood water through Emergency Spillway in case of emergency situation.
- (x) **Deputy Commissioner, Rawalpindi** to ensure removal of encroachments from the banks/ bed of Lai Nullah at the earliest.
- (xi) **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.
- (xii) **Pak Railways** to ensure the execution of Left Guide Bund of Shershah Railway Bridge across River Chenab in District Multan at the earliest. 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.
- (xiii) **WAPDA** would convene next meeting of High Level Barakas Nullah Committee before the Pak Army Post Monsoon Season Conference likely to be held in 2nd week of January 2022.
- (xiv) **MDO** to take up the matter with WAPDA authorities to include the Barakas Nullah Rehabilitation Works in the 2nd Revised PC-I of Mangla Dam Raising Project.
- (xv) **Provincial Governments** to provide list of encroachments removed along with proper coordinates to SUPARCO for analysis & verification of encroachments removed from the waterways & flood plains of rivers.
- (xvi) **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 is not agreed to provide the same during Monsoon Season 2022.
- (xvii) **PCIW** to make all possible efforts to ensure availability of authentic, reliable and real time cross border data to PMD/FFD of River Chenab and Eastern Rivers.

LIST OF ABBREVIATIONS

ADB	Asian Development Bank
AJK	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
mm	Millimeter
NESPAK	National Engineering Services Pakistan
NDMA	National Disaster Management Authority
NWC	National Water Council
NWP	National Water Policy
O&M	Operation and Maintenance
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 & Sanitation Agency, Rawalpindi
US\$	United States Dollar



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/CFEC.

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.

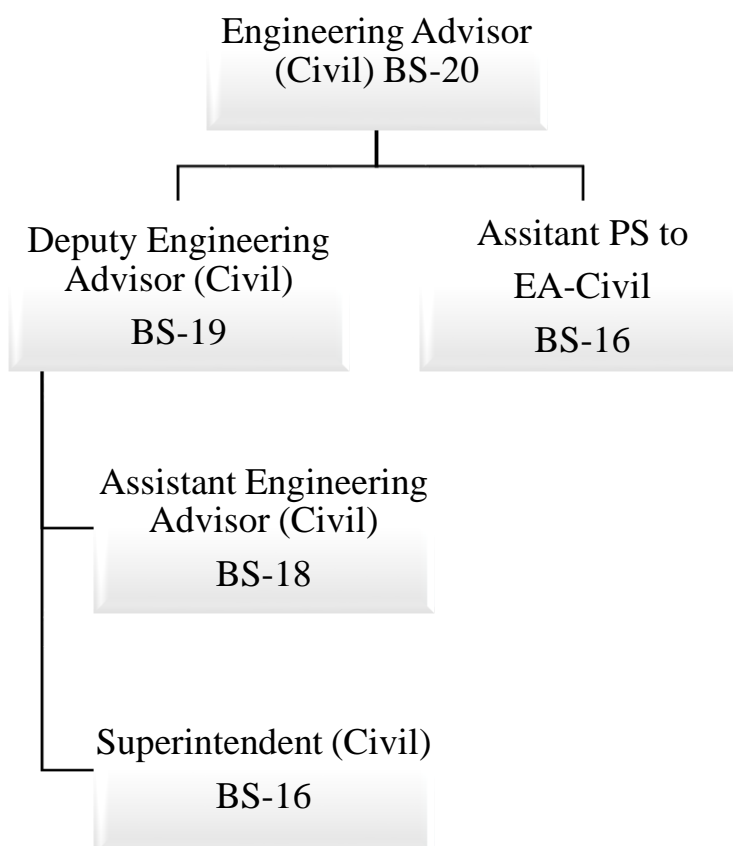


Figure 1.1: Organogram of the Civil Engineering Wing

The posts of Deputy Engineering Advisor (Civil) and Assistant Engineering Advisor (Civil) are currently lying vacant. Two Engineers from other technical wings of Office of CEA/CFFC are 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 Civil Engineering Wing are enlisted below:

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

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.

1.4. Activities Performed During 2021

During the calendar year 2021, Civil Engineering Wing of O/o the CEA/CFFC performed various functions related to its charter of duties. Detail is given in the preceding segment;

1.4.1. Technical Scrutiny of PC-I/PC-IIs of Water Sector Projects

The following project proposals (PC-Is/PC-IIs) were examined and technical views/comments were forwarded to Ministry of Water Resources, Provincial Governments & other stakeholder organizations.

- i. Comments on *“Inception Report-Sindh Barrage Project”* shared with General Manager (Hydro Planning) WAPDA, Lahore on January 11, 2021.
- ii. PC-II titled *“Feasibility Study of Thar Canal Project Sindh”* was technically reviewed and views/comments were shared with G.M Projects South WAPDA on 1st February, 2021. WAPDA was also requested to organize a briefing session on the project proposal for all concerned departments.
- iii. Technical comments on Modified PC-II for *“Environmental Study to Determine E-Follow 969 MW NJHP”* as per approved Terms of References (TORs) were shared with Ministry of Water Resources on 11th February, 2021.
- iv. Technical views and comments were shared with Ministry of Water Resources on PC-I of *“Indus Basin Irrigation System Automation of Discharge Monitoring at 07 Pilot Key Sites for Discharge Monitoring”* on 19th February 2021.
- v. Technical views/comments were prepared and shared on 1st February, 2021 with O/o PCIW, Islamabad regarding following two transboundary hydropower projects;
 - ✓ *NIMU Chilling HEP (24MW) LEH, of Ladakh on Zaskar River, A tributary of the Indus River.*
 - ✓ *Durburk Shyok HEP (19MW) hydro project, LEH UT of Ladakh on Tangtse/ Durburk Gong River, a Tributary of the Shyok River.*
- vi. Replies to the technical views/ comments of this office regarding PC-I titled *“Construction of Panjkora River Left and Right Bank Canal Dir Lower, Estimated Cost Rs. 4597.83 Million”* were reviewed and PID, KP was requested on 19th March 2021 to submit amended PC-I of the project so as to verify compliance of the observations raised by this office.
- vii. Views/comments were shared with PCRWR on March 29, 2021 regarding PC-I titled *“Rainwater Harvesting for Groundwater Recharge in ICT Region”*.
- viii. Technical views and comments on project titled *“PC-II for Preparation of Feasibility Study of THAR Canal Project”* were shared with Ministry of Water Resources on 8th April 2021.
- ix. Technical views and comments on project titled *“PC-I for Construction of Shau Khel Ouch Bazar Gravity Flow Irrigation Scheme in District Hangu”* were shared with Ministry of Water Resources on 15th April 2021.
- x. Technical views and comments on project titled *“PC-I for Construction/ Improvement of Canal Infrastructure alongwith Canal Patrol Roads of Lower Swat Canal, Abazai Canal and Drainage System and Installation of Solar Based Irrigation Tube Wells at Required*

Location in Tehsil Tangi District Charsada” were shared with Ministry of Water Resources on 15th April 2021.

- xi. Technical views and comments on project titled *“PC-I for Construction /Improvement of New Michni/Ichri Canal System along Allied Infrastructure Irrigation Patrol Roads and Installation of Solar Based Irrigation Tube Wells at Required Location in Tehsil Shabqadar District Charsadda”* were shared with Ministry of Water Resources on 15th April 2021.
- xii. Technical views and comments on project titled *“PC-I for Improvement of Approach Roads, Canal patrol Roads and Culverts along on Canals, Drains and Khwars in District Nowshera”* were shared with Ministry of Water Resources on 15th April 2021.
- xiii. Technical views and comments on project titled *“PC-I for Installation of Solar Irrigation Tube Wells in District Nowshera”* were shared with Ministry of Water Resources on 15th April 2021.
- xiv. Technical views and comments on project titled *“PC-I for Construction of Mulkoh, Kosht and Kagh Lasht Irrigation Scheme, District Chitral”* were shared with Ministry of Water Resources on 19th April 2021.
- xv. Technical views and comments on project titled *“PC-I for Indus Basin Irrigation System (IBIS): Automation of 07 Key Sites for discharge monitoring”* were shared with Ministry of Water Resources on 21st April 2021.
- xvi. Status of compliance to the observations of this office in respect of project titled *“Construction of Sahu Khel Ouch Bazar Gravity Flow Irrigation Scheme in District Hangu”* shared with Ministry of Water Resources on 4th May 2021.
- xvii. Status of compliance to the observations of this office in respect of project titled *“Construction/Improvement of Canal Infrastructure alongwith Canal Patrol Roads of Lower Swat Canal, Abazai Canal and Drainage System & Installation of Solar Based Irrigation Tube Wells in Tehsil Tangi District Charsada”* shared with Ministry of Water Resources on 4th May 2021.
- xviii. Status of compliance to the observations of this office in respect of project titled *“Construction /Improvement of New Michni/Ichri Canal System along Allied Infrastructure Irrigation Patrol Roads and Installation of Solar Based Irrigation Tube Wells at Required Location in Tehsil Shabqadar District Charsadda”* shared with Ministry of Water Resources on 4th May 2021.
- xix. Status of compliance to the observations of this office in respect of project titled *“Improvement of Approach Roads, Canal patrol Roads and Culverts along on Canals, Drains and Khwars in District Nowshera”* shared with Ministry of Water Resources on 4th May 2021.
- xx. Status of compliance to the observations of this office in respect of project titled *“Installation of Solar Irrigation Tube Wells in District Nowshera”* shared with Ministry of Water Resources on 4th May 2021.
- xxi. Technical views and comments on project titled *“Construction of Panjkora River right & Left Bank canal District Lower Dir, Estimated Cost Rs 4,644.70 million”* were shared with Ministry of Water Resources on 6th May 2021.

- xxii. In response to the observations of Ministry of Water Resources amended PC-I of project titled “*Sino Pakistan-Smart Water Management Project (SP-SWMP)*” shared with Ministry of Water Resources on 6th May 2021.
- xxiii. Technical views and comments on project titled “*PC-I for Remodelling of Kirther Canal System; Phase-I Estimated Cost Rs 1,665.00 million*” were shared with Ministry of Water Resources on 26th May 2021.
- xxiv. Technical views and comments on project titled “*PC-I for Rehabilitation & Upgradation of Canal System in Punjab, Estimated Cost Rs 23,440.807 million*” were shared with Ministry of Water Resources on 27th May 2021.
- xxv. Technical views and comments on project titled “*PC-I for Improvement of Drainage Network in selected Areas of Punjab, Estimated Cost Rs 18,384.927 million*” were shared with Ministry of Water Resources on 27th May 2021.
- xxvi. Technical views and comments on project titled “*PC-I for Construction of Manchura Dam Project, District Mansehra Khyber Pakhtunkhwa, Estimated Cost Rs 3,005.874 million*” were shared with Ministry of Water Resources on 25th May 2021.
- xxvii. Technical views and comments on project titled “*PC-I for Construction of Baber Kech Dam District Sibbi, Balochistan, Estimated Cost Rs 20.238 million*” were shared with Ministry of Water Resources on 27th May 2021.
- xxviii. Technical views and comments on project titled “*PC-I for Construction of Check Dam Khawaja Manjhra Mawand Area District Kohlu, Estimated Cost Rs 300.00 million*” were shared with Ministry of Water Resources on 28th May 2021.
- xxix. Technical views and comments on project titled “*PC-I for Barkhan Dam, District Barkhan, Estimated Cost Rs 2,615.28 million*” were shared with Ministry of Water Resources on 28th May 2021.
- xxx. Technical views and comments on project titled “*PC-I for Construction of 05 No. Dams in Killa Saifullah, Estimated Cost Rs 747.99 million*” were shared with Ministry of Water Resources on 26th May 2021.
- xxxi. Technical views and comments on project titled “*PC-I for Makhi Farash Link Canal Project (Chotiari-Phase-II) for Water Supply to Thar Coal (Revised-2021) , Estimated Cost Rs 12,111.00 million*” were shared with Ministry of Water Resources on 2nd June 2021.
- xxxii. Technical views and comments on project titled “*PC-I for Rehabilitation/ Remodelling of Lasbela Canal System; Estimated Cost Rs 1,998.00 million*” were shared with Ministry of Water Resources on 18th June 2021.
- xxxiii. Technical views and comments on project titled “*PC-I on Kiru Hydro Electric Project (624-MW) on River Chenab*” were shared with Ministry of Water Resources on 25th June 2021.
- xxxiv. In compliance of IRSA’s meeting held on June 08, 2021, additional comments regarding the updated PC-I of the project titled, “*Indus Basin Irrigation System (IBIS): Automation of 07 key sites for discharge monitoring*” were submitted to IRSA on June 11, 2021.
- xxxv. PC-Is/PC-IIs of following three projects were technically reviewed by the Civil Engineering Wing and comments were conveyed to O/o PCIW on 27th July 2021:-

- ✓ 25 MW Kulan Ramwari Hydroelectric Plant on Sindh Nallah -A tributary of Jhelum River
 - ✓ 14.1 MW Phangla Hydroelectric Projects on Change Nallah-A Tributary of Suran River in Jhelum Basin.
 - ✓ 25 MW Kargil Hunderman Hydroelectric Project on Suru River-A Tributary of Indus Basin
- xxxvi. Office of the CEA & CFFC examined amended PC-I of the project titled “Makhi Frash Link Canal Project (Chotiari Phase-II) for Water Supply to Thar Canal (Revised), Costing Rs. 12,111.000 Million” and submitted further comments on the same to Ministry of Water Resources on August 30, 2021.
- xxxvii. Progress Report regarding Development Projects of WAPDA was reviewed in detail and main observations were communicated to WAPDA on August 06, 2021.
- xxxviii. Transboundary project titled “15MW Mandi Hydro Project on Mandi River, a Tributary of the Poonch River in Jhelum Basin in the UT of J&K” was technically reviewed and views/comments were submitted to Ministry of Water Resources on 06th September 2021.
- xxxix. Views/ comments were submitted to IRSA & Ministry of Water Resources regarding their project titled “PC-I for Indus Basin Irrigation System (IBIS) – Automation of 07 Key sites for discharge monitoring” on 04th October 2021.
- xl. Views/ comments were submitted to Ministry of Water Resources on the “Tarbela 5th Extension HPP-Draft Feasibility/ Design Base Report concerning floating Solar Projects in Ghazi Brotha Ponds and Tarbela Reservoir” on 1st November 2021.
- xli. Views/ comments regarding following transboundary projects were submitted to Pakistan Commissioner for Indus Waters (PCIW) on 4th November 2021;
- ✓ 18.5 MW Sankoo Hydroelectric Plant on Suru River in Indus Basin.
 - ✓ 19 MW Mangdum Sangra Hydroelectric Plant on Suru River in Indus Basin and
 - ✓ 23 MW ANS-II Hydroelectric Plant on Ans River in Chenab Basin.
- xlii. Views/ comments were submitted to Ministry of Water Resources regarding their project titled “Greater Karachi Water Supply Scheme K-IV, 650 MGD” on 22nd November 2021.
- xliii. Compliance Status to the observations of this office on project titled “Tarbela 5th Extension HPP-Draft Feasibility/ Design Base Report concerning floating Solar Projects in Ghazi Brotha Ponds and Tarbela Reservoir” was submitted to Ministry of Water Resources on 7th December 2021.
- xliv. Views/ comments were submitted to Ministry of Water Resources on the “Revised PC-I of Project Construction of Improvement Infrastructure including flood protection works, Channels, Tube wells and Crossing Facilities in District Swabi, Estimated Cost Rs. 710.897 Million” on 8th December 2021.
- xlv. Status of Compliance to the observations of this office on PC-I of “Indus Basin Irrigation System Automation of Discharge Monitoring at 07 Pilot Key Sites for Discharge Monitoring” was shared with Ministry of Water Resources on 29th December 2021.

1.4.2. National Water Sharing dealt/Expert Advices Rendered and Issues of NWP

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

- i. Projects proposal/ Brief was prepared for consideration for the online meeting of Pakistan –EU Cooperation on the Sub-Group for Development Cooperation. The same were shared with Ministry of Water Resources on 23rd February 2021.
- ii. Brief/proposals for future cooperation between Pakistan & Japan were shared on March 4, 2021 with Section Officer (Water) M/o WR regarding “*7th Japan – Pakistan High – Level Economic Policy Dialogue scheduled to be held virtually on March 19, 2021 in the field of Integrated Water Resources, Flood and Dam Safety Management*”.
- iii. Regarding the 7th Japan – Pakistan High level Economic Policy Dialogue held on 9th April 2021 following Project Proposals were submitted to Ministry of Water Resources on March 19, 2021, for sharing with JICA:
 - ✓ Urban Flood Management of Korang River in Rawalpindi & Islamabad
 - ✓ Strengthening Dams Safety Council (DSC) of CEA&CFFC.
 - ✓ Indus Basin Irrigation System (IBIS) – Automation of 07 key sites for Discharge Monitoring
 - ✓ Construction of underground Storm Water Storage Tanks in Lahore &
 - ✓ Mitigation of effect of Climate Impact, Efficiency in Irrigation.
- iv. Brief on implementation of National Water Policy (NWP) with respect to Rainwater Harvesting was submitted to M/o WR on June 29, 2021 for consideration during the 18th meeting of National Assembly’s Standing Committee on Water Resources.
- v. On request of Ministry of Water Resources, brief on *Implementation of National Water Policy (NWP) with respect to Water Conservation and Groundwater Management* was prepared for consideration during the meeting of National Assembly’s Standing Committee on Water Resources held on June 26, 2021; however, Committee meeting was postponed.
- vi. On request of Ministry of Water Resources, the requisite information related to MoUs/Agreement between China and Pakistan for consideration during “*Inter-Ministries meeting on China-Pakistan Cooperation*” was shared with M/o WR on 08th July 2021.
- vii. Brief along with presentation for “*5th Round of Bilateral Cooperation with Hungary*” were shared with Ministry of Water Resources on 09th July 2021.
- viii. On request of Ministry of Water Resources, information regarding “*Digital Interactive Treaties and International Agreements Dashboard*” was shared with SO (Water) on 12th July 2021.
- ix. Information regarding “*5th Round of Bilateral Political Cooperation with Belarus*” was shared with M/o WR on July 26, 2021.
- x. Nomination of CEA & CFFC and EA (Civil) regarding “*19th Meeting Notice of the National Assembly Standing Committee on Water Resources*” and 45 copies of Brief on Agenda item titled “*Consideration of Implementation Status on National Water Policy*

- with reference to Rain Water Harvesting*” were submitted to Ministry of Water Resources, Islamabad on August 11, 2021.
- xi. 45 copies of Brief on following NWP related Agenda items regarding “*Senate Standing Committee on Water Resources to be held on August 26, 2020*” was submitted to Ministry of Water Resources on August 25, 2021:
- ✓ District wise details of underground water level in entire Pakistan for the past 10-15 years.
 - ✓ Inter-provincial comparison of districts in terms of underground water level situation for terms of underground waster situation.
 - ✓ Information on underground water monitoring mechanism.
 - ✓ Steps taken by government on recharging underground level including strategies for subsurface aquifer ecology.
- xii. Draft Summary for the Prime Minister for seeking his approval for participation of Pakistan delegation in “*Planet Budapest 2021 Sustainability Expo and Summit*” was submitted to Ministry of Water Resources on August 20, 2021.
- xiii. First Meeting of National Water Policy - Steering Committee was successfully organized on 28th September 2021 in a hybrid format under the Chairmanship of Federal Minister of Water Resources.
- xiv. On the request of Ministry of Water Resources, requisite input regarding “*Areas of Intervention for the Public Private Partnership*” was submitted on 1st September 2021 for onward submission to Ministry of Planning Development & Special Initiatives.
- xv. On the request of Chief Engineer (Flood), briefs regarding “*Strengthening of Office of CEA and Dam Safety Council (DSC) & Provision of Engineering Allowance/Technical Allowance for Engineers Working in O/o CEA/CFFC*” were submitted on 3rd September 2021 for onward submission to office of Honourable Federal Minister for Water Resources as per his kind direction.
- xvi. Views and Comments were shared with Ministry of Water Resource on 9th September 2021 on document titled “*ADB TA 6574: Support to the Implementation of Strategy 2030 Operations Plans*”
- xvii. Draft Minutes for “*National Water Policy – First Meeting of Steering Committee held on 28th September 2021*” were prepared and submitted to Ministry of Water Resources on 6th October 2021 for approval by competent authority.
- xviii. As per approval conveyed by Ministry of Water Resources vide its Memorandum No. 2(08)/2018-Water-VI dated 22nd October 2021, Minutes of National Water Policy-Steering Committee meeting were circulated among all concerned departments/stakeholders on 27th October 2021.
- xix. Views/ comments on Draft Implementation Framework of NWP (formulated by Ministry of Water Resources) were submitted to Ministry of Water Resources on 29th October 2021.
- xx. Advised concerned agencies to expedite follow up actions on the decisions recorded in the minutes of “*National Water Policy – First Meeting of Steering Committee held on 28th September 2021*”. Letter was issued on 17th December 2021.

- xxi. Preparation and issuance of Agenda and Working Paper for “National Water Policy – Second Meeting of Steering Committee held on 27th December 2021” on 21st December 2021.
- xxii. Updated progress regarding the selection of 5- Private Sector Members of National Water Council as per decision reflected in the minutes of First meeting of “National Water Policy – Steering Committee held on 28th September 2021” was submitted to Ministry of Water Resources on 21st December 2021.
- xxiii. Matter regarding “Establishment of Ground Water Regulatory Authority” was followed up with Govt. of Sindh, Khyber Pakhtunkhwa, Balochistan & GB. Letter was issued on 24th December 2021.
- xxiv. Follow up on “Progress on Targets of National Water Policy” with Project Director, Small Dams Organizations, Govt. of Punjab, GM, SIDA, Govt of Sindh, DG Small Dams, Govt. of KP and Provincial Coordinator, Irrigation Department, Govt. of Balochistan. Letter was issued on 24th December 2021.
- xxv. Second Meeting of National Water Policy - Steering Committee was successfully organized on 27th December 2021 which was held under the Chairmanship of Federal Minister of Water Resources.
- xxvi. Press Release regarding “National Water Policy – Second Meeting of Steering Committee held on 27th December 2021” was submitted to Director to Federal Minister, Ministry of Water Resources Islamabad on 28th December 2021.
- xxvii. Draft Minutes for “National Water Policy – Second Meeting of Steering Committee held on 27th December 2021” were prepared and submitted to Ministry of Water Resources on 29th December 2021 for approval by competent authority.
- xxviii. As per approval conveyed by Ministry of Water Resources vide its Memorandum No. 2(08)/2018-Water-VI dated 31st December 2021, Minutes of National Water Policy-Steering Committee meeting were circulated among all concerned departments/stakeholders on 31st December 2021.

1.4.3. Bilateral International Collaborations Dealt during 2021

Following cases relating to bilateral international consultations and MoU's were dealt during 2021:

Sino – Pakistan Smart Water Management Project – Phase-I

Federal Flood Commission (FFC), Ministry of Water Resources, Government of Pakistan, is collaborating with College of Hydrology and Water Resources, HOHAI University in the field of research on hydrology, water resources, smart water management and mitigation of floods hazards through this PC-I. Draft PC-I titled “*Sino-Pakistan Smart Water Management Project*” was prepared and shared with stakeholders to give their views/suggestions/comments.

A meeting was organized regarding PC-I of Sino-Pakistan SMART Water Management Project (SPSWMP) on **12th March 2021**. As per decisions of meeting modified PC-I was submitted to Ministry of water Resources for further approval. A summary for signing MoU was also presented in Cabinet Meeting for formal approval. After the approval conveyed from Cabinet, MoU template was shared with Ministry of Water Resources. MoU has been signed in English

and Chinese versions. Dean Hohai University, via an email has committed an amount of 10,000,000/- USD for SPSWMP Phase-I. Accordingly, he has been requested to convey the commitment of funds through EAD, Government of Pakistan.

MoU between Hungary & Pakistan in the field of Water Management

Contact details of Mr. Ahmed Kamal CEA/CFFC shared with Section Officer (Water), Ministry of Water Resources regarding “*MOU on Construction in the Field of Water Management between Ministry of Interior of Hungary and Ministry of Water Resources of Islamic Republic of Pakistan*” on November 02, 2020. Ministry of Water Resources vide letter No. 1(69)/2019-Water dated November 12, 2020 designated the CEA/CFFC as new focal person for the said MOU.

First virtual meeting of JEG was held on December 17, 2020 wherein draft Work Program (2021-2023) regarding implementation of MoU was presented by the Hungarian Side. In pursuance of decisions taken during First virtual meeting of JEG, a follow up meeting of Pakistan Side JEG members was held on **January 07, 2021** to review draft Work Program (2021-2023) proposed by Hungarian side. Consolidated views/ comments of Pakistan Side JEG members and subsequently modified draft Work Program (2021-2023) were submitted to Hungarian Side on January 15, 2021. In order to benefit from the Hungarian technologies related to Water Resources and Flood Management, Pakistan Side pursued the Hungarian assistance regarding following joint research and technology transfer endeavors;

- i. Knowledge sharing & Technology transfer on River Hydraulics and Flood Modeling for better Flood Forecast and Early Warning to flood prone areas so as to mitigate the high risk of massive flood damages;
- ii. Study of Transboundary/Inter-Provincial Concerns related to surface and groundwater management in Pakistan;
- iii. Computerization of irrigation supplies of a canal command in Sindh province by installing telemetry system;
- iv. A study on the demarcation of catchments of Khirthar and Koh-e-Suleman hill torrent ranges and quantifying the amount of runoff generated during any rainfall event would help the flood managers in Sindh and Punjab for the better preparation of any situations arising due to the sudden increase in discharge, besides in preparing a plan for the people living in these areas to better utilize the available water for their agriculture, domestic and livestock needs; &
- v. Pakistan is urbanizing at an annual rate of 3%, the fastest pace in South Asia. Climate change effects can be seen with extension in droughts and floods and major concern within urban environment was short duration intense precipitation which usually causes flash floods due to failure of drainage infrastructure. Resultantly there are immense effects on the life of people besides damages to public and private properties. Different strategies may be studied to improve the urban drainage infrastructure and also to come up with plans for rainwater harvesting in the cities and towns of Pakistan so as to utilize the runoff for beneficial uses.

In response to above, JEG (Hungarian Side) informed that prevailing pandemic situation and financial conditions were preventing them to be too ambitious regarding implementation of pilot

studies proposed by the Pakistan Side. Accordingly, JEG (Hungarian Side) submitted the simplified/ amended Work Program on **February 05, 2021**.

2nd virtual meeting of JEG was held on **February 24, 2021** to review the Work Program (2021-2023) as amended by the Hungarian Side in the light of a consolidated feedback from Pakistan Side. Based on the deliberations/ decisions taken during the 2nd online meeting, Members of JEG Hungarian Side reviewed the Work Plan and submitted its revised version to Pakistan Side on **11th March 2021**.

3rd virtual consultation of JEG on Pak-Hungary MoU was held on **June 09, 2021** to review the revised Work Plan and decide Way Forward for its further processing for approval by M/o WR/ signing.

4th virtual consultation of JEG was held on **July 29, 2021** to finally discuss and approve the Work Program concluded by Hungarian Side. Minutes of meeting were issued to all concerned organizations on **13th August 2021**. Following decisions were taken:-

- i. The forum/ JEG unanimously endorsed the Work Program (2021-23) with slight amendment as per deliberations of the meeting stated above.
- ii. Both sides shall process the Work Program endorsed by the JEG for seeking approval by their respective Competent Authorities for its signing and subsequent implementation. Thereafter, finally approved Work Program (2021-23) will be shared mutually for signature by the Focal Persons of both the countries. Efforts will be made to finalize the signing process within August 2021.
- iii. Amendments made by Hungarian Side in the minutes of 3rd Virtual Consultation held on June 09, 2021, were unanimously agreed and hence confirmed by the Forum/JEG.
- iv. Focal Person from Hungary will share in advance their detailed visit plan and agenda for the first physical meeting of JEG with Focal Person from Pakistan Side. The visit shall be undertaken prior to the Budapest 2021 Summit. Pakistan side will share a possible engagement schedule with the Hungarian side in this context based on number of days of Hungarian Experts' visit to Pakistan.
- v. CEA & CFFC being Focal Person Pakistan will take up, with Ministry of Water Resources, the matter of inclusion of delegates from academia in the Pakistan Delegation for Budapest Summit 2021 as received from the Ministry of Foreign Affairs, Islamabad.

JEG unanimously endorsed the Work Program for further processing with M/o WR for its approval by Secretary Ministry of Water Resources before its signing by the Focal Persons of both sides. Subsequently, matter was taken up with Ministry of Water Resources on **20th August 2021**. Both sides processed the Work Program endorsed by the JEG for seeking approval by their respective Competent Authorities for its signing and subsequent implementation. Thereafter, finally approved Work Program (2021-23) was shared mutually for signature by the Focal Persons of both the countries. Accordingly Work Program for Bilateral Hungarian Pakistan Joint Expert Group for the period of 2021-23 was signed on **31st August 2021**.

In line with the Work Program (2021-23) approved under the MoU, a 4-5 members delegation from Hungary planned to visit Pakistan on **November 8-12, 2021**, but due to their other

engagements this visit was not materialized. New tentative date of visit would be shared by Hungarian Team.

Webinar was organized on **7th October 2021** regarding Flood Forecasting under JEG on Hungary-Pak water Management MOU. Another webinar on Flood and Drought Management under Framework of Bilateral Cooperation Hungary Pakistan Water Management MOU was organized on **16th November 2021**.

1.4.4. Revision of Pakistan's Nationally Determined Contributions

CEA& CFFC is national focal person for adaptation related revision of **Pakistan NDCs**. Comprehensive National Progress Report regarding adaptation related revision of Pakistan's NDCs was submitted by O/o the CEA & CFFC to M/o CC on July 08, 2021.

The consolidated NDCs document, prepared afterward by M/o CC by merging the inputs from Adaptation and Mitigation Committees, was considered by the National Steering Committee (NCS) in its meeting held on September 27, 2021.

Thereafter, Prime Minister's Committee on Climate Change in its meeting held on October 13, 2021 approved in principle the NDCs Report finalized by the NCS in its meeting held on September 27, 2021 subject to re-authenticity of the data presented in the NDCs report. NCS, in its Wrap up Meeting held on October 14, 2021 endorsed re-authenticity of the data.

1.4.5. Pakistan's Green Diplomacy Initiative (PGDI)

As per directions from the Prime Minister's office, Ministry of Climate Change as a lead Ministry, in consultation with Ministry of Foreign Affairs, had prepared a Comprehensive document titled "Pakistan's Climate Diplomacy Initiative".

Regarding review of the document, a high level meeting was held on **19th May, 2021** in Committee Room of Ministry of Climate Change under the Chairmanship of **Special Assistant to the Prime Minister on Climate Change**. During the meeting, the Chair directed that Green Diplomacy should be an overarching theme of the document hence subsequently the document was renamed as "**Pakistan's Green Diplomacy Initiative (PGDI)**".

CEA& CFFC attended the meeting as representative of Ministry of Water Resources and emphasized upon requested the chair that water sector be given due importance and Ministry of Water Resources to be part of **Inter Ministerial Working Group (IMG)** proposed to be established on PGDI.

In response to above, M/o Climate Change has acceded to above request and notified an IMG having representation of Ministry of Water Resources. Accordingly, M/o Water Resources has nominated the CEA & CFFC to represent M/o WR in the IMG. M/o Climate Change in its communicated dated August 27, 2021 had informed that first meeting of IMG will be organized shortly. Meeting, however, has not yet been arranged by M/o Climate Change.

1.4.6. Key Events i.e. 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-1.1: Important Meetings attended by Senior Officers of Civil Engineering Wing

Sr. No	Description/ Meeting/ Workshop Title	Date of Meeting	Attended By
1.	UN-Habitat project “Enhance Community, Local and National Level Urban Climate Change Resilience to Water Scarcity Caused by Floods and Drought in Rawalpindi and Nowshera Cities”	January 28, 2021	Mr. Ather Hameed, EA (Civil)
2.	Pakistan Water Conference 2021	February 18-19, 2021	Mr. Ather Hameed, EA (Civil)
3.	IRSA meeting regarding “ <i>PC-I of Indus Basin Irrigation System (IBIS) Automation of 07 key sites for Discharge Monitoring</i> ”	February 22, 2021	Mr. Ather Hameed, EA (Civil)
4.	2 nd Virtual Conference of JEG regarding the ‘ <i>Implementation of Hungary-Pak Water Management MOU</i> ’	February 24, 2021	Mr. Ahmed Kamal, CEA&CFFC Mr. Ather Hameed, EA (Civil)
5.	Pre-CDWP Meeting for following Projects: a. Restoration & Revamping of Orangi Nullah b. Restoration & Revamping of Gujjar Nullah c. Restoration & Revamping of Liyari and Malir Rivers with associated Tributaries. d. Restoration & Revamping of Mehmoodabad Nullah and its Tributaries	February 24, 2021	Mr. Ather Hameed, EA (Civil)
6.	10 th Meeting of BOG of PCRWR	February 25, 2021	Mr. Ahmed Kamal, CEA & CFFC
7.	Workshop regarding “ <i>Roadmap for preparation of Green Building Code for Pakistan Group No.4 (Government Agency)</i> ”	March 11, 2021	Mr. Ather Hameed, EA (Civil)
8.	Steering Committee Meeting to Review Update on Nationally Determined Contributions (NDCs)	March 30, 2021	Mr. Ahmed Kamal, CEA&CFFC, Mr. Ather Hameed, EA (Civil) & AEA (Civil)
9.	Climate Change Policy Implementation Committee meeting	April 01, 2021	Mr. Ahmed Kamal, CEA&CFFC
10.	IRSA Advisory Committee meeting for the cropping season Kharif 2021	April 08, 2021	Mr. Ahmed Kamal, CEA&CFFC
11.	AARDO-AHKNCRD International Online Training Programme on “ <i>Climate Change - Implications and Adaptation</i> ”	May 31, 2021	Mr. Zafar Iqbal AEA (Civil)
12.	Transboundary effects on Ground and Surface Waters along Eastern Border of Pakistan at PCRWR’s Regional Office Lahore	June 08, 2021	Mr. Zafar Iqbal AEA (Civil)

Sr. No	Description/ Meeting/ Workshop Title	Date of Meeting	Attended By
13.	Emergent IRSA Advisory Committee meeting	July 08, 2021	Mr. Ahmed Kamal, CEA&CFFC
14.	Delivering the presentation on Thematic Area-I-Water Governance, Present and Future Scenarios in Conference on Water Challenges	July 15, 2021	Mr. Ather Hameed, EA (Civil)
15.	Public Hearing of Pay & Pension Commission with Representatives of Ministry of Water Resources	August 08, 2021	Mr. Ahmed Kamal, CEA&CFFC
16.	Consultative Meeting with the Focal Persons on Sustainable Development Goals (SDGs)	September 23, 2021	Mr. Ahmed Kamal, CEA&CFFC
17.	National Steering Committee for the Revision of Pakistan's Nationally Determined Contributions (NDCs)	September 24, 2021	Mr. Ahmed Kamal, CEA&CFFC
18.	IRSA Advisory Committee meeting	October 5, 2021	Mr. Ahmed Kamal, CEA&CFFC, Mr. Ather Hameed, EA (Civil)
19.	Meeting of Pakistan National Committee on Intergovernmental Hydrological Programme (PNC-IHP) of UNESCO	October 6, 2021	Mr. Ahmed Kamal, CEA&CFFC
20.	Steering Committee meeting on Nationally Determined Contributions (NDCs)	October 14, 2021	Mr. Ahmed Kamal, CEA&CFFC
21.	Virtual Meeting of Asia Regional Working Group (ASRWG) of ICID.	October 27, 2021	Mr. Ather Hameed, EA (Civil)
22.	Hybrid workshop on "Scientific Advice for sustainable implementation of National Water Policy	October 27, 2021	Mr. Ahmed Kamal, CEA&CFFC & Mr. Ather Hameed, EA (Civil)
23.	Senate Standing Committee on Water Resources	November 4, 2021	Mr. Ahmed Kamal, CEA&CFFC & Mr. Ather Hameed, EA (Civil)
24.	Two days workshop on "Training of Monitoring and Evaluation (M&E) System for Adaptation Tracking (Agriculture Sector) in Pakistan at Islamabad"	November 25-26, 2021	Mr. Yawar Rasheed, Assistant Engineer (Civil)
25.	Delivering Presentation as Speaker in "International Webinar on Water Resources Challenges in Pakistan".	December 17, 2021	Mr. Zafar Iqbal AEA (Civil)

1.4.7. Key Events i.e. Meetings Organized by Civil Engineering Wing

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

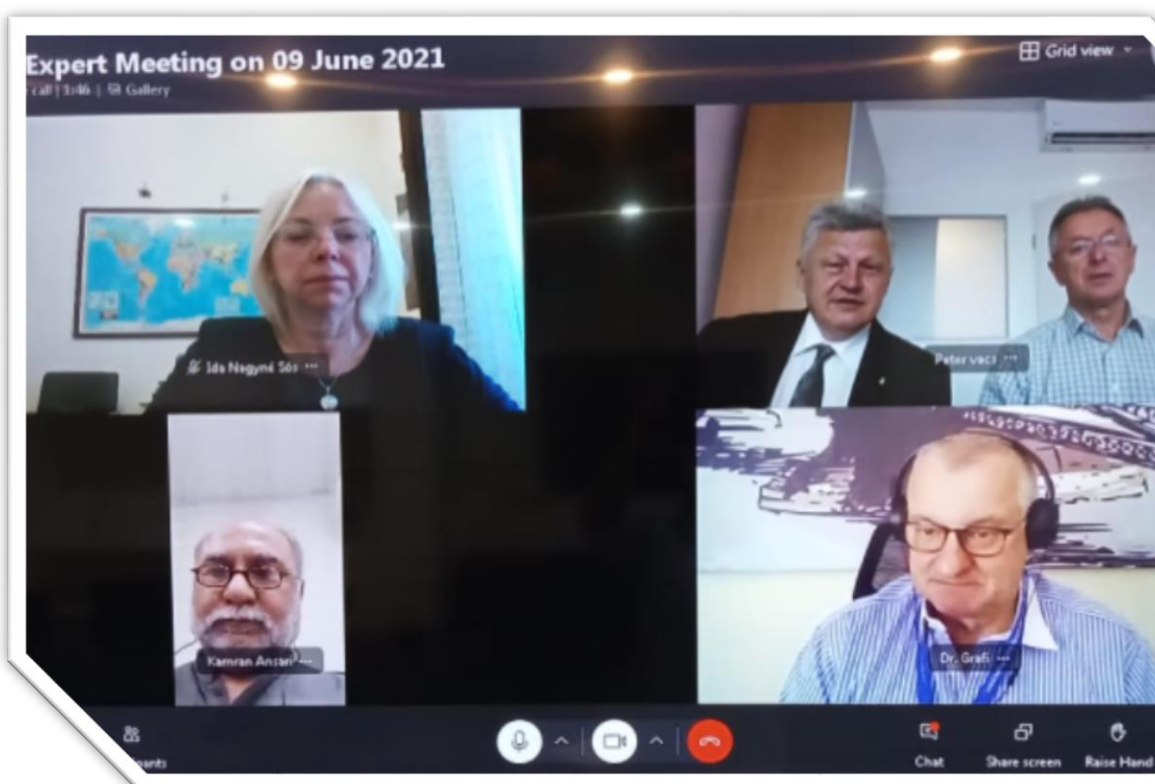
Table-1.2: Meetings organized by Civil Engineering Wing during 2021

Sr. No	Description/ Meeting Title	Date of Meeting
1.	A meeting to finalize PC-I of Sino-Pakistan SMART Water Management Project (SPSWMP)	March 12, 2021
2.	Meeting to review of PC-II for Preparation of Feasibility study of Thar Canal Project by WAPDA	March 16, 2021
3.	Third Virtual Conference of JEG regarding the Implementation of MOU Signed Between Interior Ministry of Hungary and Ministry of Water Resources of Pakistan.	June 09, 2021
4.	4 th Virtual Conference of JEG regarding the Implementation of Hungary Pakistan Water Management	July 28, 2021
5.	First Meeting of NWP - Steering Committee in a hybrid format under the Chairmanship of Federal Minister of Water Resources.	September 28, 2021
6.	Webinar on Flood Forecasting under JEG on Hungary-Pak water Management MOU.	October 07, 2021
7.	Webinar on Flood and Drought Management under Framework of Bilateral Cooperation Hungary Pakistan Water Management MOU.	November 16, 2021
8.	51 st Meeting of PANCID under chairmanship of the Secretary PANCID.	November 24, 2021
9.	Second Meeting of NWP - Steering Committee was organized under the Chairmanship of Federal Minister of Water Resources.	December 27, 2021

Snapshots of some of the important meetings:



Federal Minister of Water Resources chairing the 2nd Meeting of NWP-Steering Committee on 27th December 2021



3rd Virtual Conference of JEG regarding Hungary-Pak MOU on Water Management

1.4.8. 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. Comments on “*Proposed MOU between CNCID and PANCID*” shared with Section Officer (Water), Ministry of Water Resources, Islamabad on January 06, 2021.
- ii. Matter was taken up with Deputy Director (WM), Pakistan Council of Research in Water Resource & Joint Commissioner for Indus Water (PCIW) on 16th February 2021 for follow up of decisions taken during 50th Annual Meeting of PANCID held on 14th December 2020.
- iii. Nominations for ICID’s ‘*Working Group on Adaptive Flood Management*’ and ‘*Working Group on History of Irrigation, Drainage and Flood control*’ were requested from Flood Wing in pursuance of decisions taken during the 50th Annual Meeting of PANCID held on 14th December 2020.
- iv. On request of ICID, PANCID Members were requested on 6th May 2021 to submit the potential nominations for ICID’s Young Professionals e-Forum (IYPeF) for review by PANCID Secretariat and onward submission to ICID.
- v. Matter was followed up with PANCID Members on June 03, 2021 to submit the potential nominations for ICID’s Young Professionals e-Forum (IYPeF) so that the same be reviewed by PANCID Secretariat and a suitable nomination is subsequently forwarded to ICID.
- vi. Updated contact details related to PANCID Secretariat and PANCOLD Secretariat were shared with Publisher of the International Journal on Hydropower & Dam on 27th July 2021 for uploading in the World Atlas of Hydropower & Dams and related Industry Guide available at (www.hydropower-dams.com/industry-guide/pakistan-national-committee-on-large-dams-000582/).
- vii. Matter was followed up with all concerned organizations on 5th July 2021 for nominating relevant officers for various Working Groups of PANCID and sharing requisite information in compliance of decision of “*50th Annual Meeting of PANCID held on 14th December 2020 at Islamabad*”.
- viii. Matter was followed up with concerned organizations on 1st September 2021 for follow up of decisions taken during in 50th Annual Meeting of PANCID.
- ix. In compliance of decision taken during the 2nd Virtual meeting of Asia Regional Working Group (ASRWG) held on 23rd July 2021 progress on Agenda item 4 i.e. *Strengthening Linkages among NC’s* and Agenda item 7: *CV of Mr. Ahmed Kamal*, CEA & CFFC and Chairman PANCID was submitted to ICID on 23rd September 2021.
- x. A Communication regarding “*Invitation for IYPeF activity International Webinar on 1st November 2021*” was shared with Members of PANCID on 12th October 2021.

- xi. 51st Meeting of PANCID was held on 24th November 2021 at 1100 hours at O/o CEA/ CFFC, Islamabad” under chairmanship of the Secretary PANCID.
- xii. Minutes of “51st Meeting of PANCID” held on 24th November 2021 were issued to all the stakeholders on 6th December 2021 for taking necessary actions on the decisions reflected in the minutes.
- xiii. ICID was requested to share link for E-election for the position of Vice President to authorized representative from PANCID, i.e. Mr. Ahmed Kamal, Chairman PANCID on 9th December 2021.

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

- i. “Irrigation and Drainage-Journals (Volume-70, Number 1 February 2021)” was circulated in hard/soft form among the PANCID Members on 30th April 2021.
- ii. “Irrigation and Drainage-Journals (Volume-70, Number 2 April 2021)” was circulated in hard/soft form among the PANCID Members on 6th May 2021.
- iii. Irrigation and Drainage-Journals (Volume 70, Number 3, July 2021) was circulated in hard/soft form among the PANCID Members on August 30, 2021.
- iv. Call for submission of papers for 24th ICID Congress to be held from 3-10 October 2022 Adelaide Australia was circulated among Members of PANCID on 7th October 2021. Matter was again followed up on 23rd November 2021.
- v. “Irrigation and Draining-Journals (Volume 70, Number 4, October 2021)” was shared with Members of PANCID on 10th November 2021.



DAM SAFETY COUNCIL

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

2. DAMS SAFETY COUNCIL/DSC-WING

2.1. Creation of Dam Safety Council

Dams Safety Council (DSC) was established in 1987 within the office of CEA/ CFCC 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 (**Appendix-I**) 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 dams medium & small are owned, operated & maintained by respective Provincial Governments and these dams have also brought prominent change in the economic condition of villages and abadies at Divisional/District level. It will not be out of place to mention here that in Pakistan there exist 374 large dams (including reservoirs & barrages as per ICOLD definition) as well as hundreds of medium and small dams. Province/Agency wise detail is given in **Table 2.1**.

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

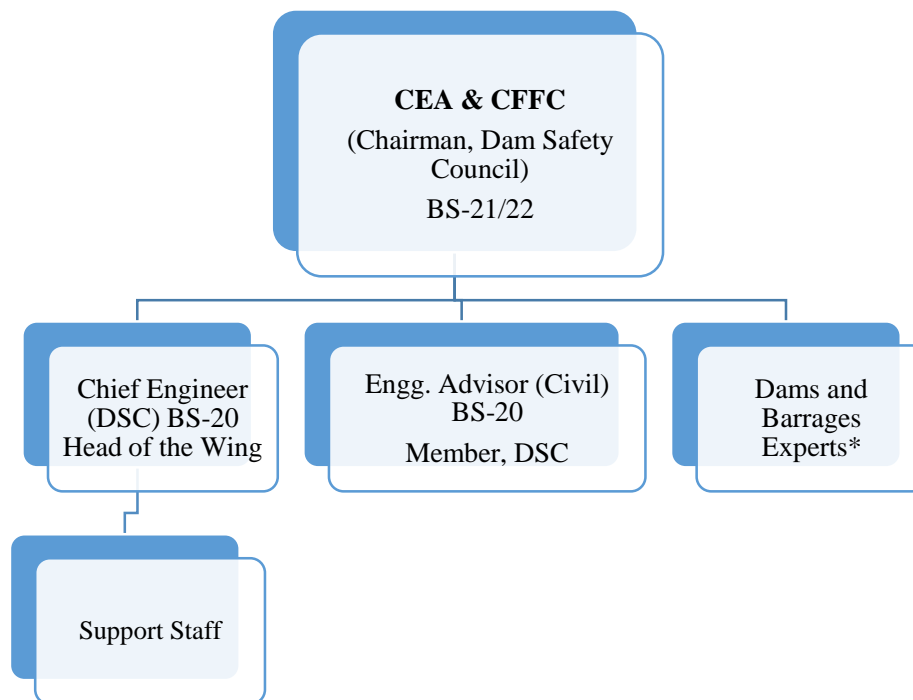
Territory	Completed						On-going (No.)	Proposed (No.)	Total (No.)
	Large Dams^		Small/Medium Dams		Total				
	No.	Capacity (MAF)	No.	Capacity (MAF)	No.	Capacity (MAF)			
Punjab	71	0.666	03	0.001701	74	0.667410	09	02	11
Sindh	44	0.277	36	0.013424	80	0.291017	39	08	47
KP	36	0.315	1	0.000245	37	0.315856	14	20	37
Balochistan	200	1.501	396	0.090511	596	1.599066	56	397	453
FATA	14	0.098	-	-	14	0.098503	-	-	-
Sub-Total	365	2.858	436	0.105881	801	2.971852	118	427	548
WAPDA's Mega Dams	9	14.360	-	-	9	14.36048	3	12	15
Grand Total	374	17.218	436	0.105881	810	17.32444	121	439	563

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

Dam 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**.



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

Figure 2.1: Organogram of Dam Safety Council

2.3. Issues Faced by Dam Safety Council

Dam 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. Along with adequate and stable flow of government funds and arranging necessary logistics and support staff, the study also recommended to expand the composition of Dams Safety Council by adding ex-officio members from each of the four provinces and Chief Engineer (DSO) WAPDA as ex-officio member besides three members from private sector to work on full time basis. In line with the study recommendations, detailed proposal prepared for strengthening DSC has been submitted to M/o WR and was being follow up as well.

2.4. Main Functions

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

- Participate in the annual and periodic inspection of dams & barrages organized by DSO-WAPDA and Provinces in accordance with SOPs of International Commission on Large Dams (ICOLD).
- Ensure implementation of follow-up actions, relating to O&M, dams/barrages safety measures required as a consequence of annual/periodic inspections.
- Advise WAPDA & concerned authorities regarding (i) repairs and maintenance of dams and reservoirs & (ii) regulation of reservoirs as per their SOPs
- Review PC-I, PC-II, Feasibility Studies and other studies/ reports/ plans of new dams & barrages, as and when received from the executing agencies (WAPDA and PIDs etc.)
- Monitor (including periodic field visit) the execution of ongoing dams & barrages projects/ programs funded by the federal government including donors and advise on necessary right coursing/ actions based on the outcome of the monitoring.
- Review plans and specifications for enlargement, modifications, major repairs, revival or otherwise of dams & barrages (as the need arises)
- Share technical data relating to dams in Pakistan including research under PANCOLD including general liaison with all related national and international organizations, in particular with International Commission on Large Dams (ICOLD)
- Liaison with WAPDA, IRSA, FFC, PCIW, NDMA, PDMAs, PMD and Provincial Irrigation Departments regarding dams safety toward: i) water distribution, ii) safety of structures in the event of any disaster iii) contingency plan to meet/respond to any disaster and (iv) observations brought out by the annual and periodic inspections.
- Pakistan is a member of the International Commission on Large Dams (ICOLD) since 1952. The Dam 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 2021

During the year 2021, Dam Safety Council of O/o the CEA & CFFC performed following functions related to its charter of duties given on preceding page;

2.5.1. Technical Review of PC-Is of Dam Projects

In all, 29 PC-Is evaluated during year 2021 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 2021

Sr. No.	Name of Project	Financing	Current Status of Project Reviews
Khyber Pakhtunkhwa			
1.	PC-I of Torawari Dam Project District Hangu KP (Estimated Cost Rs 3,486.801 million)	PID, KP/ Federal	Comments communicated to M/o WR on April 09, 2021
2.	Revised PC-I for Construction of 20 Nos. Small Dams in Khyber Pakhtunkhwa (9 Approved Schemes) (Estimated Cost Rs 27,712.58 Million)	PID, KP/ Federal	Comments communicated to M/o WR on June 02, 2021
3.	Construction of Small Dams In District Mansehra; Sub-Work: Construction Of Manchura Dam Project, District Mansehra Khyber Pakhtunkhwa (E/Cost Rs 3,005.874 M)	PID, KP/ Federal	Signed PC-I forwarded to M/o WR on December 29, 2021
Balochistan			
1.	Construction of 200 Small Check Dams for Ground Water Recharge of Quetta, (71 Dams Phase-II) E/Cost Rs 296.578 Million	PID, Balochistan/ Federal	Comments communicated to M/o WR on Feb 19, 2021
2.	Construction of Kud Gravity Dam District Lasbela (Estimated Cost Rs. 1106.775 million)	PID, Balochistan/ Federal	Comments communicated to M/o WR on Feb 19, 2021
3.	Construction of Small Mini Dams/ Water Ponds on matching grant basis with the farmers, in Turbat, E/Cost Rs 2550.00 Million	PID, Balochistan/ Federal	Comments communicated to M/o WR on March 01, 2021
4.	Modified PC-I of Zindara Karez System, District Ziarat Estimated Cost Rs 80.465 Million	PID, Balochistan/ Federal	Comments communicated to M/o WR on March 01, 2021
5.	Construction of Awaran Dam in District Awaran, Estimated Cost Rs 14,479.84 Million	PID, Balochistan/ Federal	Last comments was communicated to M/o WR on March 17, 2021
6.	Construction of Shehzanik Dam District Gawadar (Estimated Cost Rs. 2630.29 Million)	PID, Balochistan/ Federal	Last comments was communicated to M/o WR on March 17, 2021
7.	Construction of Sunni Gar Dam, District Khuzdar (Estimated Cost Rs. 4456.461 million)	PID, Balochistan/ Federal	Last comments was communicated to M/o WR on March 17, 2021
8.	Construction of Tapok Storage Dam in District Kech, Estimated cost Rs 1,251.877 million)	PID, Balochistan/ Federal	Last comments was communicated to M/o WR on March 18, 2021
9.	Construction of Panjgoor Storage Dam in District Panjgoor, Estimated Cost Rs 12,523.29 Million	PID, Balochistan/ Federal	Last comments was communicated to M/o WR on March 18, 2021
10.	PC-I for Construction of Baber Kech Dam District Sibi, Balochistan (Estimated Cost Rs 20.328 Billion)	PID, Balochistan/Federal	Last comments & signed copy was sent to M/o WR on May 28, 2021

Sr. No.	Name of Project	Financing	Current Status of Project Reviews
11.	Construction of Check Dam Khawaja Manjhra Mawand Area District Kohlu, Estimated Cost Rs. 300.00 million	PID, Balochistan/ Federal	Comments communicated to M/o WR on May.28, 2021
12.	Barkhan Dam, District Barkhan, Estimated Cost Rs. 2,615.28 million”	PID, Balochistan/ Federal	Comments communicated to M/o WR on May.28, 2021
13.	Construction of 05 Nos. Dams in Killa Saifullah (Estimated Cost Rs 747.99 million)	PID, Balochistan/ Federal	Comments communicated to M/o WR on May.28, 2021
14.	PC-I for Construction of Chagai Storage/Delay Action Dam in District Chagai (Estimated Cost Rs 100.00 million)	PID, Balochistan/ Federal	Comments communicated to M/o WR on June 01, 2021
15.	PC-I for Construction of Zangi Storage/Delay Action Dam at Gat-e-Baroth District Chagai (Estimated Cost Rs 100.00 Million)	PID, Balochistan/ Federal	Comments communicated to M/o WR on June 01, 2021
16.	PC-I for Construction of Shingero Storage/Delay Action Dam District Chagai (Estimated Cost Rs 100.00 Million)	PID, Balochistan/ Federal	Comments communicated to M/o WR on June 01, 2021
17.	PC-I for Construction of Deewanag Storage/Delay Action Dam at Union Council Julli District Chagai District Chagai (Estimated Cost Rs 100.00 Million)	PID, Balochistan/ Federal	Comments communicated to M/o WR on June 01, 2021
18.	PC-I for Construction of Ziarat Balanosh Storage/Delay Action Dam in District Chagai (Estimated Cost Rs 100.00 Million)	PID, Balochistan/ Federal	Comments communicated to M/o WR on June 01, 2021
19.	PC-I for Construction of Saindak Storage/Delay Action Dam in District Chagai (Estimated Cost Rs 200.00 million)	PID, Balochistan/ Federal	Comments communicated to M/o WR on June 01, 2021
20.	PC-I for Construction of Amuri Storage/Delay Action Dam in District Chagai (Estimated Cost Rs 100.00 Million)	PID, Balochistan/ Federal	Comments communicated to M/o WR on June 01, 2021
21.	Construction of Pharaoh Delay Action Dam, Dera Bugti (Estimated cost Rs 300 million)	-do-	Comments communicated to M/o WR on June 09, 2021
22.	Revised PC-I for construction of Dringarh Dam, District Mastung with replacement of Hushbalo Dam, estimated cost Rs. 672.646 million	PID, Balochistan/ Federal	Last comments was communicated to M/o WR on June 9, 2021
23.	Construction of 06 Nos. Dam District, Zhob and Sherani (Estimated cost Rs 1544.741 million)	-do-	Comments communicated to M/o WR on June 10, 2021
24.	Construction of Asreli Storage Dam Sui, Dera Bugti (Estimated cost Rs 500.00 million)	-do-	Comments communicated to M/o WR on June 14, 2021
25.	Construction of Dinar dam of Killa Abdullah (Estimated cost Rs 608.542	-do-	Comments communicated to M/o

Sr. No.	Name of Project	Financing	Current Status of Project Reviews
	million)		WR on June 17, 2021
26.	Construction of Talango PirKho area Delay Action Dam Dera Bugti (E/Cost Rs 325.00 million)	-do-	Comments communicated to M/o WR on June 18, 2021
Total:		29 No.	

2.5.2. Technical Review of PC-IIs & PC-IVs of Dam Projects

Two (02) PC-IIs evaluated during year 2021 and technical views/comments were forwarded to Ministry of Water Resources, Provincial Governments & other stakeholder organizations. Detail is given in **Table 2.3**.

Similarly 4 PC-IVs received from PID, Sindh were evaluated during year 2021 and technical views/comments were forwarded to Ministry of Water Resources & other stakeholder organizations. Detail is given in **Table 2.4**.

Table 2.3: PC-IIs reviewed by Dam Safety Council in Year 2021

Sr. No.	Name of Project	Financing	Current Status of Project Reviews
Balochistan			
1.	Feasibility Study and detailed design of dams in Balochistan: i. Pellar Dam District Awaran ii. Sukkah Kaur Dam District Gwadar iii. Koshk Dam District Khuzdar iv. Sorgaz Dam District Khuzdar v. Kolachi Dam District Khuzdar vi. Khazran Ghar Dam at Mula River District Khuzdar	PID, Balochistan/ Federal	Last comments were sent to M/o WR on March 17, 2021
WAPDA			
2.	PC-II of Kurram Tangi Dam Stage-II (Estimated Cost Rs 1836.363 Million)	WAPDA	Last comments were sent to M/o WR on April 14, 2021

Table 2.4: PC-VIs reviewed by Dam Safety Council in Year 2021

Sr. No.	Name of Project	Current Status of Project Reviews
Sindh		
1.	Construction of Small Dams Storage Dams/ Delay Action Dams, Retention Weir and I.S.S.O. Barrier in Sindh Construction of Two (02) Recharge Dams Malir Bakshan and Ran Pathani in Lower Kohstan Division, Sindh	Last comments were communicated to M/o WR on January 20, 2021
2.	Construction of Small Dams Storage Dams/ Delay Action Dams, Retention Weir and I.S.S.O Barrier in arid zone, Sindh, E/Cost Rs 12211.00 Million Construction of Seven (7) Gravity Weirs/Small Dams in Lower Kohstan	Last comments were communicated to M/o WR on January 20, 2021

Sr. No.	Name of Project	Current Status of Project Reviews
3.	PC-IV: Construction of Project Management Unit (PMU) for Project Directorate Hyderabad (Component-IV)	Comments communicated to M/o WR on January 21, 2021
4.	Construction of Small Dams Storage Dams/ Delay Action Dams, Retention Weir and I.S.S.O Barrier in arid zone, Sindh, E/Cost Rs 12211.00 Million Construction of Five (5) Recharge Dams/Weirs Hassan Jo Kunn, German Dhoru, Sukkan, Watan Wari and Layari in Khostan area, Sindh (Component-VI)	Last comments were communicated to M/o WR on November 11, 2021

2.5.3. Activities Performed as PANCOLD Secretariat

- i. Circulation letter of ICOLD issued to PANCOLD members regarding (i) 4th International Conference and Exhibition on Water Storage and Hydro Power Development for Africa; and (ii) International Conference and Exhibition on Roles of Hydro in the Global Recovery **on January 01, 2021.**
- ii. Letter was issued to Dr. Martin Wieland, Chairman, ICOLD Committee on Seismic Aspects of Dam Design regarding ICOLD Committee on Seismic Aspects of Dam Design Member of Pakistan **on January 12, 2021.**
- iii. Notice of meeting was issued to all PANCOLD members regarding 46th Meeting of Pakistan National Committee on Large Dams (PANCOLD) to be held on February 10, 2021 at 02:30 PM at Islamabad **on February 03, 2021.**
- iv. Minutes was issued to all PANCOLD members of 46th Meeting of PANCOLD held on February 10, 2021 **on February 16, 2021.**
- v. Letter issued to PANCOLD members regarding ICOLD Circular letter N 1982- Election Report **on August 13, 2021.**
- vi. Letter issued to PANCOLD members regarding ICOLD Circulars 1980 & 1981: 89th Meeting of the General Assembly of ICOLD **on August 30, 2021.**
- vii. Letter issued to PANCOLD members regarding ICOLD for Circulation of Bulletin **on September 08, 2021.**
- viii. Letter issued to PANCOLD members regarding “Refreshing our commitment to Dam Safety Annual Inspections” **on September 17, 2021.**
- ix. Notice of meeting was issued to all PANCOLD members regarding 47th Meeting of Pakistan National Committee on Large Dams (PANCOLD) to be held on November 11, 2021 at 11:00 AM at Islamabad **on November 02, 2021.**
- x. Minutes was issued to all PANCOLD members of 47th Meeting of PANCOLD held on November 11, 2021 **on November 19, 2021.**
- xi. Reminder was issued to all executing agencies regarding updation of National Register of Dams of Pakistan **on December 24, 2021.**



FEDERAL FLOOD COMMISSION

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

3. FEDERAL FLOOD COMMISSION

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, possibly 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 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, 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

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 abadies with monetary loss in billions of rupees. Major direct flood damages are caused to agricultural lands, standing crops, urban and rural abadies, 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 abadies, 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 remodelling/rehabilitation works of Barrages, on the basis of 100 years return period, were taken up by the Punjab & Sindh province. The construction of Khanki Barrage on River Chenab, rehabilitation of Jinnah Barrage & Taunsa Barrages on River Indus, Sulemanki Barrage on River Sutlej and Balloki Barrage over Ravi River have been completed. The remodeling work regarding Trimmu and Panjnad Barrages over Chenab River is underway. Remolding works on Guddu & Sukkur Barrages across River Indus is in progress.

3.1.3 Flood Control Objective & Need

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. Even the characteristics of catchment areas of various rivers differ from each other. 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 erosion, spurs have been constructed in critical reaches. These spurs 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, Kurram 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, Merged Area KP (Ex-FATA) and AJ&K)

- The bed slopes of rivers and nullahs in Gilgit-Baltistan, Merged Area KP (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.

3.1.4 Water Resources 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.

3.1.5 Irrigation Network of Pakistan

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 = 6.101 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**. 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 (1976-77 to 2019-20). The Provincial utilization was 97.08 MAF, System losses were 18.46 MAF and Escapages downstream Kotri Barrage were 27.59 MAF.

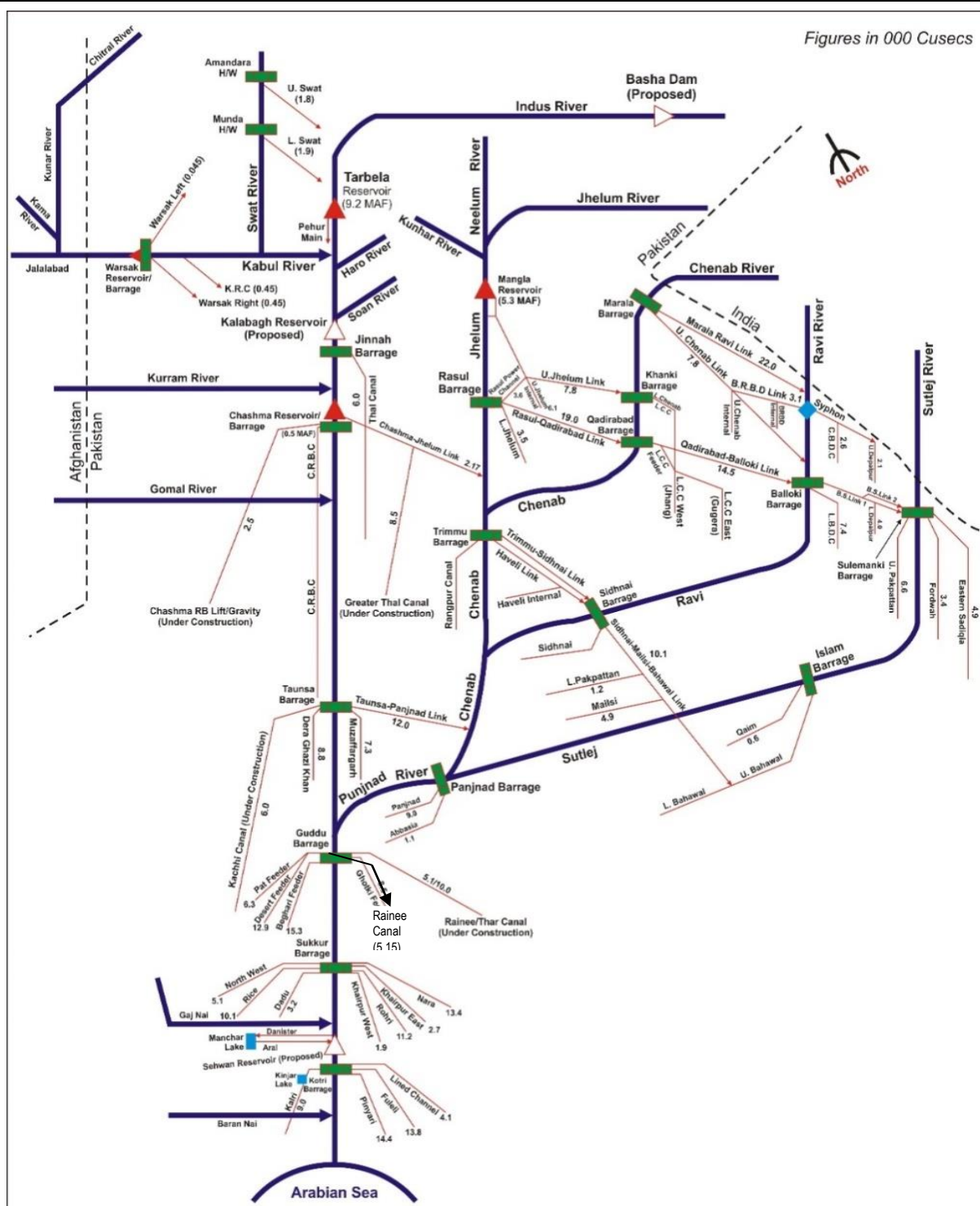


Figure 3.1: Schematic Diagram of Indus Basin Irrigation System

3.1.6 Flood Protection Facilities in Pakistan

The existing flood management strategy includes flood peaks regulation by three major reservoirs (Tarbela, Chashma on Indus & Mangla on Jhelum), protection of private & public infrastructure, urban/rural abadies and adjoining agricultural lands from spill and erosive action of major and other rivers including Hill Torrents by flood embankments/protection walls and spurs including other interventions, besides, Flood Forecasting & Early Warning System, Rescue & Relief

measures in case of flooding situation. The existing flood protection facilities in the four provinces and Federally Administered Areas are given in **Table 3.1**.

Table 3.1: Existing Flood Protection Infrastructure in Pakistan

Sr. No.	Zone/Region/ Agency/District	No. of Protection Works
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
Sub-Total (KP)		784
Balochistan		
1.	North Irrigation Zone	159
2.	South Irrigation Zone	96
3.	Canal Irrigation Zone	05
Sub-Total (Balochistan)		260
Gilgit-Baltistan		
1.	Gilgit	02
2.	Hunza/Nagar	08
3.	Skardu	04
4.	Ghizar	04
5.	Astore	02
6.	Ghanche	09
7.	Diamer	01
Sub-Total (G-B)		30
Merged Areas (Ex-FATA)		
1.	Bajaur Agency	12

Sr. No.	Zone/Region/ Agency/District	No. of Protection Works
2.	Khyber Agency	21
3.	Kurram Agency	41
4.	Mohmand Agency	8
5.	Orakzai Agency	9
6.	North Waziristan Agency	9
7.	South Waziristan Agency	42
8.	FR Bannu	5
9.	FR D.I. Khan	26
10.	FR Kohat	15
11.	FR Lakki	7
12.	FR Tank	14
Sub-Total (Ex-FATA)		209
AJ&K		
1.	Bagh	03
2.	Bhimber	06
3.	Kotli & Mirpur	01
4.	Muzaffarabad	02
Sub-Total (AJ&K)		13
Grand Total		2,742

3.1.7 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 may cause floods in Pakistan and neighboring countries in the coming years. Pakistan economy has faced significant losses due to environmental damages and degradations.

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

The most recent extreme climate events witnessed by Pakistan are 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.

3.1.8 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, 1998, 1983, 1984, 1988, 1992, 1994, 1995, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2019 & 2020, the 2010 floods were 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.

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 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 Km² was affected. The major historical flood events experienced in the past and their damages are given in **Table 3.2**.

3.1.9 Integrated Approach 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 to Integrated Flood Management (IFM).

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

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	5134	474	9,719	41,472
7	1975	684	126	8,628	34,931
8	1976	3485	425	18,390	81,920
9	1977	338	848	2,185	4,657
10	1978	2227	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	3010	1,008	13,208	38,758
16	1994	843	431	1,622	5,568
17	1995	376	591	6,852	16,686
18	2010	10,000 @ 1US\$= PKR 86	1,985	17,553	160,000
19	2011	3730* @ 1US\$= PKR 94	516	38,700	27,581
20	2012	2640** @ 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		
Total		38,169	13,460	197,273	616,558

* Economic Survey of Pakistan 2011-12

** NDMA

^ Thomson Reuters Foundation (<http://www.trust.org/item/20130909134725-rm708/>)(Agriculture sector)

^^ Economic Survey of Pakistan (2014-15)

3.1.10 Floods and the Development Process

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.

3.1.11 Traditional Flood Management Options

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. The traditional flood management interventions are listed 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, v
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 transboundary 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 programme/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.

3.1.12 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 behaviour 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. The 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 unfavourable 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.

3.1.13 Impact of Rapid Urbanization on Flood Management

According to World Urbanization Prospects (2014 revision), 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 with the urban population projected to reach 56% in Africa and 64% in Asia by 2050 (currently at 40% and 48%, respectively).

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. In addition, the total volume of water discharged during a flood tends to be more in urban streams as compared to rural areas streams.

3.1.14 Climate Variability and Change

Apart from the antecedent basin conditions, flood magnitudes depend on precipitation intensity, depth, timing and spatial distribution. A variety of climate and non-climate parameters influence flood processes. Temperature and wind affect snowmelt, which in turn affects flood magnitudes. 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 (KP), South Eastern Punjab and Central Sindh.

According to an analysis of fifty-year data, variation in the co-efficient of variability was highest in post-monsoon and pre-monsoon seasons as compared to the winter and monsoon seasons. It further revealed that most of the northern areas (upper KP and Gilgit Baltistan) remain in the same old pattern except in the post-monsoon period while the central and southern half suffers throughout the year in terms of high rainfall variability. It is also observed that more snowfall was received in the month of February as compared to January over recent years.

3.2 FFC – History, 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**.

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. Federal Flood Commission 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.

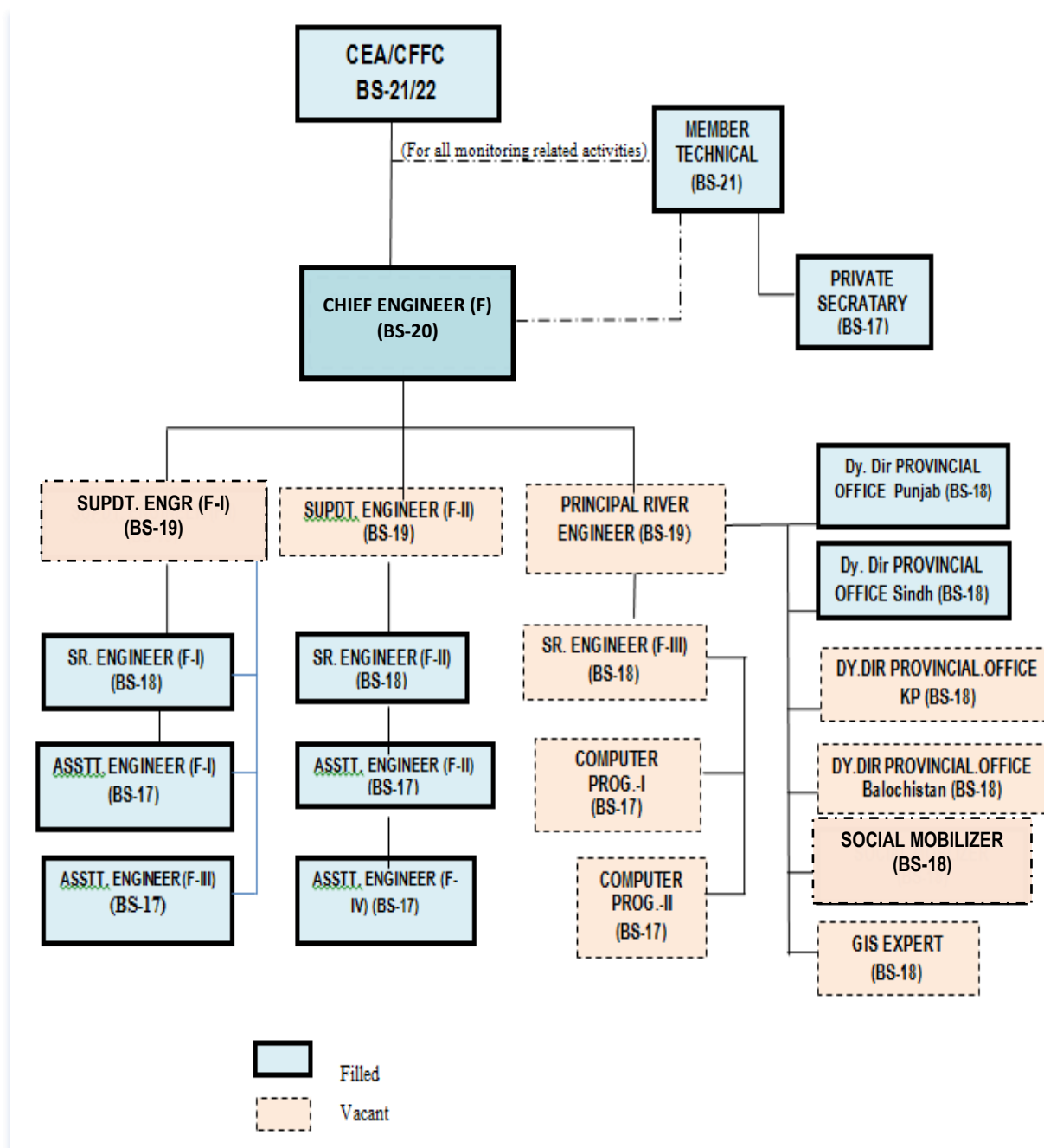


Figure 3.2: Organogram of FFC

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 number of flood projects executed under those 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)

- | | |
|---|---------------------|
| • Number of schemes executed all over country | • 170 |
| • Expenditure incurred through Normal/ Emergent Flood Program | • Rs 805.33 Million |
| • Source of funding | • GOP (100%) |

3. 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).

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

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

5. 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%)

6. 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%)

7. 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-I (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.

8. 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, Islamabad 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 and 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)

Preparation of Plan

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 Plan 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”.

Meeting 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 17th August 2017. A meeting of consultants & FFC was organized on 12th September 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 of Plan by PDWP Punjab, Sindh, KP 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 3.1**) based upon the proposals received from Irrigation Departments Government of Punjab, Sindh, KP, Balochistan & Federal Line Agencies (Merged Area, KP, 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 Economic Affairs Division (EAD).

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

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 & its own staff)	2.460
Total:		95.980

CCP for FPSP-III based on NFPP-IV (Cost of Rs 95.980 Billion) was forwarded to M/o WR 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 M/o WR 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, M/o WR 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 M/o WR 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 (**Annexure-III**) has been prepared in consultation with all the stakeholders and forwarded to EAD through Ministry of Water Resources for exploring external funding.

3.2.6 Normal/Emergent Flood Programme

Presently, the urgent nature flood protection works as proposed by the Provincial Irrigation Departments and Federal Line Agencies are executed through GOP funded Normal/Emergent Flood Programme. Around 356 number flood project costing Rs 8.396 billion have been approved for implementation through Normal/Emergent Flood Programme during the period 2007-08 to 2019-20. 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 unattended or delayed. 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 3.4**.

Table 3.4: Status of Budget Demanded/Allocated for Flood Projects under Normal/Emergent Flood Programme during 2009-10 to 2019-20

(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
Total		63,236.516	8,034.798	7,641.859	5,603.084

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

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 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. 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 3.5**.

Table 3.5: 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
<i>Sub-Total (NFPP-I)</i>			<i>311</i>	<i>1,730</i>
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
<i>Sub-Total (NFPP-II)</i>			<i>436</i>	<i>6,153</i>
3.	NFPP-III (1998-2008)			
i.	Normal/Emergent Flood Programme	Countrywide	362	4,192.348
ii.	Second Flood Protection Sector Project FPSP-II (1998-2007) Co-financed by GOP & ADB	Four Provinces	101	4,165.00
iii.	Special package executed through President Directives (2000-02)	Gilgit-Baltistan	21	92.035
iv.	Lai Nullah Flood Forecasting & Warning System through JICA grant-in-aid	District Rawalpindi & ICT	1	348.00
<i>Sub-Total (NFPP-III)</i>			<i>485</i>	<i>8,797</i>
4.	Normal/Emergent Flood Programme (2008-09 to 2019-20)	All over country	356	8396.262
<i>Sub-Total (N/EFPP-IV)</i>			<i>356</i>	<i>8396.262</i>
Total(1+2+3+4)			1588	25076
5.	FLOOD DAMAGE 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 Flood Management Mechanism

3.3.1 Organizations involved and Responsibilities

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

- Provincial Irrigation Departments (PIDs), GB-PWD, Merged Area KP (Ex- FATA), Irrigation & Small Dams Organization, Government of AJ&K.
- PMD/Flood Forecasting Division, Lahore.
- Water and Power Development Authority (WAPDA).
- Pakistan Commissioner for Indus Waters (PCIW).
- Federal Flood Commission (FFC).
- National Disaster management Authority (NDMA).
- Provincial Relief Organizations.
- Pak Army.
- National Highway Authority (NHA).
- Pakistan Railways.
- Provincial Disaster Management Authorities, GB-DMA, FDMA, SDMA & DDMA/District Administration.

Functions of these organizations are briefly described hereinafter:

3.3.2 Provincial Irrigation Departments (PIDs)

The 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.

3.3.3 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.

3.3.4 Provincial Disaster Management Authorities (PDMAs)

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

3.3.5 Pak Army

- i. Pak Army's Corps of Engineers under the command and control of Engineer-in-Chief (E-N-C) provide necessary help to the civil authorities to carry out rescue and relief operations during floods;
- ii. Provincial Governments facilitate Pak Army in providing necessary logistic support/equipment (boats, life jackets, vehicles, tents etc.) for such operations.
- iii. Pakistan Army's flood related functions encompass all the three phases of flood operations from the pre-flood to post flood phases including the important flood phase;
- iv. Pre-flood phase is the flood preparatory phase during which the adequacy and serviceability of the flood fighting equipment is ensured;
- v. Pre-flood meetings are also held at the Corps Head Quarters and Engineer Directorate, GHQ in order to review the arrangements of PIDs, PDMA's & Federal Line Agencies for handling flood situation;
- vi. Pre-flood inspections of the flood protection structures are carried out by the respective Commander Corps of Engineers alongwith concerned field formations of Provincial Irrigation Departments for their respective areas to ensure that the flood protection structures (Bunds, Barrages, Spurs etc.) are in satisfactory state of maintenance. Deficiencies, if any, are brought into the notice of PIDs;
- vii. Availability of flood fighting material and sufficient stock of explosives is ensured at pre-determined breaching sections to activate the pre-determined breaching sections, whenever required;

- viii. An officer of the 4 Corps Engineers is placed on duty in the Flood Warning Centre, Lahore, to keep a close watch on the flood situation;
- ix. All flood forecasts and warnings are communicated to the CC Engineers 4 Corps in time, which are transmitted to the D.G. Engineers and all other CC of the Engineers;
- x. In the event of floods, units of the Pak Army move out to their respective areas of responsibility and carry out the relief and rescue operations in coordination with the respective civil administration;
- xi. A post flood coordination meeting is held under the Chairmanship of Engineer-in-Chief/D.G. Engineers to discuss the performance of all flood management related agencies with the view to bring about the necessary improvements in future.

3.3.6 Pakistan Commissioner for Indus Waters (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).

3.3.7 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.

3.3.8 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 analysed 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.

3.3.9 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, preparatory meeting of Federal Flood Commission was held on **27th April 2021** under the Chairmanship of Chief Engineering Advisor/ Chairman Federal Flood Commission in the Committee Room of office of CEA & CFEC in order to review the progress on post 2020 flood activities and preparatory works for Monsoon Season 2021. Accordingly necessary directions regarding pre-emptive measures for Monsoon Season 2021 were issued to concerned organizations;
- The 12th Progress Review meeting of Federal Flood Commission was organized on **14th June 2021** 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

- The 56th Annual meeting of FFC was organized on **28th June 2021** 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 2021.



56th Annual meeting of FFC –In progress

Role of FFC during Monsoon Season

- The Flood Communication Cell established in FFC started working on round the clock basis since 15th June 2021 and worked on 24 hours basis during the entire Monsoon Season (15th June - 15th October 2021) 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 Report (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 DFSR, ten (10) Press Releases, five (05) Weather Advisories, one (01) Significant Flood Forecast and six (06) Tropical Cyclone Alerts were issued by Flood Communication Cell.
- 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. Five meetings of Scrutinizing Committee of FFC were organized on **26th March 2021, 13th April 2021, 30th September 2021, 25th October 2021 and 8th December 2021**, wherein flood protection schemes were technically examined and recommended to Ministry of Water Resources for approval of DDWP.
- Three (03) meetings were organized by FFC for review of progress on implementation of flood projects under GOP funded Normal/Emergent Flood Programme;
- The Post Flood Meeting was organized on **13th December 2021**, 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;
- Thirty eight (38) site inspections of flood protection schemes being executed under Normal/Emergent Flood Programme were carried out by the FFC's Monitoring Teams throughout the country.

3.3.10 Flood Warning Dissemination System

- Monsoon Season normally starts in 1st week of July (*sometimes, it starts little early*) and ends in last week of September (*sometimes prolongs up to mid-October*).
- The 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 Preparedness & Contingency Planning By FFC for Monsoon Season 2021

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 practice, FFC holds meetings prior to start of Monsoon Season every year, to review the status of preparedness/ flood fighting arrangements made by Federal/Provincial governments for Monsoon Season 2021. 56th Annual Meeting of FFC was organized on 28th June 2021 to review the arrangements made by the concerned organizations for flood management during Monsoon Season 2021. Further detail is given as under;

3.4.1 Preparatory Meeting of FFC

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 27th April 2021 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 2020 flood activities and preparatory works for Monsoon Season 2021. Accordingly, following necessary directions regarding pre-emptive measures for Monsoon Season 2021 were issued to PIDs/Federal Line Agencies, WAPDA, PMD & other concerned agencies etc.;

i. Provincial Irrigation Departments (PIDs) & Federal Line Agencies (FLAs) to ensure:

- a) Completion of all approved/ongoing flood protection schemes taken up under GOP funded Normal/ Emergent Flood Programme/ Foreign funded/ provincially funded Programme, before 30th June, 2021.
- b) Rehabilitation/Strengthening works at all vulnerable locations and weak sections of flood protection infrastructure, besides, completion of 2020-Flood Damages Restoration Works (if any), before 30th June, 2021.
- c) Timely completion of routine O&M works related to Barrages/Head Works/Bridges, Irrigation, Drainage and Flood Protection Infrastructure.
- d) Ensuring pre-monsoon inspections of flood protection infrastructure (Flood Bunds/Protection Structures, Spurs, Barrages/ Head-works and their allied components etc.) jointly with concerned Corps of Engineers of Pak Army to ascertain existing infrastructure condition, implementation of plan for their strengthening and execution of all rehabilitation works before start of Monsoon Season 2021.
- e) Vigorous follow-up of pending cases of fund releases under Normal/ Emergent Flood Programme (2020-21) for their early release and utilization well within June 30, 2021.
- f) Ensuring enactment of River Act based on approval from the respective Provincial Governments/ Cabinets well before 30th June 2021 to effectively implement flood plains regulation (removal of existing encroachments and restricting new settlements in the flood plains).
- g) Removal of encroachments from Flood Plains/ High Risk Zones, Waterways, which are under the threat of flood water and also causing hindrance in flood flows. Progress be submitted to FFC on fortnightly basis till completion of the task. The entire exercise be completed well before the start of Monsoon Season 2021.
- h) To remain vigilant and ensure Round-the-Clock patrolling of flood protection structures especially vulnerable sections, besides, operation of Dams and Barrage/ Headworks as per existing SOPs.
- i) Finalize respective District/ Division-wise Flood Fighting Plans, keeping in view lessons learnt from the past flood events and ensure their circulation among concerned organizations including FFC well in time for adoption during 2021 Monsoon Season.
- j) Share lists of all vulnerable locations alongwith their respective Flood Fighting/Contingency Plans clearly outlining the flood combating strategy in case of likely floods during Monsoon Season 2021.

ii. PIDs/ PDMAs/ GBDMA/ SDMA and other FLAs including NHA & Pak Railways:

- a) To expedite preparation of their respective Contingency Plans for Monsoon Season 2021, finalize them and put in place the same before 30th June 2021 for operation.

- b) Hard and soft copies be shared with FFC for uploading on its web site.
- c) Effective use of Flood Plain/ Inundation Maps already circulated by FFC for secure flood management & fighting under high flood situation be ensured.
- d) Finalize respective District/ Division-wise Flood Fighting Plans, keeping in view lessons learnt from the past flood events and ensure their circulation among concerned organizations including FFC well in time for adoption during 2021 Monsoon Season.

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

- a) Complete clearance/ cleaning of the silted up bays of Barrages.
- 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 inspection before start of Monsoon Season 2021.

iv. **Pakistan Meteorological Department & FFD, Lahore including WAPDA to ensure:**

- a) Completion of all essential repairs/maintenance of equipment relating to Flood Forecasting & Warning System.
- b) 100 percent functionality of all existing weather radars (including Karachi & D.I. Khan)
- c) Effective use of FEWS and related Models under the use of PMD/FFD, Lahore as a measure towards flood flow forecasting.
- d) Effective use of IFAS and RRI model, as a measure to support in flash flood forecasts and rivers flows inundation.

v. **General Manager Tarbela Dam Project & Chief Engineer Mangla Dam Project to ensure:**

- a) Timely completion of all necessary preparatory works as per prevailing SOPs (arrangement of stockpiles of construction materials, testing of Spillway gates & warning hooters, arrangement of Plant & Equipments for use in emergency, calibration of seepage measuring devices & instrumentations)
- b) Preparation of Flood Management Plans for Monsoon Season 2021 and carry out Mock-Exercise for Flood Mitigation as per existing SOPs of reservoir operation.

vi. **WAPDA to ensure:**

- a) Essential repair works of Flood Telemetry Stations and that entire network is fully operational before 30th June 2021.
- b) WAPDA to speed up progress on up-gradation of Flood Telemetry Network through World Bank funded WCAP so as to complete the task within the target period.

vii. **Managing Director WASA and Deputy Commissioner, Rawalpindi:** To expedite action on all necessary measures for removal of encroachments from the waterways and banks of Lai Nullah and its tributaries.

viii. **Pakistan Metrological Department (PMD) & WASA Rawalpindi:**

- a) PMD to ensure that Flood Forecasting & Warning System of Lai Nullah is fully operational and the Rainfall and run-off measurements stations are fully functional before 30th June 2021.
- b) WASA Rawalpindi to complete all necessary de-silting works of critical sections of Lai Nullah well before the start of Monsoon 2021.

ix. **Pakistan Commissioner for Indus Waters (PCIW):**

To ensure effective arrangements for the receipt and dissemination of cross-border data well in time (before start of Monsoon Season 2021) and in line with the requirements of all related stakeholders (in-particular PMD/ FFD)

- x. Karachi Water & Sewerage Board (KW&SB), (WASA)/ Municipal Corporation of all Big Cities Punjab (Lahore, Gujranwala, Sialkot, Faisalabad, Sargodha, Multan, Rawalpindi, etc.), Sindh (Karachi, Sukkur, Hyderabad, Thatta, Jacobabad, Shikarpur, Kashmore, etc.), Khyber Pakhtunkhwa (Peshawar, Mardan, D.I. Khan, etc.), Balochistan (Quetta, Sibi & Dera Allah Yar, etc.)
 - a) To clear all main Sewer Lines/ Storm Drainage System within the respective city by removing all debris/ solid wastes **before 30th June 2021**, to ensure unhindered flow of storm water to avoid any urban flooding during Monsoon Season 2021.
 - b) To put at place sizeable number of dewatering pumps and related flood fighting machinery/ equipment in fully working condition to handle any urban flooding issue.

3.4.2 Flood Communication Cell of FFC

The Flood Communication Cell of Federal Flood Commission started functioning on round-the-clock basis from 15th June 2021 till end Monsoon Season (15th October 2021) 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 Monsoon Season 2021.

3.4.3 12th Progress Review Meeting of FFC on Supreme Court Recommendations

The 12th Progress Review meeting of Federal Flood Commission was held on **14th June 2021** 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 related to flood preparedness of the four Provincial Irrigation Departments and Federal Line Agencies, WAPDA & PMD etc.

- i. All concerned organizations will furnish progress/ compliance reports on prescribed format regularly on quarterly basis to FFC for taking further action in the matter. Non-compliance will render them answerable to the Honourable Supreme Court.
- ii. Irrigation Departments, Govt. of the Punjab, Sindh, KP, Balochistan, GB-PWD and

- Agriculture, Livestock, Irrigation & ESMA, Government of AJ&K will share with SUPARCO under intimation of FFC, the details of encroachments, besides, those encroachments already removed on prescribed format already circulated among concerned organizations within a fortnight (Annex-II).
- iii. PDMA, 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 within three months' time.
 - iv. Upon receipt of information from Irrigation Departments, SUPARCO will carry out the verification of encroachments removed and those existing and submit report to FFC within three months' time.
 - v. Pakistan Metrological Department to share progress on regular basis regarding projects in progress and those planned to be executed in future. The report must clearly indicate the Capacity Building of organization i.e. improvement and expansion/ up-gradation in the system after 2010 Floods.
 - vi. PMD to share its progress on establishing a coordinating mechanism with WMO and the the SAARC countries for accessing/ sharing information on early weather warning.
 - vii. 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.
 - viii. Irrigation & Forest Departments of provinces to submit their views/ comments on PC-II for formulation of National Watershed Management Plan to FFC within a fortnight.
 - ix. PID, Punjab will provide to FFC on regular basis the updated progress on Construction of Hydro Power Station along right side of Taunsa Barrage.
 - x. WASA, in consultation with RDA, to share progress on construction of Lai Expressway with FFC on regular basis.
 - xi. WASA Rawalpindi to complete all necessary desilting/ dredging works of critical sections of Lai Nullah well before start of Monsoon 2021.
 - xii. PID Punjab & Sindh to share comprehensive reports 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.
 - xiii. PID, Punjab to share updated status regarding Model Study of River Channelization for Ravi River Front Urban Project on regular basis.
 - xiv. NHA to provide to FFC within fortnight detailed updated progress report regarding 57 vulnerable sites identified by the consultants containing the sub-project wise recommendations and their status of implementation alongwith brief details of the scope and obligation of each sub-project.
 - xv. WAPDA to keep on providing progress on Munda/ Mohmand Dam Project to FFC on regular basis.

- xvi. PID KP to furnish details of O&M funds demanded / required, allocated, released & utilized during the past 10 years including current financial year (2010-11 – 2019-20) and status of maintenance of flood protection infrastructure to FFC within a month's time.
- xvii. FFC will sensitize the PIDs/ FLAs for proper allocation of O&M funds in their respective provincial budgets/ AMR for proper maintenance of flood protection infrastructure.
- xviii. 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.
- xix. 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.
- 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.

3.4.4 56thAnnual Meeting of FFC (28thJune 2021)

The 56thAnnual Meeting of Federal Flood Commission was held on **28th June 2021** under the Chairmanship of CEA & CFFC Islamabad, in order to review the status of preparedness of the Provinces & Federal Line Agencies for Monsoon Season 2021. The following directions were given to PIDs/ Federal Line Agencies, WAPDA, WASA & PMD etc.:

- i. **Pakistan Railways** to initiate working on recommendations of IRI, Nandipur, Lahore regarding construction of Left Guide Bund of Shershah Railway Bridge. The PC-I may be prepared and approved from concerned forum of Ministry of Railways, so that physical work could be started well in time and completed before 30th June 2022. Budget for execution of work may be arranged by Pak Railways from its own resources.
- ii. **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 submission of their priority lists and PC-Is of schemes proposed under Normal/ Emergent Flood Programme of PSDP (2021-22) to FFC within July 2021 so that their technical clearance from Scrutinizing Committee of FFC is completed by November 2021 for their final approval of DDWP/ CDWP.

- (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 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.

iii. **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 2021 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.

iv. **Provincial Governments:**

- (a) To direct WASAs/Municipal Corporations and District Administrations to clear the storm drains and sewerage system and make all necessary arrangements for pumping storm water in case of severe monsoon rains so as to avoid urban flooding during 2021 monsoon season. In this context, especially Lai Nullah (Rawalpindi), and Nullahs of Karachi be given attention.
- (b) To ensure that funds allocated under Normal/ Emergent Flood Programme shall only be utilized for Flood Protection Schemes under this programme and transfer to other sectors shall be taken as a violation and a call for inquiry.
- (c) To allocate sufficient funds for O&M of flood protection infrastructure to keep it in a healthy condition in order to avert any flooding situation due to their failure/breaching.
- (d) Pursue with their respective Finance Department for early release of Normal/ Emergent Flood Programme funds without any further loss of time.

v. **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 inspection carried out before the start of Monsoon Season 2021.

vi. **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 2021 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 to PMD/FFD of River Chenab and Eastern Rivers.

vii. **PMD:**

- (a) To ensure completion of all essential repairs/maintenance of equipment relating to Flood Forecasting & Warning System
- (b) To hold a meeting of Working Group on Revised Lag Time and Flood Classification in early July 2021 and share report with FFC.
- (c) To ensure early approval of D.I. Khan Weather Radar PC-I so that its procurement and installation is initiated without any further loss of time.
- (d) To resolve the issues of FEWS & IFAS Models and report to FFC within fortnight.
- (e) To share the status and problems/issues of electric supply to FFD, Lahore with FFC for taking up the matter with the Power Division/ LESCO/ concerned authorities for its early resolution.
- (f) FFD Lahore to update the design capacities of barrages in their A & B Bulletins.
- (g) 100 percent functionality of all existing weather radars, shall be ensured by PMD.

viii. **WAPDA:**

- (a) To ensure the operation of Tarbela Dam on Minimum Operating Level (MOL) with minimum duration keeping in view the IRSA indents and water availability.
- (b) To operate the Tarbela Dam as per revised SOPs, based on the latest Periodic Inspection, for filling of reservoir beyond elevation 1510 feet during Monsoon-2021.
- (c) To ensure mock exercise of Mangla Dam as per approved SOPs as and when the desired level of 1220 SPD was achieved.
- (d) To convene the 2nd meeting of High Level Barakas Committee without any further delay for early resolution of the matter and share the status of the same with FFC.
- (e) To prepare a Contingency Plan in consultation with HQ Engineers 1 Corps (Mangla Garrison), indicating the area/buildings to be evacuated in case 20,000 cusecs

discharge was allowed through Emergency Spillway/Barakas Nullah and submit the same to FFC at the earliest, so that 100 year flood (1992 Flood), if occurred, could be safely passed through Mangla Dam.

- (f) To ensure 100% workability of existing flood telemetry system.
- ix. **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.
- x. **WASA Rawalpindi** to complete all necessary desilting works of critical sections of Lai Nullah by 30th June 2021 and submit detailed report to FFC within July 2021.
- xi. **Karachi Water & Sewerage Board (KW&SB), (WASA)/ Municipal Corporation of all Big Cities Punjab (Lahore, Gujranwala, Sialkot, Faisalabad, Sargodha, Multan, Rawalpindi, etc.), Sindh (Karachi, Sukkur, Hyderabad, Thatta, Jacobabad, Shikarpur, Kashmore, etc.), Khyber Pakhtunkhwa (Peshawar, Mardan, D.I. Khan, etc.), Balochistan (Quetta, Sibi & Dera Allah Yar, etc.)**
 - a) To clear all main Sewer Lines/ Storm Drainage System within the respective city by removing all debris/ solid wastes in order to ensure unhindered flow of storm water to avoid any urban flooding during Monsoon Season 2021.
 - b) To put at place sizeable number of dewatering pumps and related flood fighting machinery/ equipment in fully working condition to handle any urban flooding issue.

3.4.5 1st Progress Review Meeting for Funded Normal/ Emergent Flood Programme (2nd August 2021)

The 1st Progress Review Meeting regarding Normal/Emergent Flood Programme for **Financial Year (2021-22)** was held on **2nd August 2021** under the chairmanship of CEA/CFFC. Following decisions were made in the meeting:

- (i) PID Punjab & KP to submit comments on Design Criteria 2001 and 2017 to FFC within a week time for taking further action in the matter.
- (ii) PIDs & FLAs to ensure that the schemes taken-up for implementation under Normal/ Emergent Flood Programme of current financial year (2021-22) 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.
- (iii) 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.
- (iv) PIDs & FLAs to strictly follow the implementation schedule of flood protection works approved by ECNEC on **27th July 2004**, reminded time and again and as given below:

Sr. No.	Activity	Scheduled time
i.	Federal Flood Commission to prepare list of priority schemes in consultation with the provinces/ federal line agencies before priority committee meeting for demand of funds.	February-Mid of April each year
ii.	Revised list of priority works in consultation with the Provinces/ Federal line Agencies and Pak Army after allocation of funds under PSDP.	End July
iii.	Clearance of PC-Is by PDWPs, Scrutinizing Committee of Federal Flood Commission and approval from DDWP/ CDWP	Before/ By 31 st October and exceptional cases by 30 th November each year
iv.	Execution of works	October/ November-April/May each year

- (v) PIDs & FLAs to submit PC-1s of prioritized schemes duly cleared by the respective Provincial DWPs to Federal Flood Commission (FFC) before **31st August 2021** for further processing of technical clearance from the Scrutinizing Committee (SC) of FFC and approval from the DDWP of Ministry of Water Resources.
- (vi) 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 31st August 2021**, for obtaining approval from Ministry of Water Resources.
- (vii) PIDs & FLAs to submit demand proforma for release of 1st instalment of budget allocated under PSDP (2021-22) alongwith other necessary documents to FFC by/before **31st August 2021** for further processing of the case.
- (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 in writing that all the flood protection structures/ schemes are safe and no damage has occurred to the ongoing/ completed structures. 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.
- (x) PIDs & FLAs to submit to Federal Flood Commission, the utilization account of funds released during previous years (2015-16 to 2019-20) without further delay, for taking further action in the matter.
- (xi) PIDs & FLAs to submit Project Completion Reports (PCRs) of flood protection schemes carried out during (2007-08) to (2019-20) under Normal/ Emergent Flood Programme on prevailing PC-IV proforma in triplicate to FFC alongwith as built drawings, X-sections & coloured site pictures immediately before next Progress Review Meeting to FFC for further action.

3.4.6 2nd Progress Review Meeting regarding Normal/ Emergent Flood Programme (14th September 2021)

The 2nd Progress Review Meeting regarding Normal/Emergent Flood Programme for **Financial Year (2021-22)** was held on **14th September 2021** under the chairmanship of CEA/CFFC. Following decisions were made in the meeting:

- (i) PID Sindh & Merged Area KP & to submit modified PC-1s of schemes cleared in Scrutinizing Committee (SC) of FFC held on 13th April 2021, with full compliance of observations of Scrutinizing Committee immediately without further delay for further processing through DDWP of Ministry of Water Resources.
- (ii) PID Punjab, Sindh & Balochistan & FLAs (GB-PWD & Irrigation & Small Dams Organization, Government of AJ&K) to submit 15 copies of PC-1s of prioritized schemes duly cleared by the respective Provincial DWPs to Federal Flood Commission (FFC) without further delay for further processing of technical clearance from the Scrutinizing Committee (SC) of FFC and approval from the DDWP of Ministry of Water Resources.
- (iii) PIDs & FLAs to strictly follow the implementation schedule of flood protection works approved by ECNEC on **27th July 2004**, as given below;

Sr. No.	Activity	Scheduled time
i.	Federal Flood Commission to prepare list of priority schemes in consultation with the provinces/ federal line agencies before priority committee meeting for demand of funds.	February-Mid of April each year
ii.	Revised list of priority works in consultation with the Provinces/ Federal line Agencies and Pak Army after allocation of funds under PSDP.	End July
iii.	Clearance of PC-Is by PDWPs, Scrutinizing Committee of Federal Flood Commission and approval from DDWP/ CDWP	Before/ By 31 st October and exceptional cases by 30 th November each year
iv.	Execution of works	October/ November-April/May each year

- (iv) PIDs & FLAs to ensure that the schemes taken-up for implementation under Normal/ Emergent Flood Programme of current financial year (2021-22) 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.
- (v) PIDs & FLAs should submit coloured pictures alongwith PC-Is of all proposed schemes indicating the abadies, private & public property to be protected being implemented under Normal/ Emergent Flood Programme of current financial year (2021-22) for easy evaluation of the projects.

- (vi) PIDs & FLAs to submit to Federal Flood Commission, the utilization account of funds released during previous years (2015-16 to 2019-20) without further delay, for taking further action in the matter.
- (vii) FFC will write a D.O letter to the Chief Secretary Punjab for issuing necessary directions to the Provincial Financial Department for revalidation of already released PSDP funds of Rs. 248.978 million under Normal/ Emergent Flood Programme on priority basis.
- (viii) GB-PWD and Merged Area KP will provide the justifications alongwith reasons for lapsing the funds, which were released during the financial year 2019-20.
- (ix) PIDs & FLAs to submit demand proforma for release of 1st installment of budget allocated under PSDP (2021-22) alongwith other necessary documents to FFC by/ before 30th September 2021 for further processing of the case.
- (x) 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.
- (xi) PIDs & FLAs to submit Project Completion Reports (PCRs) of flood protection schemes carried out during (2007-08) to (2019-20) under Normal/ Emergent Flood Programme on prevailing PC-IV Proforma in triplicate to FFC alongwith as built drawings, X-sections & coloured site pictures immediately before **31st October 2021**.
- (xii) PIDs & FLAs to respond properly to the Federal Flood Commission's Monitoring Teams recommendations, communicated through Monitoring Reports. Compliance reports be submitted to Federal Flood Commission without further delay for further action.

3.4.7 Meeting on National Master Plan for Flood Telemetry (27th September 2021)

A meeting of stakeholders to discuss the National Master Plan for Flood Telemetry was held on **27th September 2021**. In the said meeting, following decisions were taken:

- (i) The Final Master Plan shall also include one set each for PMD HQ and FFD, Lahore
- (ii) General Manager (HRM), WAPDA to submit five (5) copies of National Master Plan FFC within one (1) week.
- (iii) WAPDA to prepare the PC-I of the National Master Plan for Flood Telemetry Network and submit the same to FFC taking further necessary action in one month time.

3.4.8 Scrutinizing Committee Meeting of FFC regarding Normal/Emergent Flood Programme (30th September 2021)

A meeting of Scrutinizing Committee of FFC regarding Normal/Emergent Flood Programme was held on **30th September 2021** in FFC. In the said meeting, three number flood protection schemes related to Gilgit Baltistan were considered and cleared. Also, PC-II for formulation of National Watershed Management Plan, Estimated Cost Rs 737.225 million, was discussed and following decisions in that regard were made:

- (i) FFC to circulate again the PC-II of National Watershed Management Plan among all stakeholders for obtaining their views/ comments.

- (ii) Pids Punjab, KP & Balochistan, CDA Islamabad, Forest Departments of Punjab, Sindh, Balochistan, G-B and Ministry of PD&SI, Islamabad to submit their views/ comments on draft PC-II directly to WAPDA with copy to FFC by/ before 20th October 2021.
- (iii) WAPDA to submit five copies of amended PC-II of National Watershed Management Plan after incorporating views/ comments of all the stakeholders to FFC, by/ before 1st November 2021 for reconsideration in the next Scrutinizing Committee meeting of FFC.

3.4.9 Meeting with ADB's Mission regarding FPSP-III and National Master Plan for Flood Telemetry Network (18th October 2021)

A meeting of stakeholders to discuss the proposed Flood Protection Sector Project-III (FPSP-III) and status of National Master Plan for Flood Telemetry was held on **18th October 2021**. In the said meeting, following decisions were taken:-

- (i) Asian Development Bank/ NDRMF will be requested by CEA/CFFC to obtain its willingness to finance FPSP-III(estimated cost Rs 95.98 billion) based on NFPP-IV and will suggest steps required to be taken to successfully complete the process of obtaining financial assistance from NDRMF.
- (ii) ADB/NDMRF may especially consider financing non-structural intervention as a first step and may share the steps involved for this process with M/o WR/FFC.
- (iii) ADB/NDRMF will share the NDRMF Standard Template on the basis of which sub-projects out of Umbrella PC-I of FPSP-III can be prepared and submitted for securing funding out of Phase-II of NDRMF.
- (iv) ADB/NDRMF may share the requirements of feasibility study and detailed design of the project/sub-projects contained in the FPSP-III, if deemed appropriate.
- (v) FFC will re-check the sub-projects taken up under Umbrella PC-I of FPSP-III and make sure that there is no duplication of the sub-projects already approved/executed or under process of approval with Planning Commission.

3.4.10 Scrutinizing Committee Meeting of FFC regarding Normal/Emergent Flood Programme (25th October 2021)

A meeting of Scrutinizing Committee of FFC regarding Normal/Emergent Flood Programme was held on **25th October 2021** under the chairmanship of CEA/CFFC. In the said meeting, 19 number flood protection schemes related to Balochistan Province were considered, out of which 17 were cleared and two were deferred.

3.4.11 Scrutinizing Committee Meeting of FFC regarding Normal/Emergent Flood Programme (8th December 2021)

A meeting of Scrutinizing Committee of FFC regarding Normal/Emergent Flood Programme was held on **8th December 2021** under the chairmanship of CEA/CFFC. In the said meeting, one number flood protection schemes related to Sindh Province, three related to Gilgit Baltistan and two pertaining to AJ&K were considered and technically cleared.

3.4.12 3rd Progress Review Meeting under Normal/ Emergent Flood Programme (8th December 2021)

The 3rd Progress Review Meeting regarding Normal/Emergent Flood Programme for **Financial Year (2021-22)** was held on **8th December 2021** under the chairmanship of CEA/CFFC. Following decisions were made in the meeting:

- (i) PID Punjab to submit PC-Is of schemes proposed for implementation under Normal/ Emergent Flood Programme (2021-22) without further delay but not later than 20th December 2021. The allocated funds of PID Punjab, i.e Rs. 675.00 million would be re-appropriated/ diverted to other urgent nature pending projects, in case of PC-Is alongwith clearance of PDWP are not received before the deadline (**20th December 2021**).
- (ii) PID Sindh, Balochistan & FLAs (GB-PWD & Irrigation & Small Dams Organization, Government of AJ&K) to submit 15 copies of modified PC-Is of schemes already cleared by the Scrutinizing Committee (SC) of FFC, with full compliance of observations of Scrutinizing Committee and recommendations of FFC's Monitoring Team immediately/ without further delay for further processing through DDWP of Ministry of Water Resources.
- (iii) PIDs & FLAs to strictly follow the implementation schedule of flood protection works approved by ECNEC on **27th July 2004**, as given below;

Sr. No.	Activity	Scheduled time
i.	Federal Flood Commission to prepare list of priority schemes in consultation with the provinces/ federal line agencies before priority committee meeting for demand of funds.	February-Mid of April each year
ii.	Revised list of priority works in consultation with the Provinces/ Federal line Agencies and Pak Army after allocation of funds under PSDP.	End July
iii.	Clearance of PC-Is by PDWPs, Scrutinizing Committee of Federal Flood Commission and approval from DDWP/ CDWP	Before/ By 31 st October and exceptional cases by 30 th November each year
iv.	Execution of works	October/ November-April/May each year

- (iv) PIDs & FLAs to submit demand Proforma for release of entire budget allocated under PSDP (2021-22) alongwith other necessary documents to FFC by/ before 31st December 2021 for further processing of the case.
- (v) PIDs & FLAs to submit to Federal Flood Commission, the utilization account of funds released during previous years (2015-16 to 2019-20) without further delay, for taking further action in the matter.
- (vi) 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.
- (vii) PID & FLAs to fully comply with the observations/ recommendations of FFC's Financial & Technical Monitoring Teams before final payment to the contractors.

- (viii) PIDs (Sindh, KP & Balochistan) & FLAs (Merged Area KP, Irrigation & Small Dams Organization, Government of AJ&K & GB-PWD) to submit the PC-I of proposed schemes for financing through expected savings under Normal/ Emergent Flood Programme of current financial year (2021-22) to FFC for taking further action in this matter.
- (ix) 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.



CEA & CFFC chairing a Scrutinizing Committee Meeting of FFC held on December 08, 2021

3.4.13 Post Monsoon Meeting of FFC (13th December 2021)

The Post Monsoon Meeting of Federal Flood Commission was held on 13th December 2021 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 2021. The following directions were given to PIDs/ Federal Line Agencies, WAPDA, WASA & PMD etc. as a way forward for Monsoon 2021:

- (i) **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 2022 Monsoon Season.
- (ii) **PIDs and FLAs** 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 nullahas, 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, 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.
- (vii) **FFC** to write D.O letter to Chief Secretary AJ&K for timely release of funds to project authority concerned for restoration of damaged Flood Protection infrastructure in AJ&K.
- (viii) **PMD** to ensure procurement & installation of the Weather Radar at D.I. Khan as per approved Implementation Plan.
- (ix) **Engineers Directorate, GHQ, Rawalpindi** to peruse the case with concerned quarters for making arrangements for relocation of Pak Army buildings from waterway of Barakas Nullah in Mangla Garrison, as per results of topographic survey being conducted by MDO, WAPDA so that the waterway is cleared before Monsoon Season 2022 to pass surplus flood water through Emergency Spillway in case of emergency situation.
- (x) **Deputy Commissioner, Rawalpindi** to ensure removal of encroachments from the banks/ bed of Lai Nullah at the earliest.
- (xi) **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.
- (xii) **Pak Railways** to ensure the execution of Left Guide Bund of Shershah Railway Bridge across River Chenab in District Multan at the earliest. 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.
- (xiii) **WAPDA** would convene next meeting of High Level Barakas Nullah Committee before the Pak Army Post Monsoon Season Conference likely to be held in 2nd week of January 2022.
- (xiv) **MDO** to take up the matter with WAPDA authorities to include the Barakas Nullah Rehabilitation Works in the 2nd Revised PC-I of Mangla Dam Raising Project.
- (xv) **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.

- (xvi) **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 is not agreed to provide the same during Monsoon Season 2022.
- (xvii) **PCIW** to make all possible efforts to ensure availability of authentic, reliable and real time cross border data to PMD/FFD of River Chenab and Eastern Rivers.

3.5 Urban Floods in Pakistan

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. As reported by the print and electronic media urban flooding in Pakistan especially in Karachi, Hyderabad and Lahore caused heavy losses of precious human lives and damages to the public and private property during the recent years.

The Karachi's vulnerability to the urban flooding is due to population growth, blocking of drainage channels, inappropriate land use and urbanization.

Urban flooding is a relatively serious problem in the city, especially in the dense parts of the city. Karachi has many large and small drains, but most of them are choked or encroached. Urban flooding takes place due to the insufficient and encroached storm water drainage system, unplanned urbanization and impact of climate changes.

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.

3.5.1 Causes of urban flooding in Pakistan

As per thorough review of literatures and considering the news published in the national print and electronic media urban flooding in Pakistan caused due to the following:

- High intensity of rainfall and uneven rainfall (due to climate change)
- Population growth/ unplanned housing
- Inadequate sewerage/Storm water drain 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)

3.5.2 Effects of Urban Flooding

Urban Floods results in accumulation of storm water on streets, markets, houses, hospitals, schools roads, railway tracks and in few cases even at airports. Because of the poor storm water drainage capacity. These results 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. Resulting in loss of precious human life, spread of diseases, loss of public and private property and disturbed economic activity. 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.

A holistic approach is needed to address the issue of urban flooding in Karachi. In this context some recommendations/ remedial measures are given as under. Urban flooding also caused spread of infectious diseases, Loss of Precious human life, Loss of property, Disturbed economic activity and Stress on National Economy.

3.5.3 Preventive measures to reduce the effect of urban flooding

Based on the review of available literature and the reports published in the daily newspapers and electronic media the following recommendations were made to minimize the damages to human lives and public and private properties in Karachi due to urban flooding:

1. Flood hazard map of Karachi needs to be prepared with respect to the drainage system and different nullah on the basis of degree of hazards.
2. Once hazard mapping is available early warning system needs to be provided on the different nullahs keeping in view the degree of danger so that necessary evacuation may be carried out in case of emergency situation.
3. 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.
4. Government of Sindh may carry out necessary legislation to stop further dumping of garbage into these nullahs by the local inhabitants.
5. Removal of encroachments in these Nullahs needs to be carried out on top priority.
6. Carryout mass campaign among the public to raise the awareness of the flood hazards and its consequences.
7. Government of Sindh needs to invest in the rehabilitation of storm drains and carry out proper maintenance of the system

3.6 Other Meetings of FFC during 2021

3.6.1 Meeting regarding updating of Lag Time and Flood Limits/ Classification of major rivers of the country (11th March 2021)

A meeting regarding updation of flood flows Lag Time and Flood Limits/ Classification of major rivers of the country was held on **11th March 2021** in Office of the Chief Engineering Advisor/Chairman, Federal Flood Commission, Islamabad. After detailed discussion, following decisions were made in the meting:

- (i) FFD, Lahore would take the lead role and a Working Group including members from FFD Lahore, FFC, PIDs of the four provinces, PCRWR, WAPDA, IRSA & PCIW was constituted. Chief Meteorologist, FFD Lahore would be the Convener. The 1st meeting of the Working Group will be held within two (02) week's time in FFD, Lahore.

- (ii) As an immediate step, the Working Group would consider/review the new/revised Lag Time prepared by FFD, Lahore for implementation during Monsoon Season 2021. The Working Group would also review and reasonably rationalize downwards the existing Flood Limits for implementation during Monsoon Season 2021 and submit recommendations alongwith detailed evaluation to FFC before 30th April 2021 for approval and future use.
- (iii) The Working Group would also prepare TORs in consultation with all stakeholders and submit to FFC within a month's time to carry out a comprehensive research study to detailed review the existing Lag Time and Floods Classification of all major & other rivers for future updation.

3.6.2 Meeting regarding Revision in the Design Criteria and Implementation Methodology of Flood Protection Projects in Pakistan (17th March 2021).

A meeting regarding revision in the Design Criteria and Implementation Methodology of flood protection projects in Pakistan was held on **17th March 2021** in the Office of the Chief Engineering Advisor/Chairman, Federal Flood Commission, Islamabad. In the said meeting, following decisions were made:

- i. PIDs & FLAs will share their views/ comments on the 2001 Design Criteria and 2017 Revised Design Criteria with FFC by 25th March, 2021.
- ii. PIDs & FLAs further to above to share with FFC by 25th March, 2021 their views/ comments on the proposed changes suggested by FFC on the basis of field observations in the 2001 Design Criteria and 2017 Revised Design Criteria.
- iii. FFC by 30th March 2021 will finalize the Final Draft Version of “Guidelines of Design and Specifications of Flood Protection Works/ River Training Works in Pakistan” on receipt of views/ comments by PIDs & FLAs and will accordingly submit the same to Ministry of Water Resources.

3.7 Monsoon Season 2021 and Analysis

3.7.1 Monsoon Season 2021

Pakistan Meteorological Department (PMD) issued Seasonal Outlook for Summer Monsoon (July-September 2021) for Pakistan on 11th June 2021. The Outlook for Monsoon Season 2021 is as under:

- **Monsoon rainfall is expected to remain near to normal during July to September 2021 in Pakistan.**
- **The upper half of Punjab, northern Balochistan and Kashmir are likely to receive moderately above normal rainfall during the season.**
- **Area weighted normal rainfall of Pakistan during Jul - Sep is 140.8 mm.**

PMD forecasted impacts of above normal rainfall as below:

- Potential for Riverine Floods
- High probability of urban flooding in metropolis cities.

- High probability of flash flooding in hill torrents of Punjab.
- Sufficient water availability for irrigation and power sectors.

During Monsoon Season 2021 (July to September), the rainfall remained close to normal. Due to lesser rainfall and low snow melting, Dam Management Authorities of WAPDA filled Tarbela Dam for only one day whereas the Mangla Reservoir could not achieve its Maximum Conservation Level. However, unprecedented Urban Flooding was witnessed in Sector E-11 of Islamabad.

Monsoon Season 2021 passed without any much trouble mainly due to lesser rains. However, urban flooding was experienced in Sector E-11 of Islamabad and in Abbotabad city of Khyber Pakhtunkhwa. On 28th July 2021, heavy rains started after the cloudburst in Islamabad, Pakistan, caused flood situation in many parts of the federal capital and killed two people. Several vehicles were swept away in the floods and water entered the basement of houses and plazas in Sector E-11, F-10 and D-12. 116 mm of rain was recorded at the personal weather station in E-11/4 Islamabad. Also, two bridges i.e. Ayub Bridge & Nowshera Bridge in District Abbottabad (Khyber Pakhtunkhwa) and one bridge in District Sibbi (Balochistan Province) were damaged. Moreover, the GLOF event in Gilgit Biltistan had damaged the roads and area was cut off from the main Highways that had hampered the rescue & relief efforts. Karakoram Highway was also blocked at various locations due to land sliding. As per NDMA, 198 lives were lost during Monsoon Season 2021 despite normal rains.

The twin cities of Islamabad- Rawalpindi experienced heavy downpour on **28th July 2021**, which generated high flood flows in Lai Nullah. The Nullah attained **21.00 feet (Evacuation Level)** at **Kattarian Bridge** at **0810 hours** and **17.00 feet (Evacuation Level)** at **Gawal Mandi Bridge** at **0910 hours** on that morning. Afterwards, the rainfall stopped and the situation became normal. Apart from that, on **11th September 2021**, due to heavy rainfall in Islamabad- Rawalpindi, water level in Lai Nullah at **Kattarian Bridge** was raised upto **19.00 feet (Alert Level)** and **15.00 feet** at **Gawalmandi Bridge (Alert Level)**. The flood flows were safely passed and no damages were reported by the concerned field formation. The details of major rainfall events received during Monsoon Season are given in **Table 3.6**:

Table 3.6: Details of Major Rainfall Events

Sr. No.	Date	City With Rainfall (mm)
1.	09-07-2021	Hafizabad=63
2.	10-07-2021	Islamabad Golra=55, Zeropoint=52, Bandi Abbaspur=50
3.	11-07-2021	Sialkot Airport=193 Kakul=180, Palandri=111, Saidu Sharif=110, Sialkot Cantt=107, Jhelum=98, Phulra=81, Mangla=70, Gujrat=66 Shinkari=55, Oghi=52, Malam Jabba=51, Mandi-Bahauddin=50
4.	12-07-2021	Narowal=117, Noorpur Thal=98, Jhang=96, Brarkot=80, Bahawalpur (Airport=69), T.T. Singh=60, Lahore Shahdara=53
5.	13-07-2021	Mangla=99, Chakwal=86, Mianwali (Airbase)=70, Sargodha (City=57), Domel=57, Jhelum=53, Joharabad=52, Mandi-Bahauddin=51

Sr. No.	Date	City With Rainfall (mm)
6.	14-07-2021	Tando Jam=50
7.	15-07-2021	Karachi=70
8.	18-07-2021	Islamabad =71, Sialkot=52
9.	19-07-2021	Mianwali=140, Palandri=122 ,Mandi-Bahauddin =96 , Islamabad Saidpur = 88, Kotli=84, Noorpur Thal=81,Gujranwala=76, Tandali=72,Township = 68, Malam Jabba=66, Panjera=64, Kakul=64 ,Saidu Sharif=61, Sialkot=Cantt = 60, Kamra =58 , Johar Town & Shahi Qilla = 56, Gujrat=56, Bandi Abbas Pur=56 Shahdara = 54, Sharqpur = 53, Narowal = 52, Brarkot=52 , Punjab University = 50, Sialkot Airport = 50, Dolat Nagar=50, Domel=50
10.	20-07-2021	Faisalabad=118, Hafizabad=91Lahore Taj Pura = 86, Sharqpur=84, Gujranwala=81,Islamabad =Saidpur = 79 Golra = 76 , Luckshami = 74,Shahi Qilla = 71, Joharabad=71Shahdara = 70, Upper Mall = 68, Malam Jabba=68 Air Port = 66, Gulberg = 64, Ravi Syphon=58, Jhang=57, Township & Mughal Pura = 56 , Johar Town = 55,T.T Singh=55, Palandri=52
11.	26-07-2021	Balakot=75, Mangla=60
12.	27-07-2021	Islamabad Saidpur=123, Golra=103, Sialkot (Cantt=103 & Airport=83), Zeropoint=72, Kotli=63, Gujrat=63, Daulatnagar=58, Narowal=54
13.	28-07-2021	Bannu=96, Takht Bai=85, Joharabad=82, Domel=86,G.S Wala=71 , Kasur=68, Muzaffarabad (City=66), Mardan=60, Buner=57, Shinkari=54, , Gujranwala=51
14.	29-07-2021	Brarkot=71,Malam Jabba=64
15.	30-07-2021	Malam Jabba=68, Kohat (Airbase)=50
16.	31-07-2021	Lahore (Shahi Qilla=132, Shahdara=128, Misri Shah=105, Phulra=72 Jail Rode &Luckshami=60
17.	01-08-2021	Malam Jabba=78
18.	03-08-2021	Bhakkar=102
19.	05-08-2021	Lahore [Shahi Qilla=106, Taj Pura=98, Luckshami=92, Misri Shah & Shahdara=80 Airport=71, Mughal Pura=53 Zhob=50

Sr. No.	Date	City With Rainfall (mm)
20.	11-08-2021	Dir=52
21.	20-08-2021	Bandi Abbaspur=62, Lahore Gulshan e Ravi=65, Sialkot (Airport=54) ,Dhulli=53
22.	29-08-2021	Islamabad Chaklala = 57, Bokra = 54
23.	30-08-2021	Shahdara = 62Toba Tek Singh & Kot Addu=50
24.	03-09-2021	Karachi Saadi Town=81, Gulshan-e-Hadeed=73, Faisal Base=70, University Road=69, Airport=61, Jinnah Terminal=57, Sarjani Town=54, Thatta=51
25.	04-09-2021	Karachi Gulshan e Hadeed=75
26.	07-09-2021	Islamabad Chaklala (Airbase)=169, Daulatnagar=140, Zeropoint=77, Mangla=73, Bokra=71, New Airport=69, Garhi Dupatta=62, Jhelum=56, Chakwal=52Gujrat=50
27.	08-09-2021	Gujrat=80, Sialkot =63, Gujranwala=60, Sargodha=59, Karachi=58,Mianwali=53
28.	09-09-2021	Lahore=174, Muzaffarabad =84, Ravi Syphon=83Shinkiari=77, Domel =62
29.	10-09-2021	Lahore Luckshami=198, Misri Shah=196, Shahi Qilla=176, Shahdara=155, Township=149, Syphon=147, Taj Pura=130, Samanabad=118, Iqbal Town=109, Gulshan-e-Ravi=107,Johar Town=99, Kasur=98 ,Jail Road=96, Upper Mall=87, Islamabad Zeropoint, Golra & Saidpur=83 ,GS Wala=79, Mughal Pura=77, Gulburg=71, Airport=63, Sharqpur=62,
30.	11-09-2021	Brarkot=83, Kasur=73, Ganda Sing Wala=62, Domel=58, Lahore=56, Balakot=50
31.	17-09-2021	Domel=61
32.	18-09-2021	Sialkot (Airport)=55
33.	19-09-2021	Sialkot =58
34.	20-09-2021	Islamabad Zeropoint=65Lahore (Luckshami=53, Gulshan-e-Ravi=52, Shahi Qilla=50
35.	21-09-2021	Jhelum=69
36.	22-09-2021	Jhelum=116, Malam Jabba=55 , Palandri=50
37.	27-09-2021	Chhor=100
38.	30-09-2021	Balakot=68

3.7.2 Flood Peaks Recorded during Major Historical Floods

Highest ever recorded flood peaks during major flood events at various control points of Indus Basin are given in **Table 3.7**. Flood peaks recorded at important control structures across major rivers during 2021 Monsoon Season are given in **Table 3.8**.

The details about flood flows (inflows & outflows) of major rivers at important control structures i.e. Reservoirs & Barrages are attached as **Appendix-II**, related hydrographs at **Appendix-III** whereas rainfall data of Monsoon Season 2021 is attached as **Appendix-IV**. Escapages below Kotri Barrage as received from IRA are also attached as **Appendix-V**.

3.7.3 Country-Wide Losses/ Damages due to 2021 Rains/ Floods

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 2021 are given in **Table 3.9**.

3.7.4 Infrastructure Damaged and Planning for Restoration/ Rehabilitation

No significant damages occurred to flood protection infrastructure in Punjab, Sindh, Khyber Pakhtunkhwa, Balochistan, Ex-FATA and AJ&K during Monsoon Season 2021 as reported by the concerned organizations.

Table 3.7: Historically Peak Discharges (Cusec) Recorded 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 3.7: Historically Peak Discharges (Cusec) Recorded in Major Rivers (Continued)

Site	Max of 1994	Max of 1995	Max of 1996	Max of 1997	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	3,00,500 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 3.7: Historically Peak Discharges (Cusec) Recorded 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	

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Table 3.7: Historically Peak Discharges (Cusec) Recorded 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

Table 3.8: Flood Peaks (Cusec) Recorded During 2021 Monsoon Season

River	Sites	Inflow (Cusec)	Retention Date & time	Outflow (Cusec)	Classification	Retention Date & Time
Indus	Tarbela	3,51,000	31-07 @ 0600hrs	2,70,000	Low Flood	22-07 @ 1200 hrs
	Kalabagh	2,97,809	01-08@ 1200hrs	2,91,309	Low Flood	01-08 @ 1200hrs
	Chashma *	3,52,707	02-08@1800 hrs	3,44,907	Low Flood	02-08@1800hrs
	Taunsa	3,29,989	04-08@1800hrs	3,06,489	Low Flood	04-08@1800hrs
	Guddu	3,06,296	07-08@1800hrs	2,66,344	Low Flood	07-08@1800hrs
	Sukkur	2,50,345	07-08@0600hrs	19,3,045	Normal	07-08@0600hrs
	Kotri	1,30,590	12-08@1800 hrs	95,085	Normal	12-08@1800hrs
Kabul	Nowshera	87,400	22-07 @0600 hrs	87,400	Low Flood	22-07 @0600 hrs
	Warsak	64,975	20-07 @ 1800 hrs	64,975	Low Flood	20-07 @ 1800 hrs
Jhelum	Mangla	1,09,000	28-07@1200hrs	80,315	Low Flood	01-08@1200hrs
	Rasul	53,363	29-06@1800hrs	43,135	Normal	15-06@1800hrs
Chenab	Marala	1,99,889	29-07@ 1200hrs	1,71,150	Medium Flood	29-07@0600hrs
	Khanki	1,89,683	29-07@1200hrs	1,83,688	Low Flood	29-07@1200hrs
	Qadirabad	1,87,812	29-07@1800 hrs	1,67,812	Medium Flood	29-07@1800 hrs
	Trimmu	1,23,167	31-07@1200 hrs	1,06,967	Normal	31-07@1200 hrs
	Panjnad	75,250	03-08@2359 hrs	59,725	Normal	03-08@2359 hrs
Ravi	Jassar	20,200	27-08 @1200 hrs	20,200	Normal	27-08 @1200 hrs
	Shahdara	36,477	14-07 @0600 hrs	36,477	Normal	14-07 @0600 hrs
	Baloki	59,679	22-07@2359 hrs	32,200	Normal	22-07@2359 hrs
	Sidhnai	39,394	25-8@ 1800hrs	11,215	Normal	25-08@1800 hrs
Sutlej	Sulemanki	20,198	15-09@0600 hrs	7,212	Normal	15-09@0600 hrs
	Islam	5,221	18-09@0600 hrs	3,971	Normal	18-09@0600 hrs

Table 3.9: Country-Wide Losses/Damages due to Rains/Floods 2021*

Province/ Region	Persons Died	Persons Injured	Houses Damaged	Roads/Bridges	Masjid/Shops/Hotels	Power Houses
Punjab (incl.ICT)	55	146	54	-	-	-
Sindh	15	07	150	-	-	-
KP (incl. merged areas)	89	133	124	1(R) 2(B)	-	-
Balochistan	24	09	437	6(R) 1(B)	-	-
AJ & K	09	04	56	-	14(S), 3(H)	-
Gilgit Baltistan	06	0	15	6(R) 6(B)	20(S)	1
G. TOTAL	198	299	836	22	37	1

*Source; NDMA



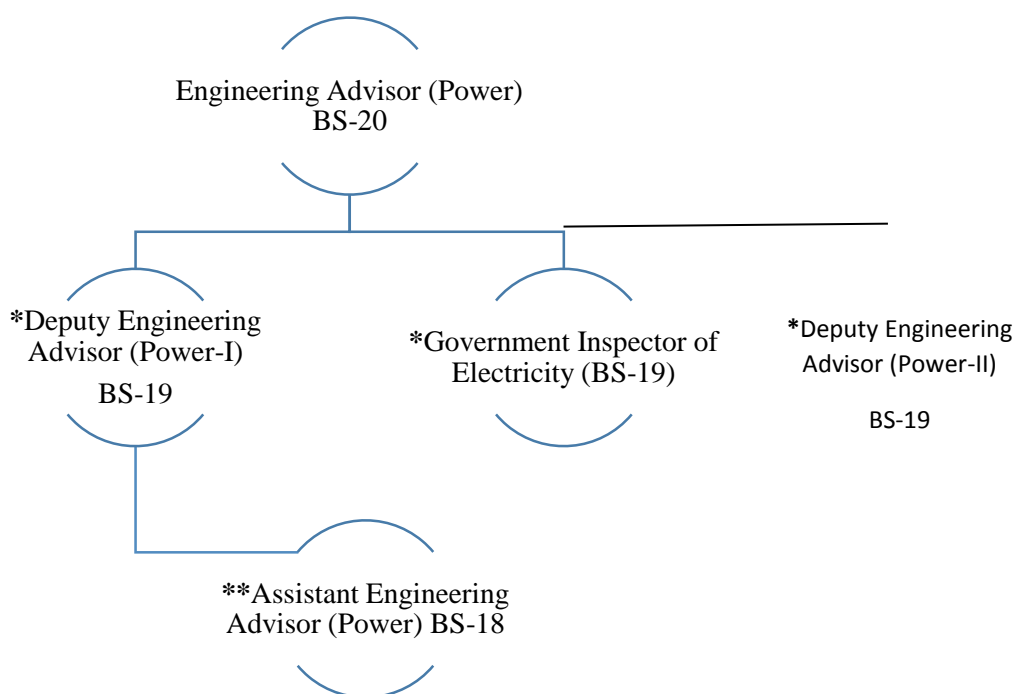
POWER WING

**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. The assignments during 2020 were completed by Engineering Adviser (Power) (BS-20) 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 4.1** shows Organogram of the Power Wing.



* Vacant.

** On study leave abroad.

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 2021

The summary of annual performance of Power Wing for the year 2021 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	19	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	26	WAPDA Inquires involving technical and contractual matters were completed. Detail is given in Table 4.3 .
3.	Transmission & Distribution Projects and Technical Matters.	68	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 analysed for final advice. In the light of our advice the project proposals were substantially improved. DDWP meetings were also attended in Power Division

Sr. No.	Description of Project/Work	No. of Cases	Activities carried out
			to assist the approving authority. Detail of projects is given in Table 4.4 .
4.	Miscellaneous Matters	16	Comments on certain miscellaneous matters were forwarded. Details are given in Table 4.5 .
TOTAL		129	

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

Sr. No.	Name of Project
1.	Tarbela 5 th HPP-Draft Feasibility/ Design basis report concerning Floating Solar Project in Ghazi Brotha /Ponds and Tarbela Reservoir.
2.	Establishment of Hydropower Training Institute Mangla PC-I Proforma (1 st Revision).
3.	PC-II Proforma of 2800 MW Thakot Hydropower Project.
4.	Rehabilitation of 22 MW Jabban Hydroelectric Power Station 2 nd Revised PC-I Proforma.
5.	PC-II Proforma for Feasibility Study of Dudhnial Dam Multi-Purpose Project (960 MW).
6.	PC-II Proforma for detailed Engineering Design, Preparation of Tender Documents for Lower Palas HPP (665 MW).
7.	PC-II Proforma for Detailed Engineering Design, Preparation of Tender Documents for Patan HPP (2400 MW).
8.	PC-I Proforma for Tarbela 4 th Extension Hydropower Project.
9.	3 rd Revised PC-I for 128 MW Keyal Khwar Hydropower Project.
10.	Provision of Water for the 4.0 Jarri-II Hydropower Project Jarrikas, Mirpur, AJ&K-Resolution of Dispute between WAPDA & Investor.
11.	Hydropower Proposal for Retrospective EIA Study of Mega Hydel Projects.
12.	PC-II Proforma for Detailed Engineering Design, Preparation of Tender Documents and PC-I for Lower Palas Hydropower Project (665 MW).
13.	PC-I for Establishment of Hydropower Training Institute (HPTI).
14.	3 rd Revised PC-I For 128 MW Keyal Khwar Hydropower Project
15.	No Objection Certificate – CJ Hydro (Private Limited)
16.	Tarbela 5 th Extension Hpp-draft Feasibility/Design Base Report Concerning Floating Solar Project In Ghazi Barotha Ponds And Tarbela Reservoir
17.	PC-I of Attabad Lake Hydropower Project
18.	Diamer Basha Dam Project – PC-I Power Generation Facilities
19.	300MW Floating Solar Photovoltaic (FPV) on Water Bodies In Tarbela Ghazi Hydropower Generation Complex

Table 4.3: WAPDA Inquiries Completed

Sr. No.	Name of Inquiry
1.	Inquiry/Fact Finding Report In PDP NO.491 of AR-2019-20 of WAPDA. (Loss due to delay in Procurement-Rs.222.39 Million) under directives of DAC meeting relating to CE/GM (Power) Tarbela.
2.	Enquiries/Fact Finding in PDP No. 17 & 18 of AR-18-19 of WAPDA under directives of DAC meeting dated 12-12-2018 relating to GM (P) North. Loss of Rs.82.787 million on account of variation in currency rate due to delay in finalization of contractual requirements. (Tarbela).
3.	Enquiries/Fact Finding in PDP No. 16 of AR-2017-18 of WAPDA under Directives of DAC meeting relating to GM(P) Tarbela. Loss of Rs.82.787 million on account of variation in currency rate due to delay in finalization of contractual requirements. (Tarbela).
4.	Enquiries/Fact Finding in DP No. 1466 of AR-2011-12 of WAPDA under Directives of DAC meeting dated 12&13.03.2019 relating to GM (P) Tarbela. Shortage of stores amounting to Rs. 8.063 million & surplus amounting to Rs.0.962 million.
5.	Enquiries/Fact Finding in various Audit Paras (PDPS) of WAPDA, PAR of Jabban HPS for Audit Year 2016-17 under directives of DAC. Enquiries/Fact Finding in various Audit Paras (PDPS) of WAPDA, PAR of Jabban HPP for Audit Year 2016-17 under directives of DAC
6.	Enquiry / Fact Finding in Para No.2.4.6(DP No.1384 –Golan Gol, DP No.1485- Keyal Khawar and DP No.1487, GM Hydel, Development on Account of Non-Recovery of Liquidated Damages Rs.610.96 M of AR-2016-17 of WAPDA under directives of DAC meeting. Non-Recovery of Liquidated Damages Rs.438.46 million Non-Recovery of Liquidated Damages from Contractor Rs.28.11 million (Keyal Khwar Hydropower Project, Dasu) Non-recovery of liquidated damages Rs.144.39 million (Jabban Rehabilitation Hydropower Project) (Golon Gol Hydropower Project, Chitral)
7.	Enquiry/Fact Finding in DP NO.1247/2.4.1 of AR-2016-17 of WAPDA under directives of DAC meeting dated 15-06-2019 pertaining to G.M (Hydel) Operation. Non-recovery of delaying charges from the contractor-Rs.3,783.81 million
8.	Enquiry /Fact Finding in PDP No.1826 of AR-2014-15 of WAPDA under Directives of DAC meeting dated 19-07-2019 pertaining to G.M. (Hydel) Operation. Enquiry/Fact Finding in PDP No.1826 of AR-2014-15 of WAPDA under Directives of DAC Meeting dated 19-07-2019 Pertaining to G.M (Hydel) Operation.
9.	Inquiry regarding Closure of Tunnel-3 (T3) of Tarbela Dam Project.
10.	Loss due to Extra Payment on Account of Supply of 110 V Battery Chargers from the supplier other than provided in Bidding Documents Rs 4.13 million (Golen Gol Hydropower Project).
11.	Non-Recovery of Liquidated Damages from Contractor Rs 28.11 million (Keyal Khwar Hydropower Project Dasu).
12.	Non-Recovery of Liquidated Damages Rs 144.39 million (Jabban Rehabilitation HPP).
13.	Non-Recovery of Liquidated Damages Rs 123.925 million (Jabban Rehabilitation HPS).
14.	Delay in completion of the project due to non-inclusion of additional scope of work at the time of preparation bidding document (Jabban HPS).
15.	Irregular payment due to procurement without Factory Acceptance Tests at manufacture premises US\$ 0.258 million (Jabban HPS).
16.	Irregular Reliability Test Run of Unit No.1,2,3&4) (Jabban HPS).

Sr. No.	Name of Inquiry
17.	Non Supply of Mandatory Spare Parts by the Contractor valuing US\$ 0.103 million) (Jabban HPS).
18.	Non Achievement of Envisaged Benefits due to non operation of channels Rs500.56 million (Satpara Dam Project).
19.	Non-Recovery/Adjustment of Advance given to the Contractor Rs4.71 million (Satpara Dam Project).
20.	Loss due to less Annual Generation as envisaged in PC-I Rs226.29 million (Jabban HPS).
21.	Non-Receipt/Adjustment of Advances on Account of Acquisition of Land Rs382.34 million (HPS).
22.	Draft Para No.1384/Para No.2-4-6 of AR 2016-17 Golan Gol on Account of Non-Recovery of Liquidated Damages
23.	Fact Finding Inquiry Committee Report to Review the Technical Inquiry Report regarding Audit Para No. 4.3.2 (old) 4.3.5 (new)–Loss of Rs. 29.264 Million due to Lapse in Design regarding Khan Khawar Hydropower Project
24.	Inquiry Report regarding DP No.2.4.38/29 of AR-218-19- Wasteful Expenditure on Procurement of Unnecessary Material – Rs. 19.94 Million on Account of Golen Gol Hydropower Project
25.	To Review the Fact Finding Inquiry Committee Report regarding Proposed Draft Paras DP-16/AR-2018-19 and DP -28/AR-2018-19 for GM (P) North Peshawar/ Golen Gol Hydropower Project WAPDA
26.	Inquiry Report regarding DP-540 (Para No. 1.5.125) AR-2019-20 Annual Generation Loss due to Non-Operation of Unit No.1 of Gomal Zam Hydel Power Station – Rs. 336.78 Million

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

Sr. No.	Name of the Project
1.	PC-I for 220 kV Haripur Sub-Station.
2.	PC-I for Additional Source of Supply to 220 kV Jaranwala Sub-Station.
3.	PC-I for Village Electrification of 01 Scheme, District Lasbela.
4.	PC-I for Evacuation of Power from 330 MW Siddiqsons Coal Fired Power Plant at Thar (Revised).
5.	PC-I for Evacuation of Power from 660MW Lucky Electric Coal Fired Power Plant at Port Qasim.
6.	PC-I for 220 kV Kohat Sub-Station.
7.	PC-I for Provision of Electricity to Dhabeji SEZ (A priority project under CPEC).
8.	PC-I for 220 kV Gujranwala-II Sub-Station.
9.	PC-I for 220 kV Sialkot Sub-Station.
10.	PC-I for 220 kV Arifwala Sub-Station.

Sr. No.	Name of the Project
11.	PC-I for Conversion of LT Line into ABC Cable in Quetta.
12.	PC-I for Additional Source of Supply to 220 kV Jaranwala Sub-Station.
13.	PC-I for Electrification of 21 number Works for (13-Village Electrification and 08-Renovation/ Augmentation of District Mirpurkhas.
14.	PC-I for Electrification of 20 Villages of District Badin under Sustainable Development Goals Achievement Program / (SAP) for the Year 2019-20.
15.	PC-I for Electrification of 11 Villages of District Sanghar.
16.	PC-I for Electrification of 16 Villages of District Badin under Sustainable Development Goals Achievement Program / (SAP) for the Year 2019-20.
17.	PC-I for Electrification of 07 Villages of District Badin under Sustainable Development Goals Achievement Program / (SAP) for the Year 2019-20.
18.	PC-I for Electrification of 10 Villages of District Badin under Sustainable Development Goals Achievement Program / (SAP) for the Year 2019-20.
19.	PC-I for Electrification of 12 Villages of District Badin under Sustainable Development Goals Achievement Program / (SAP) for the year 2019-20.
20.	PC-I for Electrification of 14 Villages of District Sujawal under Pak MDGs Community Development Program.
21.	Revised PC-I for 220 kV GIS Sub-station Ghazi Road Lahore.
22.	PC-Is of Badin under SDGs Program.
23.	PC-Is of Mir Pur Khas under SDGs Program.
25.	PC-I for Construction of 132 kV D/C Khanozai-Pishin T/Line(60 KM) and 2 nd Circuit stringing of 132 kV Kalat-Surab T/Line under PSDP 2020-21.
26.	PC-Is of Projects Proposed in PSDP 2020-21.
27.	Re-Submission of PC-I for Provision of Electricity to Dhabeji Special Economic Zone SEZ (A priority project under CPEC).
29.	PC-I for 220 kV Quaid-E-Azam Business Park Gird Station for Provision of Electricity to PIEDMC Special Economic Zone (SEZ).
29.	PC-I for Provision of Electricity to 132 kV Grid at Bin Qasim Industrial Park.
30.	Construction of 132 kV Grid Station at Industrial Estate Bostan with Allied 132kV D/C Transmission Line (in & out Arrangement) (25 km).
31.	Construction of 132 kV (AIS) Grid Station at Deep Sea Port (Gwadar) and Allied 132 kV D/C Transmission Line (11 km).
32.	PC-I for Village Electrification of Village Lohi Haji Siddique Jamali in District Lasbela.
33.	PC-I for village electrification of 50 Schemes in District Khuzdar.
34.	PC-I for Additional Source of Supply to 220 kV Jaranwala Sub-Station.
35.	PC-I for Installation of ABC in Peshawar and Bannu Circle.
36.	PC-I for Evacuation of Power from 220/132 KV Grid Station, Swabi.
37.	PC-I for Village Electrification Lohi Haji Sidik Durgi, Lasbela.

Sr. No.	Name of the Project
38.	1 st Revised PC-I of Tranche-III (FESCO).
39.	PC-I for Conversion of LT line into ABC Cable in Khuzdar Circle.
40.	PC-I for Village Electrification of 50 Schemes in District Khuzdar.
41.	Request for Facility for Providing Electricity Facility of Following Villages of District Sanghar
42.	PC-I's of Three Projects Prepared by QESCO For Inclusion in PSDP 2021-22
43.	04 X PC-I's Under SDGS
44.	PC-I for Construction of 132 kV Grid Station Deep See for (Gwadar) and Allied 132 kV Double Circuit T/Line (11 kM)
45.	PC-Is of LESCO Development Project (STG, DOP & ELR)
46.	Revised PC-I for 500 kV Allama Iqbal Industrial City and 220 kV M-3 Industrial City Grid City for Supply of Power to Industrial Estate of FIEDMC
47.	Accelerated Development Plan for Southern Balochistan
48.	PC-I of Electrification of Different Villages of District Chaghi (QESCO)
49.	Submission of PC-Is of Projects Proposed in PSDP 2020-21 (400 villages of District T.T.Singh) FESCO
50.	Request of Facility for providing Electricity Facility of following Villages of District Mirpur Khas (HESCO)
51.	Request of Facility for providing Electricity Facility of following Villages of District Tharparkar (HESCO)
52.	Request of Facility for providing Electricity Facility of following Villages of District Sanghar (HESCO).
53.	Submission of PC-I for Electrification of 23 No. Schemes District Hyderabad (HESCO)
54.	PC-I for Secondary Transmission & Grid (STG) in respect of HESCO Hyderabad for Allocation of Funds as Grant/PSDP FY 2021-22
55.	PC-I for Rehabilitation of SEPCO Distribution System under Federal PSDP Special Funding and Secondary Transmission Lines & Grid Stations (STG).
56.	PC-I For Construction Of 132 Kv Grid Station At Dasht Balnagoor With Allied 132 KV SDT Mand-Balanagoor Transmission Line (80 KM)
57.	PC-I for Construction of 132 KV Grid Station Barthi Khas with Transmission Line District DG Khan
58.	Submission of PC-I for Electrification of Development Schemes under Sustainable Development Goals Achievement Programme (SAP) District Jacobabad
59.	New Gwadar International Airport Project (NGIAP) Construction of 132 KV Sub-Station NGIA Project
60.	Construction of 132KV Grid Station at Dosarkar Loralai (QESCO) with Allied 132 KV Double Circuit Transmission Line (05 KM) In & Out Arrangement).
61.	Construction of 132KV Grid Station at Zar Karriz Loralai (QESCO) with Allied 132 KV Double Circuit Transmission Line (06 KM) In & Out Arrangement.
62.	PC-I of Electricity Distribution Efficiency Improvement Project under World Bank Loan (PESCO).

Sr. No.	Name of the Project
63.	PC-I of Electricity Distribution Efficiency Improvement Project under World Bank Loan (HESCO).
64.	PC-I of Electricity Distribution Efficiency Improvement Project under World Bank Loan (MEPCO).
65.	Umbrella PC-I Electricity Distribution Efficiency Improvement Project (Under World Bank Financing).
66.	Revised PC-I for Construction of LT line into ABC Works in Khuzdar City.
67.	PC-II for Consultancy Services for Feasibility Study for Conversion of Commissioned Imported Coal Based Power Projects to Thar Coal.
68.	PC-I for 7 th Secondary T/Line and Grid Station (STG) Project 2022-23 to 2026-27

Table 4.5: Miscellaneous Matters dealt by Power Wing

Sr. No.	Miscellaneous Matters
1.	PC-I for Industrial Energy Efficiency Initiatives to Supplement Sustainable Energy for all (SE4ALL).
2.	PC-I for Building Sector Energy Efficiency Initiatives.
3.	PC-I for Establishment of National Electric Vehicle Research Centre (NEVRC).
4.	Comments on Policy Paper on Integrated Energy Planning (IEP) –Electric Vehicle Analysis.
5.	Comments on Policy Paper on Modeling the Impact of Pakistan’s National Electric Vehicle Policy.
6.	Comments on Policy Paper on Options to Catalyze an Electric Vehicle Market in Pakistan.
7.	Annual Report of Office of CEA/CFFC.
8.	Material for the Finance Ministry’s Budget Speech 2020-21.
9.	Audit Programme for Statutory Audit of Accounts up to the Financial Year 2019-20.
10.	Performance Agreement 2020.
11.	Establishment of Independent System of Market Operator (ISMO)
12.	PC-Is of Projects Proposed by NEECA
13.	Non-Cash Settlement for Power Sector Relent Loans against Subsidies payable by Government of Pakistan
14.	Installation of Solar Irrigation Tubewells in District Nowshera (PSDP 2021-22)
15.	Adherence to Rules of Business, 1973 and Secretariat Instructions, 2004, Recommendations of Broadsheet Inquiry Commission.
16.	Year Book 2017-2018 & 2020-2021



ADMINISTRATION & 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.

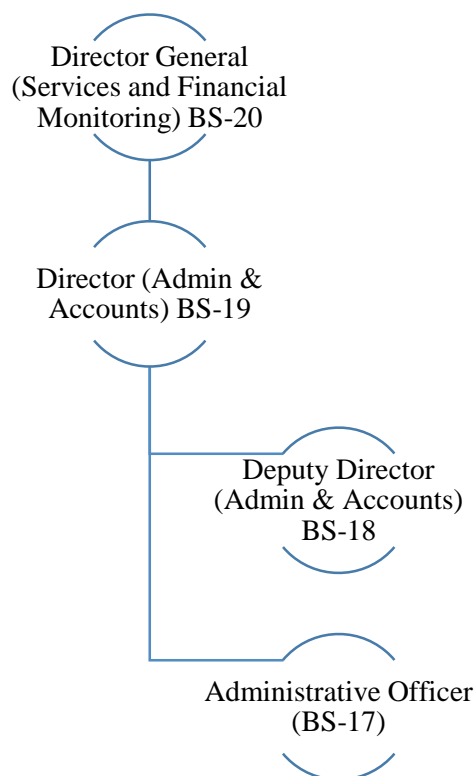


Figure 5.1: Organogram of Admin & Accounts Wing

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 2021

- i. **Requisition to FPSC**
 - Following requisitions have been forwarded to the FPSC through Ministry of Water Resources for initial recruitment which is in process of advertisement. Beside this, requisition for filling up vacant posts of Social Mobilizer (BS-18), Assistant Librarian (BS-16), APS (BS-16) and Sub-Engineer (BS-16) have also been recently forwarded to the FPSC for its publication in the press.
- ii. **Revision in Recruitment Rules.**
 - The revision in Recruitment Rules of certain technical posts were taken up with the Establishment Division out which the rules for 12 posts were got revised for the posts of Computer Operator (BS-16) and programmer (BS-17) has been taken up with the Establishment Division through Ministry of Water Resources.
- iii. **Promotion during the year of 2021.**
 - Nine (09) posts of officers and Eight (08) posts of officials have been filled through process of Promotion during the year 2021.
- iv. **Recruitment Process**
 - Ten (10) posts of officials were filled through initial appointment after obtaining of NOC from Establishment Division. NOC for the filling up the vacant Eight (08) posts in BS-14 and below have been obtained from Establishment Division. The Recruitment process is in progress.
- v. **Budget and Accounts**
 - Clearance of the pending claims from office of the AGPR, Islamabad.
 - Enhancement of 7.82% in the budget allocation from Rs.143.766 million (Financial Year 2020-21) to Rs. 155.00 million (Financial Year 2021-22).

vi. **Promotions of different Cadres:-**

Sr.#	Name & Designation	Promoted as
1.	Dr. Qazi Tallat Mehmood Siddiqui, DEA (Civil),BS-19	Chief Engineer(DSC),BS-20
2.	Mr. Abdul Hafeez, Supdt (BS-16)	Supdt. (BS-17)
3.	Mr. Muhammad Farooq, Supdt (BS-16)	Supdt. (BS-17)
4.	Mr. Ashfaq Ahmed Farooqi, APS (BS-16)	Private Secretary (BS-17)
5.	Mr. Sibtain Raza, Assistant(BS-16)	Supdt. (BS-16)
6.	Mr. M. Amin, Stenotypist(BS-14)	APS(BS-16)
7.	Mr. Faisal Khalid, Stenotypist(BS-14)	-Do-
8.	Mr. Babar Khan, Stenotypist(BS-14)	-Do-
9.	Mr. Fayaz Hussain, Sub. Engineer (BS-11)	Sub-Engineer (BS-16)
10.	Mr. Yousaf Bashir, UDC(BS-11)	Assistant(BS-15)
11.	Mr. Asif Ali Shigri, Draughtsman(BS-11)	Head Draughtsman(BS-13)
12.	Mr. Naseer Ahmed, LDC(BS-09)	UDC(BS-11)
13.	Mr. Saqib Bashir, Naib Qasid(BS-01)	LDC(BS-09)
14.	Mr. Zain-ul-Abidin, Naib Qasid(BS-01)	LDC(BS-09)
15.	Mr. Musaddiq Riaz, Feroprinter(BS-04)	Tracer(BS-05)
16.	Mr. Raidullah Khan, Naib Qasid (BS-03)	Daftari (BS-03)
17.	Mr. Muhammad Aleem, Naib Qasid (BS-03)	Qasid (BS-03)

vii. **Fresh Recruitment on Vacant Posts in BS 15 and below:-**

Sr. #	Name of official	Post with BPS	Regional Quota
1.	Mr. Jahan Zaib	Assistant(BS-15)	Punjab
2.	Mr. M. Mohsin	Stenotypist(BS-14)	Punjab
3.	Mr. Adnan Haider	Sub Engineer(BS-11)	Punjab
4.	Mr. Aqib Bashir	Feroprinter(BS-04)	Islamabad
5.	Mr. Umair Nasim	Driver(BS-04)	Islamabad
6.	Mr.M. Umar Munir	Naib Qasid(BS-01)	Islamabad
7.	Mr.M. Munib	Naib Qasid(BS-01)	Islamabad
8.	Mr. Usman H. Shah	Naib Qasid(BS-01)	Islamabad
9.	Mr. Ahmed Ishaque	Naib Qasid(BS-01)	Islamabad
10.	Mr.M. Ramzan	Chowkidar (BS-01)	Islamabad

viii. **Pension and other related Payment made to Retired/Widows of Deceased Officers/Officials**

Sr.#	Name of deceased employee	Name of Beneficiary of the payment	Relationship with deceased employee	Remarks
1.	Dr. Zia Ahmed, Ex. Engg. Advisor (P) BS-20	Self	N/A	Pension & other emolument had been made.
2.	Malik Imtiaz Farooq, Ex-Social Mobilizer (BS-18)	Self	N/A	-Do-
3.	Mr. Burhan-ud-Din, Ex-Asstt. Librarian(BS-16)	Self	N/A	-Do-
4.	Mr. Fateh Sher, Ex-Head Draughtsman (BS-13)	Self	N/A	-Do-
5.	Mr. Kabir Ahmed, Ex-Driver	Self	N/A	-Do-



INSTITUTIONAL STRENGTHENING AND CAPACITY BUILDING

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

6. INSTITUTIONAL STRENGTHENING AND CAPACITY BUILDING

6.1. 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 Ministry of Water Resources 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;
- (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, KP & Balochistan for Engineers working in Provincial Departments besides by the Pakistan Railways;
- (viii) On the above issue, official request of O/o CEA & CFFC is pending with Ministry of Water Resources since February 2019 for want of action.

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) 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 set up of Ministry of Water Resources including Minister's Secretariat, Office of PCIW besides the contract staff of WCAP Project has been housed in the Office Building Complex of O/o of CEA & CFFC.

Presently, except for recently made mandatory training (MCMC and SMC) there had been and 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 unlimited 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 owing to some of the staff placed under Ministry of Water Resources, 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 modelling, real time simulation of flood water in the hill torrents/ rivers across the country). To this effect, a most recent proposal stands submitted to Ministry of Water Resources on December 13, 2019 for strengthening/ restructuring of the organization.

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. Besides, contribution of technical services to Ministry of Water Resources shall be much enhanced, as a principal advisory authority to Ministry of Water Resources, without raising a new parallel technical directorate in Ministry of Water Resources. 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 FPSC, 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.

6.2. 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 KP for Engineers working in Provincial Departments;
- (iv) Revision in the recruitment rules for a better career path to the Engineers working in the organization;
- (v) Filling in of all vacant gazetted & Non gazetted posts on immediate basis;
- (vi) Sufficient logistic support (Latest related software, equipment, vehicles for senior officers and transport for pick & drop facility);
- (vii) Creation of Authority for more empowerment i.e. Establishment of National Engineering Advisory & Flood Management Authority (NEFMA) needs to be relooked into;
- (viii) On the job, short as well as long term local and foreign trainings including degree oriented courses 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 (2021-22)
- II. Major Rivers Flow Data of Monsoon Season 2021
- III. Major Rivers Flow Hydrograph of Monsoon Season 2021
- IV. Monthly Rainfall Data (July-September 2021) (Source: PMD)
- V. Escapages below Kotri Barrage (Source: IRSA)

**SCHEMES TO BE EXECUTED
UNDER NORMAL/ EMERGENT FLOOD
PROGRAMME DURING F.Y (2021-22)**

**List of Schemes Proposed to be Executed Under Normal/ Emergent Flood Programme During
Financial Year (2021-22)**

(Rs. Million)

Sr. No.	Name of the Scheme	Estimated Cost (Rs. Million)	Status of Approval
I.	<u>Punjab</u>		
1.	Checking erosive action of River Chenab at RD 31+000 of Massan Flood bund at RD 6+300 of J-Head Spur No. 1, District Jhang- (Sargodha Zone)	71.900	Un- Approved
2.	Construction of Diversion structures on River Jhelum near Gaga Village Tehsil Bhera District Sargodha (Sargodha Zone)	75.765	Un- Approved
3.	Raising and & Strengthening of Jampur Flood Bund Right Side of River Indus in District Rajanpur – (D.G. Khan Zone)	160.00	Un-Approved
4.	Construction of J-Head Spur along left bank upstream existing stone stud at RD 13+000 of River Indus District Muzaffargarh (D.G. Khan Zone)	170.000 Un- Approved	Un- Approved
5.	Management of Disposal of Sori Janubi Hill Torrent Flood Water from Kachi Canal to Railway Pul Grang to River Indus District Rajanpur (D.G. Khan Zone)	127.000	Un-Approved
6.	Rehabilitation of Flood Embankment along Fateh Muhammad Disty. From RD 0+000 to RD 86+600 of River Sutlej District Kasur & Okara (Lahore Zone)	70.335	Un- Approved
Sub-Total (Punjab)		675.00	
II	<u>Sindh</u>		
1.	Earth work Strengthening of S.M Bund Mile 80/0 to 123/0 (Different Reaches) Shaheed Benazirabad Division.	400.552	Un- Approved
2.	Providing Stone Apron, Stone Pitching L. S Bund Mile 16/7 to 17/2 in Northern Dadu Division.	150.638	Approved
3.	Strengthening & Widening of Stone Apron of Main Bund, T-Head Spur & J-Spur of MS Bund at Munarki Point from Mile 43/2 to 44/2+560, Lower Pinyari Division.	90.371	Un- Approved
Sub-Total (Sindh)		641.561	
III	<u>Khyber Pakhtunkhwa</u>		
1.	Construction of Flood Protection Structures along Swat River and its tributaries in Tehsil Matta & Khwaza Khaila, District Swat.	149.030	Approved
2.	Construction of Flood Protection Work at Muqam Nullah for Protection of Abadies & Agriculture Land Mohallah Peer Khel, U/C Shahbaz Garhi, District Mardan.	15.00	Un-Approved
Sub-Total (Khyber Pakhtunkhwa)		164.03	
IV	<u>Balochistan</u>		
1.	Construction of Flood Protection Bund in Gresha	20.00	Un- Approved

Sr. No.	Name of the Scheme	Estimated Cost (Rs. Million)	Status of Approval
	Area Tehsil Nal, District Khuzdar		
2.	Construction of flood protection scheme Sari Kauran Washaab, District Panjgoor	20.00	Un- Approved
3.	Raising Strengthening & Stone Pitching of Flood Protection Bund Saifabad village, District Jhal Magsi	7.500	Un- Approved
4.	Construction of flood protection bund for right side of Killi Mir Gahwar Khan Khaliq Abad Mangochar.	2.000	The scheme was Dropped by the Scrutinizing Committee in its meeting held on 25th October 2021.
5.	Construction of flood protection of Umaidabad Durraigi area, District Lasbella.	22.50	Un- Approved
6.	Construction of flood protection bund for agriculture land of Honuk Shahbug Kerichi area, District Washuk.	2.50	The scheme was Dropped by the Scrutinizing Committee in its meeting held on 25th October 2021.
7.	Flood protection scheme Taimark Manda, near Killi Malik Yar, District Pishin.	3.00	Un- Approved
8.	Flood protection of Killi Mulvi Abdul Rehman Shah near Spin Masjid, District Loralai	3.50	
9.	Construction of flood protection wall at Ziarat Town Killi Haji Amanullah Khan near Ziarat Football Stadium, District Ziarat	3.50	Un- Approved
10.	Construction of flood protection for agriculture land Killi Malak Umer Gul Sara Kalla Khost area, District Harnai.	3.00	Un- Approved
11.	Construction of Flood Protection Wall for Killi Sardaran Jangal Bandat Moza Ahmadoon District Ziarat	3.00	Un- Approved
12.	Construction of flood channel for Graveyard and houses Khanezai Aghbarg area, District Quetta.	4.00	Un- Approved
13.	Construction of flood protection wall for agriculture land at left side of Dhola Nadi Phullan Wala area, Basti Chohar Khot, District Barakan.	10.00	Un- Approved
14.	Construction of flood protection Gabion wall for Killi Amir Hamza in Hanna area, District Quetta.	5.00	Un- Approved
15.	Construction of flood protection wall for Killi Faizabad Sharan u/c Murgha, District Pishin.	2.00	Un- Approved
16.	Construction of flood protection wall for Killi Nadir Abdul Rehmanzai, District Killa Abdullah.	2.00	Un- Approved
17.	Construction of flood protection wall for Killi Ghuttai, District Killa Saifullah	2.500	Un- Approved
18.	Construction & Restoration Of Dhana Sadhori Protection Diversion Bund Tehsil Lakhra District	10.00	<ul style="list-style-type: none"> The scheme has been implemented

Sr. No.	Name of the Scheme	Estimated Cost (Rs. Million)	Status of Approval
	Lasbella		by PID Balochistan through its provincial resources. <ul style="list-style-type: none"> • PID Balochistan would propose other scheme in replacement of the scheme
Sub-Total (Balochistan)		126.00	
V	<u>Gilgit-Baltistan</u>		
1.	Construction of Flood protective Work at Barmas Area, Gilgit	17.000	The scheme was considered in S.C of FFC meeting held on 8th December 2021 and deferred.
2.	Construction of Flood Protective Work at Thing Bala Astore	3.500	Un- Approved
3.	Construction of Flood Protective Work for RCC Bridge Shahra-e-Quaid-e- Azam and Serena Road	10.000	
Sub-Total (Gilgit-Baltistan)		30.50	
VI	<u>Merged Areas</u>		
1.	Construction of Flood Protection Bund at Down Stream of Kochi Bridge in Lower Kurram on left Side of Kurram River.	40.434	Differed by DDWP of MoWR
Sub-Total (Merged Areas)		40.434	
VII	<u>AJ&K</u>		
1.	Construction of flood protection structure/ wall along right and left bank of Parak Nullah and spur on right bank of River Jhelum	20.000	Un- Approved
Sub-Total (AJ&K)		20.00	
Grand Total (I+II+III+IV+V+VI+VII)		1567.349	

Appendix-II

**MAJOR RIVERS FLOW DATA OF
MONSOON SEASON 2021**

RIVER INDUS FLOW DATA FOR JULY 2021 (INCLUDING KABUL AT NOWSHERA)

Date	Time	Indus			Kabul	Indus						
		Tarbela			Nowshera	Kalabagh		Chashma			Taunsa	
		Reservoir Level	U/S	D/S	Flow	U/S	D/S	Reservoir Level	U/S	D/S	U/S	D/S
1-Jul-21	0600	1430.91	129300	130800	34600	157400	151400	644.60	177500	177500	180200	151800
2-Jul-21	0600	1432.05	144800	130100	35500	156400	150400	644.60	176400	176400	166900	140600
3-Jul-21	0600	1434.06	155900	130600	39900	164500	158500	643.30	166300	166300	157000	138300
4-Jul-21	0600	1435.59	151600	132100	36200	167500	161500	641.80	166200	166200	161000	142400
5-Jul-21	0600	1436.54	144900	132500	35500	156700	150700	641.80	174600	174600	162200	144000
6-Jul-21	0600	1436.80	136600	132600	40300	162500	156500	641.40	170900	170900	166600	148000
7-Jul-21	0600	1436.36	132100	132500	38200	166400	160400	640.80	169300	169300	162400	144100
8-Jul-21	0600	1436.70	133300	132500	39000	156400	150400	641.40	174900	174900	158100	140400
9-Jul-21	0600	1437.16	140400	134000	34300	157400	151400	641.80	173300	173300	158000	140300
10-Jul-21	0600	1437.20	156800	155500	36200	167400	151200	643.00	181600	181600	158000	140300
11-Jul-21	0600	1438.45	171100	155000	40300	186800	180800	643.20	181800	181800	156400	138800
12-Jul-21	0600	1440.75	184300	155000	36800	178000	172000	644.90	199700	199700	154800	137400
13-Jul-21	0600	1445.13	211700	155000	51200	187800	180800	644.80	193400	193400	166400	147700
14-Jul-21	0600	1450.44	226700	155000	63600	187900	179900	645.50	210800	210800	162200	144000
15-Jul-21	0600	1454.65	239400	155000	61000	167900	160400	646.90	221500	221500	176600	156800
16-Jul-21	0600	1457.68	206000	140000	52800	197500	190000	647.40	209500	209500	177800	157900
17-Jul-21	0600	1458.82	183400	160000	46600	189300	181800	648.20	225400	225400	185700	162300
21-Jul-21	0600	1460.44	183300	150000	45900	196800	191000	647.60	207000	207000	185700	162300
21-Jul-21	0600	1464.58	221000	135000	48700	188600	182800	645.20	201400	201400	187100	163600
21-Jul-21	0600	1470.21	251700	135000	60600	210900	205900	642.70	215700	215700	193200	163800
21-Jul-21	0600	1476.86	275900	135000	86800	225600	221600	642.00	242100	247100	196600	168500
22-Jul-21	0600	1483.38	276100	135000	87400	191600	187600	643.80	247200	247200	208600	181200
23-Jul-21	0600	1487.91	234800	135000	67200	184400	179400	646.40	234900	234900	215400	186300
24-Jul-21	0600	1490.58	194900	135000	48400	169400	163200	647.90	215200	215200	226700	197300
25-Jul-21	0600	1492.36	176400	135000	47500	177500	170400	648.20	195800	195800	195100	165700
26-Jul-21	0600	1494.24	178600	135000	36200	167100	159600	647.70	185600	185600	180000	159100
27-Jul-21	0600	1497.60	212400	135000	37400	167100	159600	646.70	181000	180000	172300	151000
28-Jul-21	0600	1502.36	263200	150000	47600	170900	163400	643.80	169800	195000	172300	151300
29-Jul-21	0600	1507.36	309600	186500	70900	223300	216800	640.00	189100	212400	172100	151500
30-Jul-21	0600	1512.36	333400	208100	72800	266300	259800	639.50	275800	270000	185800	164700
31-Jul-21	0600	1517.36	348000	220200	67900	296900	290400	639.50	297900	289100	193300	171800

Date	Indus						Jhelum				
	Guddu		Sukkar		Kotri		Mangla			Rasul	
	U/S	D/S	U/S	D/S	U/S	D/S	Reservoir Level (Ft)	U/S	D/S	U/S	D/S
1-Jul-21	133300	98000	88600	36600	42400	1600	1152.95	42600	50000	37600	15800
2-Jul-21	134000	98200	88600	36600	42400	1600	1153.15	44300	40000	34400	11900
3-Jul-21	129100	94400	88600	36600	40900	1100	1153.80	43800	30000	29900	8000
4-Jul-21	117100	85600	86300	35000	39500	800	1154.45	44300	30000	27300	5300
5-Jul-21	117100	85600	80600	31000	38800	800	1154.55	42100	40000	33800	11900
6-Jul-21	116400	85300	78100	29200	36300	800	1154.50	38900	40000	37700	15800
7-Jul-21	117800	85500	78000	30200	34600	800	1154.35	36800	40000	37700	15800
8-Jul-21	121300	86600	78000	30200	32500	500	1154.20	36800	40000	37700	15800
9-Jul-21	123100	87300	78700	30400	32500	500	1154.15	38900	40000	27300	5300
10-Jul-21	119900	85600	79400	30600	32000	500	1154.40	40300	35000	37700	15800
11-Jul-21	116800	83700	79400	30600	29500	500	1155.30	44100	25000	33400	11900
12-Jul-21	116800	83700	77800	30100	27900	500	1156.55	46300	19700	22500	11900
13-Jul-21	114000	81000	77700	30100	28100	500	1158.75	56800	10000	9600	NIL
14-Jul-21	113400	81000	77700	30100	27400	500	1161.00	60100	10000	8200	NIL
15-Jul-21	113400	81000	77600	30100	26000	500	1162.80	52800	10000	8100	NIL
16-Jul-21	121200	84400	77600	30100	25600	500	1164.25	44100	10000	7200	NIL
17-Jul-21	130900	90200	80000	33600	25200	500	1165.60	41800	10000	2400	NIL
21-Jul-21	137500	95000	86100	35600	25300	500	1166.90	40600	10000	6800	NIL
21-Jul-21	138200	95000	91900	37400	24400	500	1168.30	42900	10000	7200	NIL
21-Jul-21	138500	95000	94400	39100	24500	500	1170.20	55100	10000	8200	NIL
21-Jul-21	154300	112100	94400	40100	24500	500	1172.65	73000	10000	8600	NIL
22-Jul-21	163600	121500	106500	50700	24500	500	1174.45	56300	10000	9100	NIL
23-Jul-21	177200	134700	110700	54600	25400	500	1176.25	56300	10000	7800	NIL
24-Jul-21	181300	138100	117300	62000	27900	500	1177.70	47300	10000	3700	NIL
25-Jul-21	201900	158700	122100	65900	29900	500	1179.00	43400	10000	6800	NIL
26-Jul-21	186300	142600	133100	76600	34600	500	1180.45	48300	10000	6800	NIL
27-Jul-21	164900	121200	126800	70300	37600	600	1182.15	57600	10000	10000	NIL
28-Jul-21	160900	118400	112000	56200	43600	3200	1183.60	50600	10000	7400	NIL
29-Jul-21	155100	112600	107700	51800	49200	9800	1186.15	81400	10000	9700	NIL
30-Jul-21	152900	111100	101000	46700	55900	17800	1187.60	50600	10000	9700	NIL
31-Jul-21	148500	107900	100100	45800	63000	25700	1189.15	53400	10000	3800	NIL

Discharge in Cusec

Date	Time	Indus			Kabul	Indus						
		Tarbela			Nowshera	Kalabagh		Chashma			Taunsa	
		Reservoir Level	U/S	D/S	Flow	U/S	D/S	Reservoir Level	U/S	D/S	U/S	D/S
1-Jul-21	0600	1430.91	129300	130800	34600	157400	151400	644.60	177500	177500	180200	151800
2-Jul-21	0600	1432.05	144800	130100	35500	156400	150400	644.60	176400	176400	166900	140600
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4-Jul-21	0600	1435.59	151600	132100	36200	167500	161500	641.80	166200	166200	161000	142400
5-Jul-21	0600	1436.54	144900	132500	35500	156700	150700	641.80	174600	174600	162200	144000
6-Jul-21	0600	1436.80	136600	132600	40300	162500	156500	641.40	170900	170900	166600	148000
7-Jul-21	0600	1436.36	132100	132500	38200	166400	160400	640.80	169300	169300	162400	144100
8-Jul-21	0600	1436.70	133300	132500	39000	156400	150400	641.40	174900	174900	158100	140400
9-Jul-21	0600	1437.16	140400	134000	34300	157400	151400	641.80	173300	173300	158000	140300
10-Jul-21	0600	1437.20	156800	155500	36200	167400	151200	643.00	181600	181600	158000	140300
11-Jul-21	0600	1438.45	171100	155000	40300	186800	180800	643.20	181800	181800	156400	138800
12-Jul-21	0600	1440.75	184300	155000	36800	178000	172000	644.90	199700	199700	154800	137400
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16-Jul-21	0600	1457.68	206000	140000	52800	197500	190000	647.40	209500	209500	177800	157900
17-Jul-21	0600	1458.82	183400	160000	46600	189300	181800	648.20	225400	225400	185700	162300
21-Jul-21	0600	1460.44	183300	150000	45900	196800	191000	647.60	207000	207000	185700	162300
21-Jul-21	0600	1464.58	221000	135000	48700	188600	182800	645.20	201400	201400	187100	163600
21-Jul-21	0600	1470.21	251700	135000	60600	210900	205900	642.70	215700	215700	193200	163800
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25-Jul-21	0600	1492.36	176400	135000	47500	177500	170400	648.20	195800	195800	195100	165700
26-Jul-21	0600	1494.24	178600	135000	36200	167100	159600	647.70	185600	185600	180000	159100
27-Jul-21	0600	1497.60	212400	135000	37400	167100	159600	646.70	181000	180000	172300	151000
28-Jul-21	0600	1502.36	263200	150000	47600	170900	163400	643.80	169800	195000	172300	151300
29-Jul-21	0600	1507.36	309600	186500	70900	223300	216800	640.00	189100	212400	172100	151500
30-Jul-21	0600	1512.36	333400	208100	72800	266300	259800	639.50	275800	270000	185800	164700
31-Jul-21	0600	1517.36	348000	220200	67900	296900	290400	639.50	297900	289100	193300	171800

DATE	CHENAB								RAVI			
	MARALA		KHANKI		QADIRABAD		TRIMMU		PANJNAD		BALLOKI	
	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S
1-Jul-21	58400	25600	10500	2800	32600	12600	19900	3500	10200	NIL	30400	1800
2-Jul-21	67100	34000	25300	17400	37800	17800	23300	7000	10400	NIL	33900	4800
3-Jul-21	59000	25600	27300	19500	43100	23100	26700	10500	8700	NIL	33800	4800
4-Jul-21	50900	17200	27300	19500	45800	25800	27700	11500	9000	NIL	34200	5900
5-Jul-21	51100	17200	13400	5600	31000	11000	29000	12600	8700	NIL	34500	5300
6-Jul-21	51100	17200	12500	4700	28300	8300	30200	13800	11000	NIL	34100	3900
7-Jul-21	55300	21400	18400	10500	32200	12200	26300	9800	10100	NIL	32200	3000
8-Jul-21	55300	21400	23100	15200	34900	14900	25200	8600	10600	NIL	34600	5300
9-Jul-21	55300	21400	23100	15200	38800	18800	26300	9500	11800	NIL	35200	5900
10-Jul-21	67900	34000	29600	21600	38800	18800	26300	9500	11800	NIL	34000	4800
11-Jul-21	79700	45800	33700	25700	48000	28000	27600	10800	12700	NIL	34600	5300
12-Jul-21	88900	55000	40200	32900	50600	30600	28600	11900	11500	NIL	35500	6500
13-Jul-21	99600	73100	91400	84400	73100	53100	32900	16600	11100	NIL	36300	7700
14-Jul-21	87700	54100	76800	69500	85100	65100	34200	17700	10700	NIL	39800	11200
15-Jul-21	67700	34000	41900	34600	44000	24000	38400	22100	11500	NIL	46000	1700
16-Jul-21	50900	17200	31100	23700	37200	17200	62600	46000	11100	NIL	43300	14200
21-Jul-21	59300	25600	22700	15200	18000		52700	36100	11500	NIL	39800	10600
21-Jul-21	80300	46500	31100	23700	25500	5500	35900	19300	12200	NIL	36800	7600
21-Jul-21	88500	54100	42300	34600	38100	18100	25900	9300	13800	NIL	34500	5300
21-Jul-21	95900	61900	52000	44700	53300	33200	23500	6900	20800	6000	34500	5300
21-Jul-21	108500	81700	135600	129600	98400	78400	30400	14200	25100	10500	40500	13800
22-Jul-21	79000	54300	81400	75600	90800	70800	38200	21900	23600	8900	49700	23000
23-Jul-21	61700	34000	53800	48100	57100	37100	104400	88200	19800	4700	60900	32200
24-Jul-21	54200	21400	32000	25700	29500	9500	73400	57100	15900	800	52700	23500
25-Jul-21	62900	29800	34300	27400	26900	6900	54900	38500	15600	NIL	41800	13600
26-Jul-21	87300	54100	51600	44700	38900	18900	41500	25100	37800	22200	39400	11200
27-Jul-21	107100	73800	99100	93000	96100	76100	29400	13000	47300	31600	39600	11200
28-Jul-21	107300	74100	78800	72600	81300	61300	27000	10600	43500	27900	39000	10300
29-Jul-21	193800	171200	164300	158500	164900	144900	45100	28700	39500	23900	46300	18000
30-Jul-21	98200	75600	102200	95900	113900	93900	69300	53000	31400	15700	52900	24200
31-Jul-21	105600	90900	119400	112600	86100	66100	123200	106900	27800	12200	53500	25100

DATE	SUTLEJ						LINKS/ CANAL				SKARDU	
	SIDHNAI		SULEMANKI		ISLAM		C.J	CRBC	Q.B	T.P	Temperature °C	
	U/S	D/S	U/S	D/S	U/S	D/S	Flow	Flow	Flow	Flow	Max	Min
1-Jul-21	15000	NIL	13300	2000	500	NIL	5000	4600	20000	NIL	31.7	20.0
2-Jul-21	15400	NIL	13800	2000	500	NIL	5000	4600	20000	NIL	30.6	18.9
3-Jul-21	14700	NIL	14100	2000	500	NIL	5000	4600	20000	NIL	30.0	17.8
4-Jul-21	15000	NIL	13700	2000	500	NIL	5000	4600	20000	NIL	29.4	18.3
5-Jul-21	14300	NIL	13900	2000	500	NIL	5000	4600	20000	NIL	27.8	17.2
6-Jul-21	15000	NIL	14000	2000	500	NIL	5000	4600	20000	NIL	26.7	17.8
7-Jul-21	15900	NIL	14500	2700	500	NIL	5000	4600	20000	NIL	27.2	18.3
8-Jul-21	16400	NIL	14600	2900	1200	NIL	5000	4600	20000	NIL	28.3	15.6
9-Jul-21	16500	NIL	14900	2900	1200	NIL	5000	4600	20000	NIL	29.4	16.7
10-Jul-21	15900	NIL	14800	2900	1700	NIL	5000	4600	20000	NIL	30.6	17.8
11-Jul-21	14400	NIL	14900	3100	1700	NIL	5000	4600	20000	NIL	31.1	18.3
12-Jul-21	15100	NIL	14700	3200	1700	NIL	5000	4600	20000	NIL	31.7	18.9
13-Jul-21	15800	13000	15200	3800	1700	NIL	5000	4600	20000	NIL	32.8	17.8
14-Jul-21	15900	700	14700	3000	1800	NIL	2000	4600	20000	NIL	31.7	18.3
15-Jul-21	14200	NIL	15000	3400	1800	NIL	2000	4600	20000	NIL	30.6	16.7
16-Jul-21	16700	300	14600	2600	200	NIL	2000	4600	20000	NIL	28.3	17.2
17-Jul-21	20100	3300	14600	2600	1600	NIL	5800	4600	20000	NIL	32.8	16.1
21-Jul-21	21500	5300	14900	2900	1200	NIL	15100	4600	20000	NIL	32.2	15.6
21-Jul-21	22700	6600	14700	2600	1200	NIL	18300	4600	20000	NIL	33.3	16.7
21-Jul-21	18700	2600	15200	3200	1200	NIL	NIL	NIL	20000	NIL	30.4	16.0
21-Jul-21	17000	1300	14700	3800	1900	NIL	10000	4000	20000	NIL	29.4	14.4
22-Jul-21	17500	1300	14000	3200	2500	1300	NIL	NIL	20000	NIL	28.9	13.9
23-Jul-21	20800	4000	14100	2600	2500	1300	NIL	NIL	20000	NIL	NR	NR
24-Jul-21	24800	7800	14300	2600	2000	800	2100	4500	20000	NIL	28.6	16.3
25-Jul-21	25600	9100	15400	3600	2000	800	4000	4600	20000	NIL	NR	NR
26-Jul-21	27600	11700	14300	2300	2000	800	16300	4600	20000	NIL	31.7	18.3
27-Jul-21	28700	12900	14500	2300	2000	800	12500	4600	20000	NIL	35.6	18.9
28-Jul-21	28200	12400	14500	2300	2000	800	10000	4600	20000	NIL	36.1	21.1
29-Jul-21	24600	8500	14900	2300	2000	900	6600	4300	20000	NIL	34.4	18.9
30-Jul-21	24500	8400	14800	2300	2000	800	5000	3800	20000	NIL	31.1	16.7
31-Jul-21	24500	9300	14800	2300	2000	800	5000	3800	20000	NIL	31.7	15.6

Discharge in Cusec

DATE	TIME	INDUS			Kabul	INDUS						
		TARBELA			Nowshera	KALABAGH		CHASHMA			TAUNSA	
		Reservoir Level (Ft)	U/S	D/S	Flow	U/S	D/S	Reservoir Level (Ft)	U/S	D/S	U/S	D/S
1-Aug-21	0600	1521.00	334700	240800	77400	271000	264500	639.50	334700	325900	276100	246600
2-Aug-21	0600	1524.00	314500	234500	70300	278600	272100	639.50	323000	314200	305300	275800
3-Aug-21	0600	1527.00	302300	222100	70100	269100	262600	639.50	340400	323400	318300	294800
4-Aug-21	0600	1530.00	276700	196500	56100	263000	256500	639.50	311500	303200	327600	304100
5-Aug-21	0600	1532.00	252700	196600	52700	225800	219300	640.70	280400	262700	330000	306500
6-Aug-21	0600	1534.00	222300	166200	47200	205800	199300	643.00	261100	228900	313000	289500
7-Aug-21	0600	1536.00	204600	148500	49000	195500	189000	644.60	222300	190000	268700	245400
8-Aug-21	0600	1538.00	193100	137000	40500	157600	151100	645.50	215800	190000	268700	245400
9-Aug-21	0600	1540.00	173100	117000	39100	138200	131700	645.00	186700	180000	190700	167400
10-Aug-21	0600	1541.00	162200	132600	38800	149100	142600	643.70	168400	170000	185900	163400
11-Aug-21	0600	1541.00	165100	160000	33200	146200	139700	642.60	167600	166000	180300	168700
12-Aug-21	0600	1541.12	157200	160000	33900	152400	145400	643.40	184500	166000	169200	149100
13-Aug-21	0600	1541.20	163000	160000	35200	186200	179200	645.60	203200	166000	169200	149100
14-Aug-21	0600	1542.03	169600	145000	37500	186500	179000	646.90	196200	166000	159300	131300
15-Aug-21	0600	1543.41	170500	130000	36800	176400	168900	647.20	181400	166000	160800	132100
16-Aug-21	0600	1544.87	172800	130000	42500	158600	151100	647.40	188700	175000	161200	133400
17-Aug-21	0600	1545.58	151200	130000	32700	156100	148300	646.80	173000	175000	168300	139500
21-Aug-21	0600	1544.74	131500	155000	27700	144400	136600	646.50	176100	170000	160900	133400
21-Aug-21	0600	1543.40	117200	155000	27300	176200	168400	645.70	172000	170000	186400	170400
21-Aug-21	0600	1541.99	151100	155000	27900	177300	169300	646.60	198800	170000	168500	140700
21-Aug-21	0600	1542.11	119300	115000	22900	176300	169300	648.40	192100	140000	163200	140800
22-Aug-21	0600	1542.95	125000	100000	21000	137700	130700	648.50	157100	140000	146200	140800
23-Aug-21	0600	1543.92	128800	100000	19200	106200	99200	647.30	127400	140000	135500	126100
24-Aug-21	0600	1544.15	132400	125000	18000	117600	110600	645.30	121800	140000	135500	115800
25-Aug-21	0600	1544.37	137100	130000	17400	138700	131700	644.60	145400	140000	135500	115800
26-Aug-21	0600	1544.58	149200	142300	15800	140600	133600	643.20	150200	152000	135500	115800
27-Aug-21	0600	1544.67	168400	165000	16000	189300	182200	641.90	153300	152000	135500	115800
28-Aug-21	0600	1545.32	184500	165000	17700	183200	176200	641.80	177700	164000	135500	115800
29-Aug-21	0600	1546.48	191300	156500	18400	173100	166100	642.60	186500	164000	145700	126100
30-Aug-21	0600	1547.68	179300	143900	24700	172800	165800	643.60	189400	164000	155400	136100
31-Aug-21	0600	1548.88	155700	120300	21500	159600	152600	643.80	180800	164000	171000	149800

Discharge in Cusec

DATE	Indus						Jhelum				
	Guddu		Sukkur		Kotri		Mangla			Rasul	
	U/S	D/S	U/S	D/S	U/S	D/S	Reservoir Level (Ft)	U/S	D/S	U/S	D/S
1-Aug-21	153300	110800	97900	44300	63000	25700	1190.80	58000	10000	6700	NIL
2-Aug-21	177800	134800	100100	45700	48500	11200	1192.20	52300	10000	6900	NIL
3-Aug-21	234100	191600	122400	65300	46500	9700	1193.60	52300	10000	3700	NIL
4-Aug-21	263300	221800	170500	113400	40200	4000	1194.90	49300	10000	3700	NIL
5-Aug-21	303200	262400	202200	145000	39900	4000	1196.05	44800	10000	3500	NIL
6-Aug-21	306100	266300	243100	185900	37600	2400	1197.35	49300	10000	3500	NIL
7-Aug-21	306100	266300	250300	193000	37900	2400	1198.65	49300	10000	8800	5300
8-Aug-21	302500	261800	250300	193000	56400	20600	1199.60	38700	10000	3500	NIL
9-Aug-21	277800	240000	248400	191100	92300	56800	1200.35	33700	10000	3500	NIL
10-Aug-21	230800	192400	227200	169600	109000	73500	1200.80	36900	22000	3500	NIL
11-Aug-21	172300	134500	169300	111800	116700	81200	1201.20	35200	22000	19300	15800
12-Aug-21	161200	122400	122610	65030	127800	92300	1201.60	35200	22000	19300	15800
13-Aug-21	148900	109800	109300	53700	130600	95100	1201.90	31900	22000	23200	19700
14-Aug-21	132900	97300	98000	44200	130600	95100	1202.25	33600	22000	19300	15800
15-Aug-21	125700	91500	89000	40000	127000	91500	1202.50	30300	22000	15400	11900
16-Aug-21	128000	96500	85800	38100	89100	53600	1202.95	34900	22000	23100	19700
17-Aug-21	121500	90000	86100	35000	57700	22200	1203.15	26600	20000	19200	15800
21-Aug-21	121500	90000	82600	32000	44700	9200	1203.20	21700	20000	15300	11900
21-Aug-21	121500	90000	82200	32000	37900	2400	1202.90	25100	20000	27300	11900
21-Aug-21	121500	90000	81400	32000	36300	800	1202.60	23800	35000	26800	11900
21-Aug-21	195400	152300	122100	65900	31200	500	1202.30	23800	33700	26300	8000
22-Aug-21	128100	96500	87300	34500	31400	400	1202.05	21700	33700	30900	15800
23-Aug-21	124100	92600	87100	34600	31400	400	1201.80	21700	30000	27400	11900
24-Aug-21	119800	88300	85200	31200	28300	400	1201.35	20100	30000	27400	11900
25-Aug-21	109100	78800	80400	32000	28300	400	1200.95	21800	35000	28000	11900
26-Aug-21	99100	72600	75000	28300	28300	400	1200.60	23400	35000	28000	11900
27-Aug-21	99100	72600	68800	26700	28700	400	1200.15	20100	35000	28000	11900
28-Aug-21	99100	72600	67000	26200	28800	400	1199.90	17000	35000	29000	11900
29-Aug-21	95900	69600	67000	26200	28900	400	1199.80	22000	25000	19100	NIL
30-Aug-21	102900	76600	67000	26200	28700	400	1199.40	17300	29400	20200	NIL
31-Aug-21	110700	84200	68000	26500	27500	400	1198.70	13800	35000	29500	8000

Discharge in Cusec

Date	Chenab								Ravi			
	Marala		Khanki		Qadirabad		Trimmu		Panjnad		Baloki	
	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S
1-Aug-21	119300	96100	106800	100000	100700	80700	92400	76100	24000	8200	51400	23300
2-Aug-21	97400	70500	98600	91700	108300	88300	65500	49400	33200	17300	37500	9400
3-Aug-21	98500	64800	82600	75600	71500	51500	83500	67400	67000	51100	37500	9400
4-Aug-21	90000	55700	66700	59400	62300	42300	8800	64700	75300	59700	35800	7400
5-Aug-21	77900	43600	53700	46400	49700	29700	54100	38000	65500	5000	36300	7700
6-Aug-21	78000	43600	44900	37600	45800	25800	51100	35000	63400	48000	37700	9500
7-Aug-21	67300	32900	43100	35800	35400	15400	40900	24800	72400	57500	39300	10700
8-Aug-21	56600	22200	28800	21400	32000	12000	40300	24200	63500	48000	39300	10700
9-Aug-21	62000	27600	24000	16600	25500	5500	36300	20200	5000	34300	39300	10700
10-Aug-21	64000	29800	34100	26700	28900	8600	34100	18000	32300	17500	37700	9200
11-Aug-21	60000	25800	31800	24400	26900	6900	30900	14800	30800	15000	38000	9400
12-Aug-21	55800	21400	27300	19900	21500	1500	21700	5600	27400	11600	37300	8500
13-Aug-21	55800	21400	27300	19900	20000	NIL	20200	4100	25400	9600	36100	7300
14-Aug-21	60002	25600	27306	19900	22800	2800	21900	9100	20700	7900	34300	5600
15-Aug-21	60022	25600	35900	28500	26900	6900	21600	9100	19900	7100	34300	5600
16-Aug-21	55800	21400	27300	19900	22800	2800	19100	6600	16900	1000	33500	4700
17-Aug-21	48000	13000	15800	8400	20000	NIL	19100	6600	15900	NIL	33600	4700
21-Aug-21	41400	5600	11100	3700	9900	NIL	231600	9100	14900	NIL	31800	3000
21-Aug-21	41700	5900	9300	1900	8200	NIL	25100	11600	14300	NIL	27500	NIL
21-Aug-21	48800	13000	13000	5600	14600	NIL	25100	11600	12900	NIL	23500	NIL
21-Aug-21	53000	17200	14100	6600	22500	2800	22700	6600	12900	NIL	30000	1200
22-Aug-21	42500	17200	14900	7500	25200	8200	21500	5400	12900	NIL	31800	3000
23-Aug-21	48300	13000	13200	5600	22500	5500	20300	4200	13600	NIL	31600	2400
24-Aug-21	48300	13000	12200	4700	19900	NIL	24000	7900	12200	NIL	30000	1200
25-Aug-21	48300	13000	15100	7500	22800	2800	24000	7900	11300	NIL	32700	3800
26-Aug-21	46700	21400	25200	47600	25500	5500	24000	7900	11000	NIL	33600	4700
27-Aug-21	60800	25600	27400	19900	31600	9600	22800	6700	11000	NIL	32700	3800
28-Aug-21	65000	29800	34300	26700	35600	13600	20200	4200	11000	NIL	33600	4700
29-Aug-21	56700	21400	32000	24400	345600	13600	24000	7900	11300	NIL	32700	3800
30-Aug-21	48300	13000	22900	15300	35600	13600	26600	10500	11900	NIL	32700	3800
31-Aug-21	44100	8800	11300	3700	24800	2800	29900	13900	11100	NIL	35400	4700

Discharge in Cusec

DATE	Sutlej						Links Canal				Skardu	
	Sidhnai		Sulemanki		Islam		C.J	CRBC	Q.B	T.P	Temperature °C	
	U/S	D/S	U/S	D/S	U/S	D/S	Flow	Flow	Flow	Flow	Max	Min
1-Aug-21	28000	11600	16700	3300	1600	400	5000	3800	20000	NIL	33.3	17.8
2-Aug-21	29100	13100	17500	4000	1200	NIL	5000	3800	20000	NIL	32.2	16.7
3-Aug-21	31800	15800	17900	4300	1100	NIL	5000	2800	20000	NIL	27.8	15.6
4-Aug-21	32000	15900	18200	4600	200	800	5000	3500	20000	NIL	28.9	17.2
5-Aug-21	28500	12500	17300	4000	2500	1300	5000	3500	20000	NIL	26.1	18.3
6-Aug-21	23600	7400	16300	3000	3000	1800	10000	3500	20000	NIL	25.0	17.2
7-Aug-21	22400	5800	15600	2300	3000	1800	10000	3800	20000	NIL	26.7	18.3
8-Aug-21	32500	6800	16800	3500	3500	2300	10000	3800	20000	NIL	27.2	18.9
9-Aug-21	24500	7700	16100	2700	3500	2300	10000	3800	20000	NIL	27.8	17.8
10-Aug-21	24000	7100	15800	2400	1700	400	10000	4300	20000	NIL	28.9	16.7
11-Aug-21	25400	8100	15800	2400	1300	NIL	7100	4500	20000	NIL	27.8	17.2
12-Aug-21	23700	6400	16000	2400	1300	NIL	5000	4600	20000	NIL	29.4	17.8
13-Aug-21	22800	5400	15700	2000	1300	NIL	5000	4600	20000	NIL	33.7	15.4
14-Aug-21	20700	3300	15700	2000	1300	NIL	5000	4600	20000	NIL	30.4	17.4
15-Aug-21	18400	1000	15800	2000	1300	NIL	5000	4600	20000	NIL	29.3	14.4
16-Aug-21	18100	700	15900	2000	1300	NIL	5000	4600	20000	NIL	NR	NR
17-Aug-21	17100	NIL	16000	2000	600	NIL	5000	4600	20000	NIL	24.6	7.3
21-Aug-21	16000	NIL	16000	2000	600	NIL	10000	4600	20000	NIL	29.6	8.3
21-Aug-21	15600	NIL	15500	2000	600	NIL	10000	4600	NIL	NIL	31.1	14.0
21-Aug-21	15800	NIL	14500	2000	700	NIL	10000	4600	NIL	NIL	33.1	17.4
21-Aug-21	15000	NIL	14000	2000	700	NIL	10000	4600	NIL	NIL	33.4	19.1
22-Aug-21	14800	NIL	15500	2000	700	NIL	10000	4600	19700	NIL	32.7	15.0
23-Aug-21	14000	NIL	15900	2000	700	NIL	10000	4600	17000	NIL	NIL	NIL
24-Aug-21	13600	NIL	15900	2000	700	NIL	10000	4600	17000	5300	NIL	NIL
25-Aug-21	15300	NIL	15900	2000	700	NIL	10000	4600	20000	5300	NIL	NIL
26-Aug-21	16100	NIL	16000	2000	1300	NIL	10000	4600	20000	5300	33.6	16.3
27-Aug-21	14600	NIL	16700	2700	1300	NIL	10000	4600	22000	5300	34.6	18.4
28-Aug-21	14600	NIL	16800	2700	1200	NIL	10000	4600	22000	5200	34.4	19.2
29-Aug-21	16100	NIL	16700	2600	1200	NIL	10000	4600	22000	5200	27.0	12.3
30-Aug-21	16300	NIL	16700	2600	1300	NIL	10000	4600	22000	4900	21.8	9.5
31-Aug-21	17200	NIL	16400	2400	1300	NIL	10000	4600	22000	6800	26.3	14.5

Discharge in Cusec

Date	Time	Indus			Kabul	Indus						
		Tarbela			Nowshera	Kalabagh		Chashma			Taunsa	
		Reservoir Level (Ft)	U/S	D/S	Flow	U/S	D/S	Reservoir Level (Ft)	U/S	D/S	U/S	D/S
1-Sep-21	0600	1550.00	124000	90900	25700	114700	107700	641.20	152100	164000	158100	138400
2-Sep-21	0600	1548.55	124000	165000	19100	124100	117100	638.15	140100	152800	158100	138400
3-Sep-21	0600	1546.34	107100	170000	18500	160500	153500	640.50	154800	133600	158100	138400
4-Sep-21	0600	1544.00	103300	170000	15600	180700	173700	643.40	202500	164000	147500	129100
5-Sep-21	0600	1541.30	92900	170000	11700	180700	173700	644.30	191200	164000	138900	121600
6-Sep-21	0600	1538.62	95200	170000	12100	173600	166600	644.60	187300	164000	159600	139800
7-Sep-21	0600	1536.00	95200	170000	13000	170800	163800	644.90	187300	164000	159300	139500
8-Sep-21	0600	1534.05	98400	160000	14500	173600	166600	645.00	184800	164000	159300	139500
9-Sep-21	0600	1532.35	115800	162000	23700	184800	177800	645.60	192100	164000	159300	139500
10-Sep-21	0600	1531.50	127300	150000	18400	170800	163800	646.40	195900	164000	159300	139500
11-Sep-21	0600	1531.50	138800	138000	17400	159600	152600	647.20	186600	153000	159300	139500
12-Sep-21	0600	1531.87	149000	138000	23400	158200	150700	647.20	172400	153000	159300	139500
13-Sep-21	0600	1532.09	144900	138000	36300	150400	142900	647.10	170300	153000	147000	127400
14-Sep-21	0600	1531.74	129100	138000	24200	167500	160000	647.00	170300	153000	147000	127400
15-Sep-21	0600	1530.82	113400	138000	17900	156300	148800	647.00	172400	153000	150000	127400
16-Sep-21	0600	1529.78	100300	128000	16600	147200	139700	647.30	168600	143000	146700	126300
17-Sep-21	0600	1528.52	95400	128000	15400	122600	115100	647.20	160300	143000	146700	125800
21-Sep-21	0600	1527.20	93900	128000	15800	127000	119000	645.30	133400	143000	137000	115900
21-Sep-21	0600	1125.03	98400	155000	15300	135200	127200	643.70	146400	143000	137200	115600
21-Sep-21	0600	1522.79	96500	15500	16300	177200	169200	643.60	165300	130000	137700	115600
21-Sep-21	0600	1521.83	105400	130000	16200	162900	154900	645.80	150100	125300	137600	115500
22-Sep-21	0600	1520.95	102500	125000	17500	127900	119900	646.70	162500	125000	137600	115500
23-Sep-21	0600	1520.41	107800	125000	16800	118600	110600	646.00	135900	125000	137600	116300
24-Sep-21	0600	1519.25	99600	125000	18400	139500	131500	646.20	139100	116800	125500	104400
25-Sep-21	0600	1518.11	86800	115000	17400	137600	129600	646.80	151900	120000	121000	100400
26-Sep-21	0600	1517.00	82600	110000	16100	112600	104600	647.20	132200	110300	119500	99200
27-Sep-21	0600	1515.72	77500	110000	13300	78000	70000	647.00	132800	115000	116700	96900
28-Sep-21	0600	1514.42	77000	110000	12900	122400	114400	646.20	117978	112000	116600	96800
29-Sep-21	0600	1513.16	78700	110000	12800	109800	101800	646.70	137200	112000	110900	91200
30-Sep-21	0600	1511.95	80000	110000	13400	122400	114400	646.40	123900	112000	110900	91200

Discharge in Cusec

Date	Indus						Jhelum				
	Guddu		Sukkur		Kotri		Mangla			Rasul	
	U/S	D/S	U/S	D/S	U/S	D/S	Reservoir Level (Ft)	U/S	D/S	U/S	D/S
1-Sep-21	119200	90700	75500	28200	26900	400	1198.05	18300	38000	31300	11900
2-Sep-21	129100	99500	84100	33600	24800	400	1197.34	16800	38000	31100	11900
3-Sep-21	139300	109500	90000	36500	24300	400	1196.60	17300	40000	30700	11900
4-Sep-21	130400	100100	97900	45000	23600	400	1195.80	15800	40000	32200	11900
5-Sep-21	125500	94600	93000	40100	23500	400	1195.95	17300	43000	29600	8000
6-Sep-21	116300	85100	87400	34700	23900	400	1194.10	12300	38000	33900	11900
7-Sep-21	100200	70600	81200	30000	23900	400	1193.35	15300	38000	33700	11900
8-Sep-21	115800	84900	68600	22000	28900	400	1192.90	21400	35000	29700	8000
9-Sep-21	121800	90500	66000	20800	30100	400	1192.55	19400	30000	36900	15800
10-Sep-21	132900	101600	75100	24400	32200	2700	1192.25	15900	25000	23100	5300
11-Sep-21	132900	101600	92100	37800	30600	4700	1192.00	22400	30000	32800	15800
12-Sep-21	131800	100800	92100	35500	29100	4000	1191.80	24000	30000	32800	15800
13-Sep-21	135100	104200	92300	35500	27100	2700	1191.95	29500	25000	25000	8000
14-Sep-21	132100	100900	93100	35500	20400	400	1192.00	26500	25000	27300	11900
15-Sep-21	123200	94100	91800	35500	20400	400	1191.85	20500	25000	18200	NIL
16-Sep-21	109300	79100	88000	32000	22000	400	1191.65	19000	25000	20500	NIL
17-Sep-21	107700	77000	73700	20000	28700	3200	1191.50	20500	25000	18800	NIL
21-Sep-21	118000	85800	70500	19300	26900	2400	1191.10	17900	25000	25700	5300
21-Sep-21	130300	96900	70500	19300	26900	2000	1190.70	17900	30000	21000	NIL
21-Sep-21	123000	90400	75500	21200	26700	1600	1190.30	17900	30000	28800	8000
21-Sep-21	118700	86000	78000	22900	26700	1500	1189.90	18000	30000	27100	7900
22-Sep-21	134700	103000	78000	22900	24000	1900	1189.70	19400	25000	24400	5300
23-Sep-21	125900	93800	81000	25500	19500	1000	1189.55	20800	25000	17600	NIL
24-Sep-21	120400	87300	81100	25500	19000	500	1189.40	20000	16000	28000	7900
25-Sep-21	118300	85200	77000	25500	19000	500	1189.15	18000	25000	26000	5300
26-Sep-21	107100	76000	75000	23100	19200	500	1189.00	16000	9400	20700	NIL
27-Sep-21	102700	72100	69900	19400	19500	500	1189.85	15800	20000	14800	NIL
28-Sep-21	98300	72000	66400	17200	19400	1500	1188.40	17408	30000	14800	NIL
29-Sep-21	97100	74600	66400	20300	19400	1500	1187.90	16000	30000	24100	5300
30-Sep-21	96100	74600	69200	43000	20000	17500	1187.40	16000	30000	28700	7900

Discharge in Cusec

Date	Chenab								Ravi			
	Marala		Khanki		Qadirabad		Trimmu		Panjnad		Baloki	
	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S
1-Sep-21	44100	8800	9500	1900	21000	NIL	28800	12700	10700	NIL	35400	6700
2- Sep -21	40300	5000	9300	1900	17000	NIL	28900	12800	12000	NIL	35400	6700
3- Sep-21	36300	5000	7400	NIL	15000	NIL	25200	9100	13000	NIL	32500	3800
4- Sep -21	34800	5000	7400	NIL	16000	NIL	18900	2800	14900	NIL	30500	1800
5- Sep-21	32600	5000	7500	NIL	18000	NIL	16200	NIL	15000	NIL	27000	NIL
6- Sep-21	29500	5000	7500	NIL	18000	NIL	20400	4200	13200	NIL	29100	NIL
7- Sep-21	28400	5000	7600	NIL	18000	NIL	27800	11600	11500	NIL	30700	1200
8- Sep-21	30100	5000	7400	NIL	17500	NIL	29100	12800	10300	NIL	29000	NIL
9-- Sep-21	63000	34000	31500	24400	41000	19000	32600	16200	9600	NIL	31500	2400
10- Sep-21	47900	13000	31300	24400	44900	22900	32600	16200	10300	NIL	39400	10400
11-- Sep-21	48900	17200	14300	7500	30200	8200	32600	16200	12900	NIL	48900	23400
12- Sep-21	62600	34000	19900	13100	33000	11000	34800	18400	13700	NIL	56300	30300
13-- Sep-21	66800	38100	42400	35500	44900	22900	44800	28400	15300	NIL	55200	29200
14- Sep-21	39900	17200	26900	19900	47600	25600	37900	21500	15500	NIL	51600	24600
15- Sep-21	37300	13000	13000	22400	31700	21600	39400	23000	18000	2100	50400	23200
16- Sep-21	33100	8000	8000	10800	25600	13600	44000	27600	22700	6600	38600	11200
17-Aug 21	29500	5000	5000	7200	17200	NIL	46000	29600	26600	10400	34100	6500
21-Aug 21	30100	5000	5000	9100	19300	NIL	41000	24600	27600	11500	35400	7700
21-Sep-21	30100	5000	5000	9100	21100	NIL	37300	20900	30600	14500	36200	6500
21-Sep-21	33900	8800	8800	1100	20000	NIL	31600	15200	34100	17800	38100	8500
21-Sep-21	33900	8800	20200	13000	26100	4100	29100	12700	34500	19300	38100	8500
22-Sep-21	37500	13000	12600	5500	26000	11600	29700	14500	29700	14500	37900	11100
23-Sep-21	29500	5000	12500	5500	24800	2800	29200	12800	24000	9600	40200	13700
24-Sep-21	29300	5000	8900	1800	22000	NIL	30400	14000	24200	9600	40500	13700
25-Sep-21	33700	8800	8900	1800	22500	5500	30400	14000	19500	4900	40700	13700
26-Sep-21	29800	5000	9800	2800	22500	5500	30400	14000	19500	4900	34700	7600
27-Sep-21	28500	5000	7100	NIL	13000	NIL	30400	14000	19700	5100	33700	6500
28-Sep-21	29800	5000	8000	900	13300	NIL	30400	14000	19600	5100	29100	NIL
29-Sep-21	26000	5000	8900	1800	17000	NIL	30400	14000	20100	5100	25500	NIL
30-Sep-21	27100	5000	8000	900	18400	1400	22800	6600	20600	5100	29500	NIL

Discharge in Cusec

Date	Sutlej						Links/canal				Skardu	
	Sidhnai		Sulemanki		Islam		C.J	CRBC	Q.B	T.P	Temperature °C	
	U/S	D/S	U/S	D/S	U/S	D/S	Flow	Flow	Flow	Flow	Max	Min
1-Sep-21	17000	NIL	106400	2400	600	NIL	10000	4600	21000	5200	23.6	13.4
2-Sep-21	16800	NIL	15800	2000	600	NIL	6800	2600	17000	5200	24.4	13.2
3-Sep-21	16800	NIL	14600	2000	1300	NIL	2300	2800	15000	5200	25.2	9.3
4-Sep-21	17900	300	15100	2000	700	NIL	6200	3400	16000	3900	27.4	10.6
5-Sep-21	18300	700	15400	2000	700	NIL	12100	4600	18000	2900	31.3	10.3
6-Sep-21	17500	2000	15400	2000	700	NIL	15000	4600	18000	5400	32.4	11.4
7-Sep-21	15500		15800	2000	700	NIL	15000	4600	18000	5400	32.6	13.3
8-Sep-21	14500	NIL	16100	2400	1300	NIL	15000	4600	17500	5400	31.6	13.4
9-Sep-21	13600	NIL	15400	2000	1300	NIL	15000	4600	22000	5400	32.8	17.8
10-Sep-21	13600	NIL	15400	2000	1300	NIL	15000	4600	22000	5400	28.9	18.3
11-Sep-21	13600	NIL	17000	4000	1300	NIL	15000	4500	22000	5400	29.4	17.2
12-Sep-21	18500	1300	17300	4600	1300	NIL	15000	4400	22000	5400	30.6	17.8
13-Sep-21	24700	7900	17400	4600	1300	NIL	15000	4400	22000	5200	31.1	18.3
14-Sep-21	27000	9800	19500	6700	1300	NIL	15000	4400	22000	5200	28.3	16.7
15-Sep-21	29100	11900	20200	7200	2300	1000	15000	4400	22000	5500	26.7	15.6
16-Sep-21	30800	13500	20200	7200	3900	2600	15000	4400	22000	6000	26.1	15.0
17-Sep-21	27000	9800	17500	4300	4700	3500	15000	4400	22000	6500	27.8	16.7
21-Sep-21	33600	16400	15900	2700	5200	4000	16700	4400	22000	6700	28.3	13.9
21-Sep-21	20200	3000	15700	2400	4100	2800	19000	4400	22000	7200	27.8	12.2
21-Sep-21	21100	3600	15800	2300	2000	800	19000	4400	22000	7700	27.2	11.7
21-Sep-21	24500	3900	15700	2300	1600	400	19000	4400	22000	7700	28.3	11.1
22-Sep-21	22900	6600	15700	4200	1200	NIL	19000	3600	22000	6900	27.4	11.3
23-Sep-21	23900	7000	16200	4900	1600	400	19000	3600	22000	6800	25.3	11.4
24-Sep-21	23300	5900	15000	2900	1600	400	19000	3300	22000	7000	22.7	8.4
25-Sep-21	25500	7800	15200	2600	3000	1700	19000	2900	22000	6600	26.8	9.5
26-Sep-21	25400	7800	15400	2700	3000	1700	19000	2900	22000	6300	27.3	7.3
27-Sep-21	25200	7800	15400	2700	2100	800	19000	2900	13000	6100	27.8	10.0
28-Sep-21	25200	7800	15300	2600	2000	800	14000	2900	13600	6000	29.4	7.3
29-Sep-21	21200	3900	16300	3500	1200	NIL	14000	2900	17000	6000	26.7	10.6
30-Sep-21	18800	1300	14900	2000	1600	400	14000	2900	17000	6200	25.6	10.6

Discharge in Cusec

Date	Time	Indus			Kabul	Indus						
		Tarbela			Nowshera	Kalabagh		Chashma			Taunsa	
		Reservoir Level (Ft)	U/S	D/S	Flow	U/S	D/S	Reservoir Level (Ft)	U/S	D/S	U/S	D/S
1-Oct-21	0600	1511.38	81200	95000	13900	110700	102700	647.10	128000	100000	108200	89100
2-Oct-21	0600	1511.44	87200	85000	12100	78200	71200	647.50	121900	100000	108500	91700
3-Oct-21	0600	1511.58	89300	85500	14400	99800	92800	647.00	103100	100000	108400	91900
4-Oct-21	0600	1511.66	87700	85000	15300	87900	80900	646.40	103500	100000	96500	80000
5-Oct-21	0600	1511.76	78200	75000	15400	108000	101000	646.20	108900	100000	96600	80000
6-Oct-21	0600	1511.98	72300	66000	16400	86900	79900	647.00	110300	89000	96600	80000
7-Oct-21	0600	1511.98	65700	65000	12400	76300	69300	647.30	99000	89000	96500	80000
8-Oct-21	0600	1511.99	56000	55000	12900	74300	67300	646.80	77900	84000	96100	79600
9-Oct-21	0600	1512.05	52200	50000	11900	68200	61300	646.60	84100	84000	85400	70600
10-Oct-21	0600	1512.12	52500	50000	9600	57400	51000	645.30	67600	84000	85400	70600
11-Oct-7	0600	1512.16	51700	50000	9100	54400	50300	644.80	65700	69000	80700	70700
12-Oct-21	0600	1512.10	49200	50000	7900	56100	52000	644.20	65000	69000	72400	70100
13-Oct-21	0600	1511.91	45900	50000	9900	68300	64200	644.20	72500	69000	80300	70400
14-Oct-21	0600	1511.63	43600	50000	8400	49600	45500	643.90	68900	69000	64300	59300
15-Oct-21	0600	1511.76	39000	35000	8000	51500	47400	642.70	73200	69700	65200	60100
16-Oct-21	0600	1511.87	38500	35000	6400	47700	42700	643.40	60100	49000	64700	59600
17-Oct-21	0600	1511.92	37000	35000	6600	39100	34100	642.90	47400	49000	64700	59600
21-Oct-21	0600	1511.97	37000	35000	5700	39700	34700	642.80	47000	44000	44600	39700
21-Oct-21	0600	1511.70	35700	35000	5300	45100	40100	642.30	43100	44000	44600	39700
21-Oct-21	0600	1511.89	33700	35000	6100	40000	35000	642.10	46400	44000	40600	40200
21-Oct-21	0600	1511.80	33400	35000	4600	57500	52500	641.50	42800	44000	40000	39600
22-Oct-21	0600	1511.70	33200	35000	4700	33300	28300	641.90	47800	40000	39700	39300
23-Oct-21	0600	1511.61	33400	35000	4500	49900	45900	641.10	36600	40000	39700	39300
24-Oct-21	0600	1511.45	31700	35000	7100	33300	28300	641.40	46600	40000	35800	35400
25-Oct-21	0600	1511.30	31900	35000	7100	36200	31200	640.70	37800	40000	35800	35400
26-Oct-21	0600	1510.99	32800	40000	6000	42900	37900	640.70	43900	40000	42900	37900
27-Oct-21	0600	1510.74	29300	35000	6200	46700	41700	641.70	47700	35000	36100	35700
28-Oct-21	0600	1510.51	29000	35000	4900	39000	34000	642.60	47800	35000	36100	35700
29-Oct-21	0600	1510.27	29900	35000	5300	50100	45100	642.80	40900	35000	33600	33200
30-Oct-21	0600	1509.59	29000	45000	5200	39000	34000	642.80	38900	35000	32300	31900
31-Oct-21	0600	1508.95	30100	45000	5000	62300	57300	643.60	47700	35000	32300	31900

Discharge in Cusec

Date	Indus						Jhelum				
	Guddu		Sukkur		Kotri		Mangla			Rasul	
	U/S	D/S	U/S	D/S	U/S	D/S	Reservoir Level (ft)	U/S	D/S	U/S	D/S
1-Oct-21	83600	73600	69200	54400	20900	20600	1186.85	14600	30000	26100	5300
2-Oct-21	83600	73600	66400	37300	19100	14300	1186.70	25800	30000	26100	5300
3-Oct-21	88700	73600	66400	32300	18300	500	1186.30	18800	30000	28600	7900
4-Oct-21	79400	60400	65500	29200	18300	500	1186.00	21600	30000	28900	7900
5-Oct-21	79800	58700	56000	16300	20900	3100	1185.45	14600	30000	26200	5300
6-Oct-21	75600	54300	54400	13800	22700	4900	1184.95	16000	30000	26200	5300
7-Oct-21	71900	50600	50200	11300	33700	15900	1184.40	14600	30000	26200	5300
8-Oct-21	67500	46200	46700	10300	26000	8200	1183.80	13200	30000	28800	7900
9-Oct-21	67500	46200	43000	9200	23100	5300	1183.15	11800	30000	26100	5300
10-Oct-21	67500	46200	43000	9200	21700	3900	1182.50	11800	30000	28700	7900
11-Oct-21	67500	46200	43000	9200	14500	500	1182.30	15000	20600	28700	7900
12-Oct-21	65800	46200	43000	9200	12000	500	1181.80	11000	25000	11000	22100
13-Oct-21	65300	48500	43900	9200	10800	500	1181.35	12400	25000	26500	7900
14-Oct-21	64600	52600	47000	11100	9900	500	1181.00	15200	25000	16700	NIL
15-Oct-21	65400	54400	48900	12000	8500	NIL	1180.50	11000	23200	19700	NIL
16-Oct-21	58500	47500	50500	12800	8500	NIL	1180.20	11600	20000	19800	NIL
17-Oct-21	58300	47500	46400	11900	8500	NIL	1179.90	11800	20000	17800	NIL
21-Oct-21	55700	44900	45600	11200	8400	NIL	1179.60	12300	20000	13800	NIL
21-Oct-21	53400	42600	44000	10500	8700	NIL	1179.35	13600	20000	14400	NIL
21-Oct-21	53400	42600	41500	9400	9500	NIL	1179.40	13300	12000	13800	NIL
21-Oct-21	44500	33700	40800	9400	10700	NIL	1179.55	13900	10000	6800	NIL
22-Oct-21	44500	33700	36000	6500	11600	NIL	1179.65	12600	10000	6800	NIL
23-Oct-21	40400	34300	33300	6100	11200	NIL	1179.75	12600	10000	4800	NIL
24-Oct-21	42700	36600	33300	6100	11000	NIL	1179.85	12600	10000	4800	NIL
25-Oct-21	42700	36600	36000	6500	10100	NIL	1180.00	13900	10000	5800	NIL
26-Oct-21	41900	35900	34900	6100	10100	NIL	1180.20	15600	10000	4800	NIL
27-Oct-21	41900	35900	34900	6100	8900	NIL	1180.40	15600	10000	4800	NIL
28-Oct-21	39800	33700	33300	6100	6300	NIL	1180.65	17000	10000	4800	NIL
29-Oct-21	39800	33700	31700	6100	5900	NIL	1180.90	17000	10000	4800	NIL
30-Oct-21	37300	31300	30400	6000	5900	NIL	1181.15	17000	10000	4800	NIL
31-Oct-21	37300	31300	30100	6000	6300	NIL	1181.30	14200	10000	4100	NIL

Discharge in Cusec

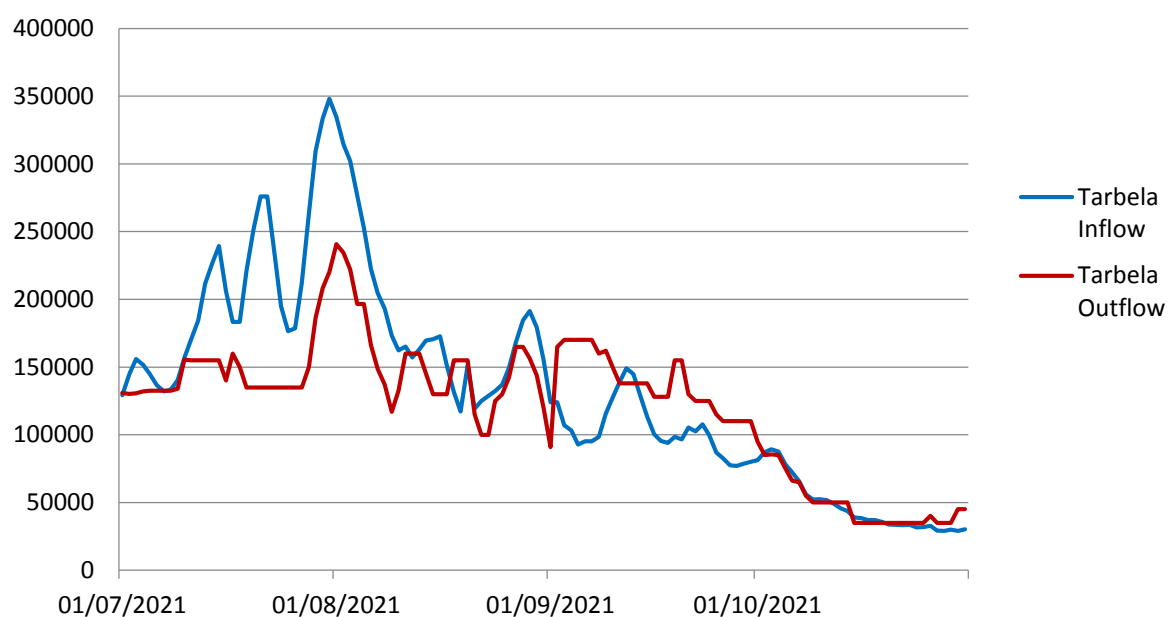
DATE	Chenab								Ravi			
	Marala		Khanki		Qadirabad		Trimmu		Panjnad		Baloki	
	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S
1-Oct-21	27700	5000	8000	900	19800	2800	21500	5300	17700	4000	29500	NIL
2-Oct-21	30400	5000	14500	7400	19200	NIL	19000	2600	17600	4000	29500	NIL
3-Oct-21	31100	5000	12400	5500	24800	2800	23100	6700	17000	3200	32400	2900
4-Oct-21	30800	5000	10500	3700	23400	1400	19100	2800	13700	2100	36800	7300
5-Oct-21	30000	5000	10500	3700	22000	NIL	19100	2800	11300	NIL	38100	9900
6-Oct-21	27400	5000	8700	1800	22000	NIL	19000	2800	10600	NIL	37800	9300
7-Oct-21	20000	5000	8700	1800	21000	NIL	19000	2800	10200	NIL	36400	6900
8-Oct-21	19500	5000	8400	1800	20000	NIL	14600	NIL	10200	NIL	34200	4700
9-Oct-21	19500	5000	8400	1800	20000	NIL	12600	NIL	9400	NIL	30600	1100
10-Oct-21	19600	5000	7600	900	20000	NIL	10800	NIL	8900	NIL	26000	NIL
11-Oct-21	18300	5000	6700	NIL	21000	NIL	10000	NIL	9800	NIL	23000	NIL
12-Oct-21	19300	5000	7700	900	11400	NIL	9800	NIL	9800	NIL	25000	NIL
13-Oct-21	18300	5000	8400	1800	14100	NIL	9500	NIL	7400	NIL	21000	NIL
14-Oct-21	17700	5000	8500	1800	16000	NIL	9500	NIL	6500	NIL	18500	NIL
15-Oct-21	14800	5000	8600	1900	16000	NIL	9200	NIL	6500	NIL	20500	NIL
16-Oct-21	14700	7000	9300	2800	21400	NIL	7400	NIL	4300	NIL	18500	NIL
17-Oct-21	14200	6500	8300	1900	17000	NIL	7500	NIL	2900	NIL	21500	NIL
21-Oct-21	12200	5000	9300	2800	19700	NIL	6500	NIL	2900	NIL	19500	NIL
21-Oct-21	13800	6100	10200	3700	17000	NIL	6400	NIL	3200	NIL	17700	NIL
21-Oct-21	13800	6100	10200	3700	19300	NIL	3900	NIL	2500	NIL	16500	NIL
21-Oct-21	12200	6100	9400	2800	11000	NIL	3900	NIL	2700	2700	17500	NIL
22-Oct-21	12200	5000	10300	3700	5600	NIL	3900	NIL	2100	2100	15000	NIL
23-Oct-21	11900	5000	8300	1900	7700	NIL	3900	NIL	2100	2100	9500	NIL
24-Oct-21	82700	75400	63900	57800	4800	NIL	3900	NIL	2400	2400	9500	NIL
25-Oct-21	26400	19100	38200	32000	50800	38600	3900	NIL	2800	2800	9500	NIL
26-Oct-21	19200	11900	21500	15200	21600	4100	NIL	NIL	2800	2800	12500	NIL
27-Oct-21	16300	9000	15000	9100	18000	NIL	17900	9500	2400	2400	22400	6900
28-Oct-21	16200	9000	12300	6400	11300	NIL	19200	10800	2400	2400	21600	6100
29-Oct-21	16200	9000	8700	2800	12000	NIL	10500	2100	2400	2400	15500	NIL
30-Oct-21	16200	9000	9400	3600	10600	NIL	7100	NIL	2800	2800	15500	NIL
31-Oct-21	16200	9000	11300	5500	7900	NIL	6800	NIL	4900	4900	13500	NIL

Discharge in Cusec

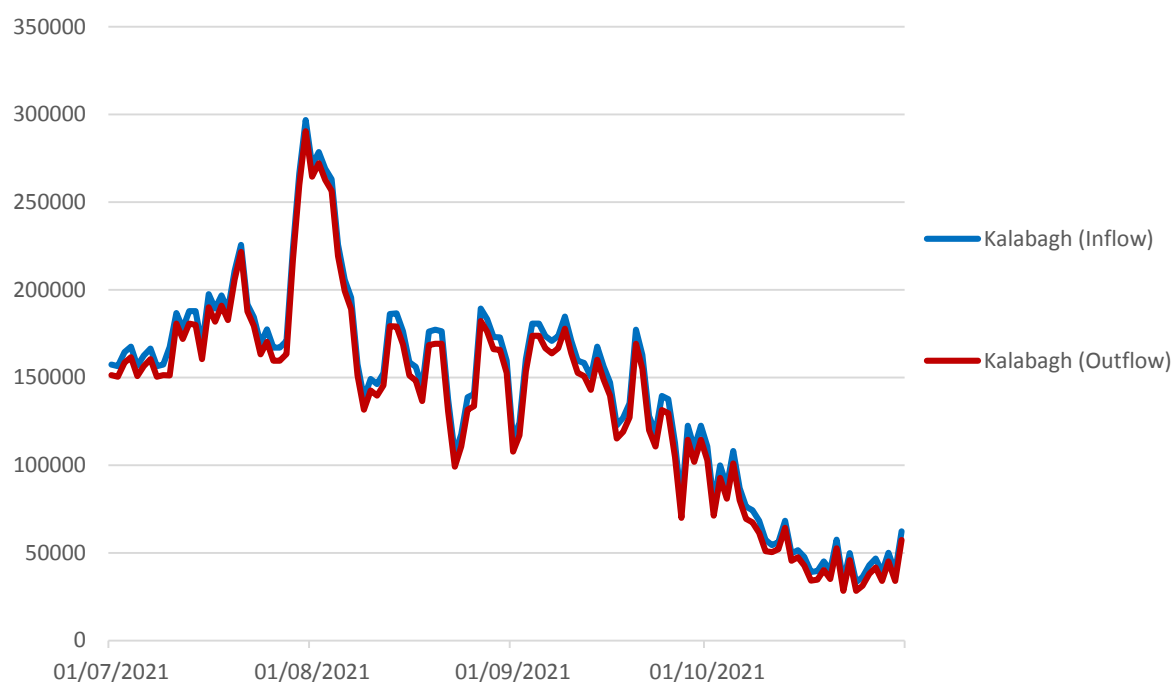
Date	Sutlej						Links Canal				Skardu	
	Sidhnai		Sulemanki		Islam		C.J	CRBC	Q.B	T.P	Temperature °C	
	U/S	D/S	U/S	D/S	U/S	D/S	Flow	Flow	Flow	Flow	Max	Min
1-Oct-21	16400	NIL	16549	3300	1600	400	11200	3500	17000		30.7	10.5
2-Oct-21	14600	NIL	16500	3300	1600	400	10000	3500	19500	5100	29.6	10.4
3-Oct-21	14400	NIL	15600	2400	2200	NIL	10000	3500	22000	5300	28.2	9.1
4-Oct-21	13800	NIL	15600	2400	1200	NIL	10000	3500	22000	5300	23.4	10.0
5-Oct-21	13900	NIL	16900	4100	1200	NIL	6600	3500	22000	NIL	23.3	9.3
6-Oct-21	15700	NIL	16800	4100	1600	400	2200	3500	22000	NIL	23.0	6.0
7-Oct-21	19600	1900	16900	4100	2000	700	NIL	3500	21000	5200	23.4	6.5
8-Oct-21	20600	3300	17400	4400	2400	1200	NIL	3500	20000	5400	24.1	5.0
9-Oct-21	19200	1900	17000	4100	2700	1400	NIL	3500	20000	5400	24.2	9.3
10-Oct-21	17200	NIL	17100	4100	2700	1400	NIL	3500	20000	3600	24.3	7.0
11-Oct-21	12800	NIL	16300	3300	2400	1200	NIL	3500	21000	3500	22.2	7.3
12-Oct-21	9900	3900	15000	2000	2000	800	NIL	3500	11300	3500	15.3	5.4
13-Oct-21	8200	NIL	14900	2000	2000	700	NIL	3500	14400	NIL	18.3	4.0
14-Oct-21	8200	NIL	14200	2000	1000	NIL	NIL	3500	16000	NIL	19.3	3.3
15-Oct-21	8300	NIL	11300	2000	1300	NIL	NIL	3500	16000	NIL	18.9	9.4
16-Oct-21	6000	1000	12000	3900	4100	4100	NIL	3600	21400	NIL	18.9	7.8
17-Oct-21	7600	NIL	13600	5200	1200	1200	NIL	3900	17000	NIL	20.6	6.7
21-Oct-21	7600	NIL	15500	7400.0	400	400	NIL	4000	19700	2000	15.6	8.9
21-Oct-21	6400	NIL	14600	6400	1500	1500	NIL	4300	17000	2000	14.4	6.7
21-Oct-21	4600	NIL	12500	4400	4700	4700	NIL	4400	19300	NIL	16.7	5.6
21-Oct-21	3600	NIL	11800	3700	4000	4000	NIL	4400	11000	NIL	17.2	4.4
22-Oct-21	3600	NIL	12500	4200	4000	4000	NIL	4100	5600	NIL	17.2	5.6
23-Oct-21	2700	NIL	9600	1300	2600	2600	NIL	3400	7700	NIL	16.7	7.8
24-Oct-21	3000	NIL	7900	NIL	1800	1800	NIL	3900	4800	NIL	12.8	6.1
25-Oct-21	3000	NIL	6500	NIL	800	800	NIL	3900	12300	NIL	10.6	3.3
26-Oct-21	2600	2600	6900	NIL	NIL	NIL	NIL	3900	NIL	NIL	10.0	3.9
27-Oct-21	2300	2300	7000	NIL	NIL	NIL	NIL	3900	17900	NIL	13.3	2.8
28-Oct-21	7200	7200	8400	200	NIL	NIL	NIL	3900	19200	NIL	13.9	1.1
29-Oct-21	8100	8100	9300	1100	NIL	NIL	NIL	3900	10500	NIL	15.0	1.1
30-Oct-21	8100	8100	9200	1000	NIL	NIL	NIL	3900	7100	NIL	16.7	1.7
31-Oct-21	8800	8800	8300	NIL	NIL	NIL	NIL	3900	6800	NIL	15.0	1.1

MAJOR RIVERS FLOW HYDROGRAPH OF MONSOON SEASON 2021

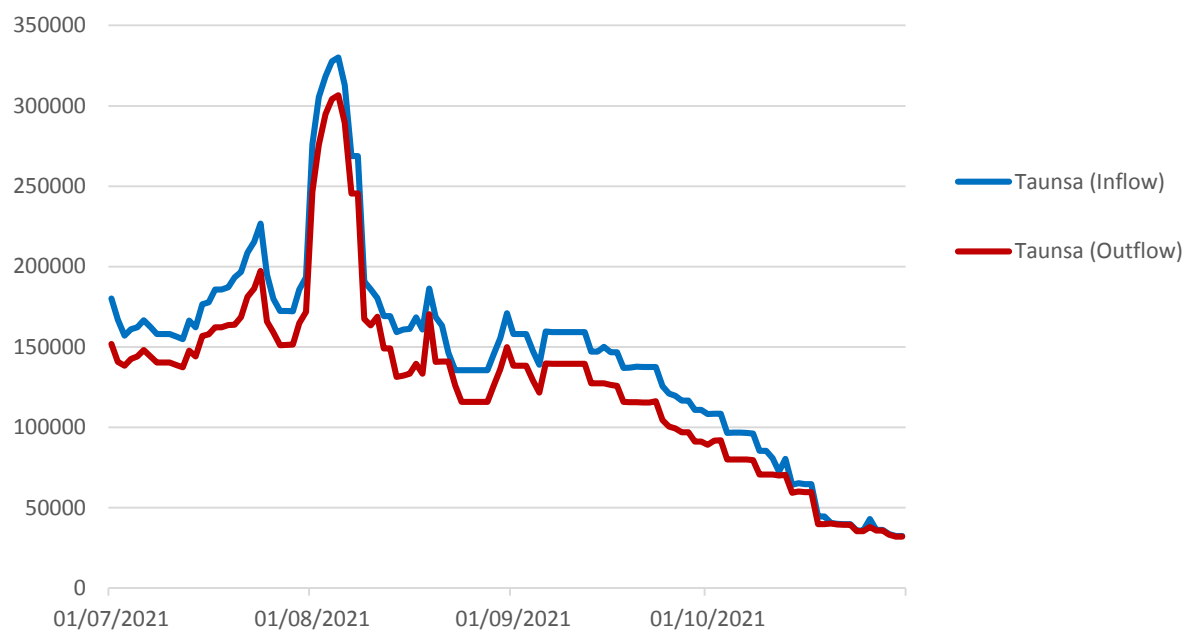
River Indus at Tarbela (Jul-Oct 2021)



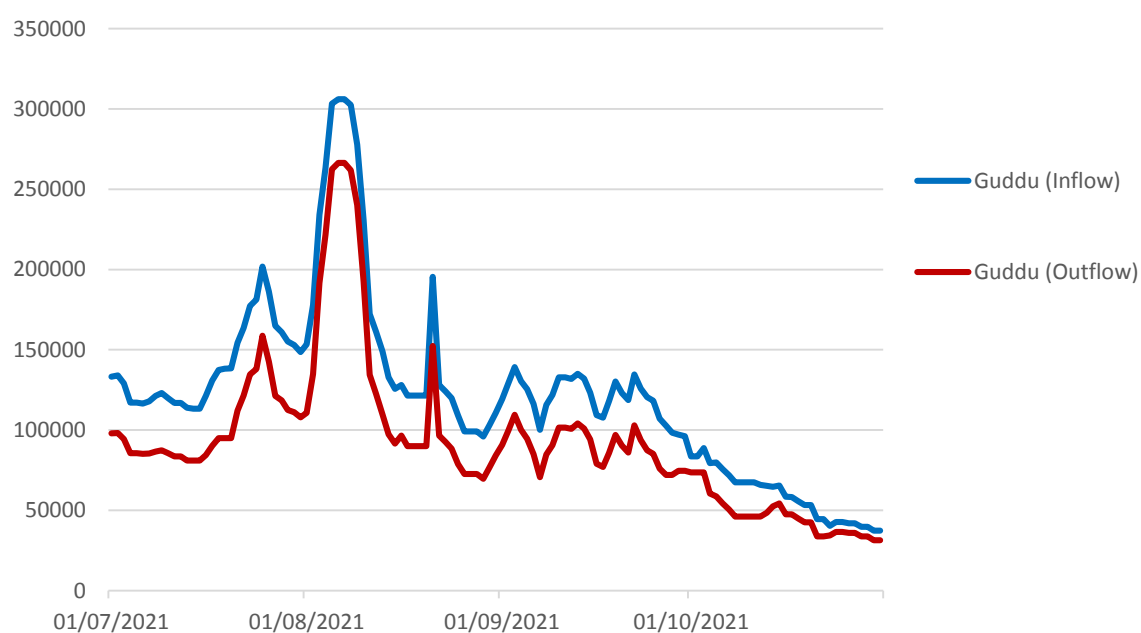
River Indus at Kalabagh (Jul-Oct 2021)



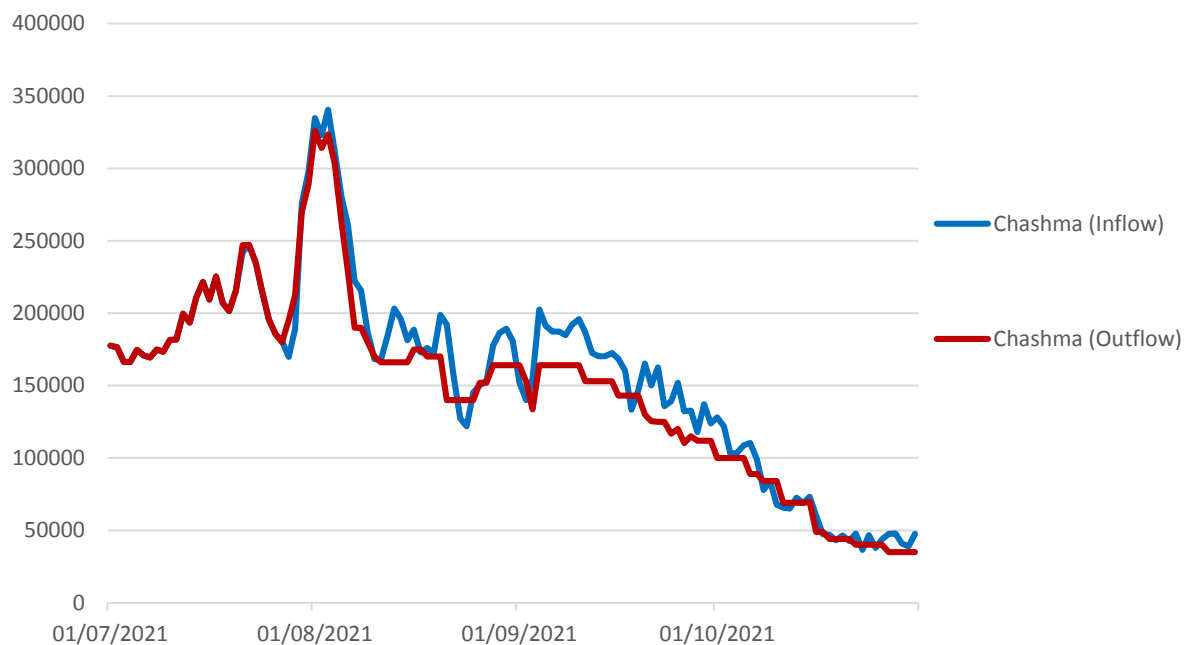
River Indus at Taunsa (Jul-Oct 2021)



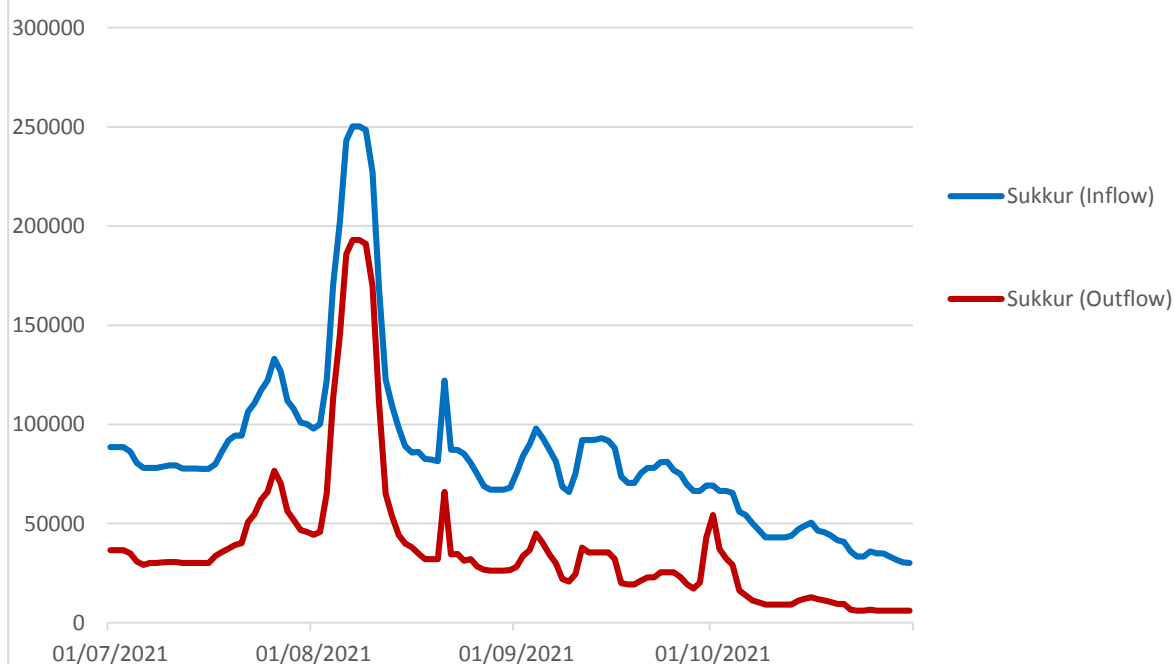
River Indus at Guddu (Jul-Oct 2021)



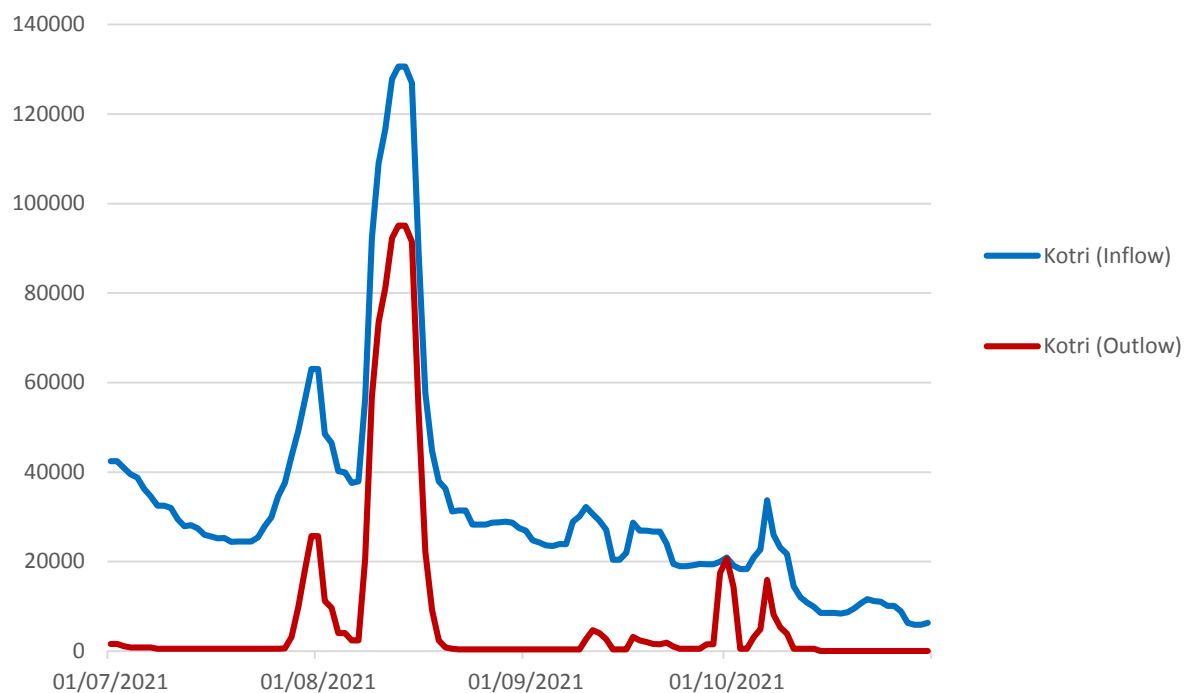
River Indus at Chashma (Jul-Oct 2021)



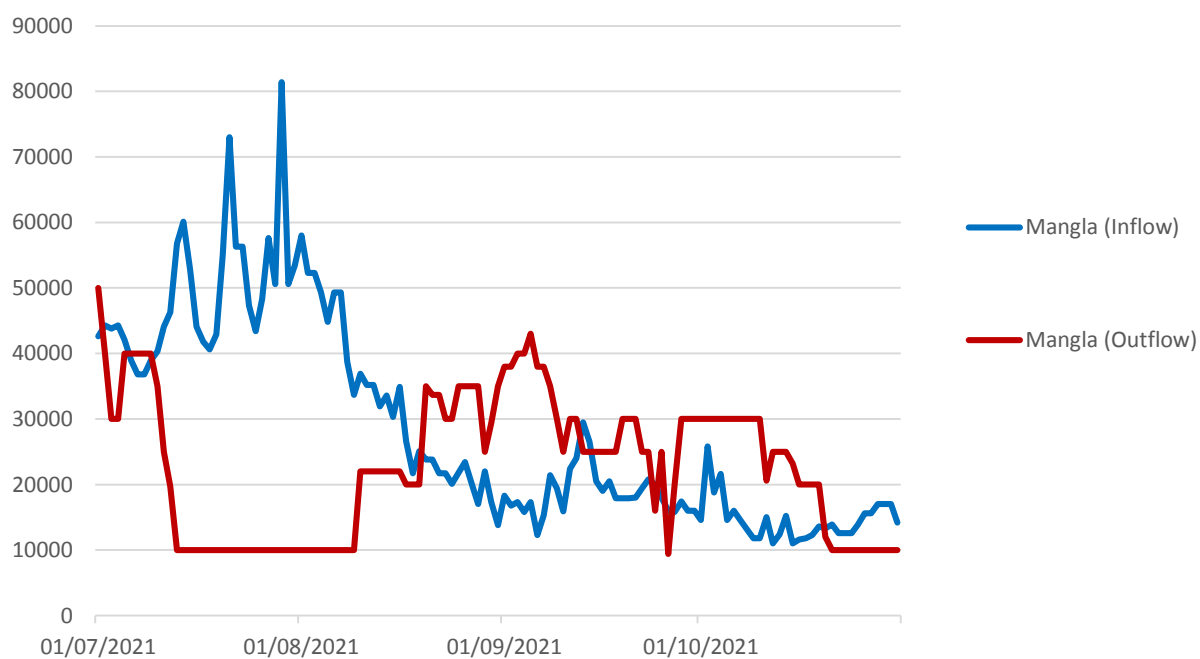
River Indus at Sukkur (Jul-Oct 2021)



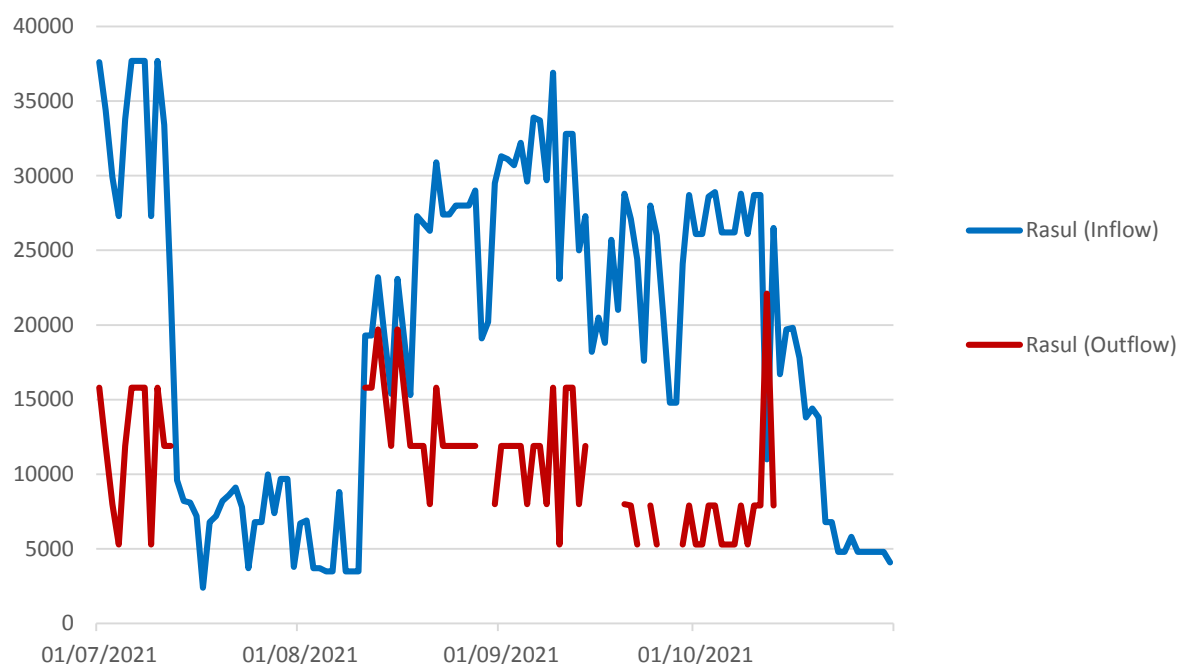
River Indus at Kotri (Jul-Oct 2021)



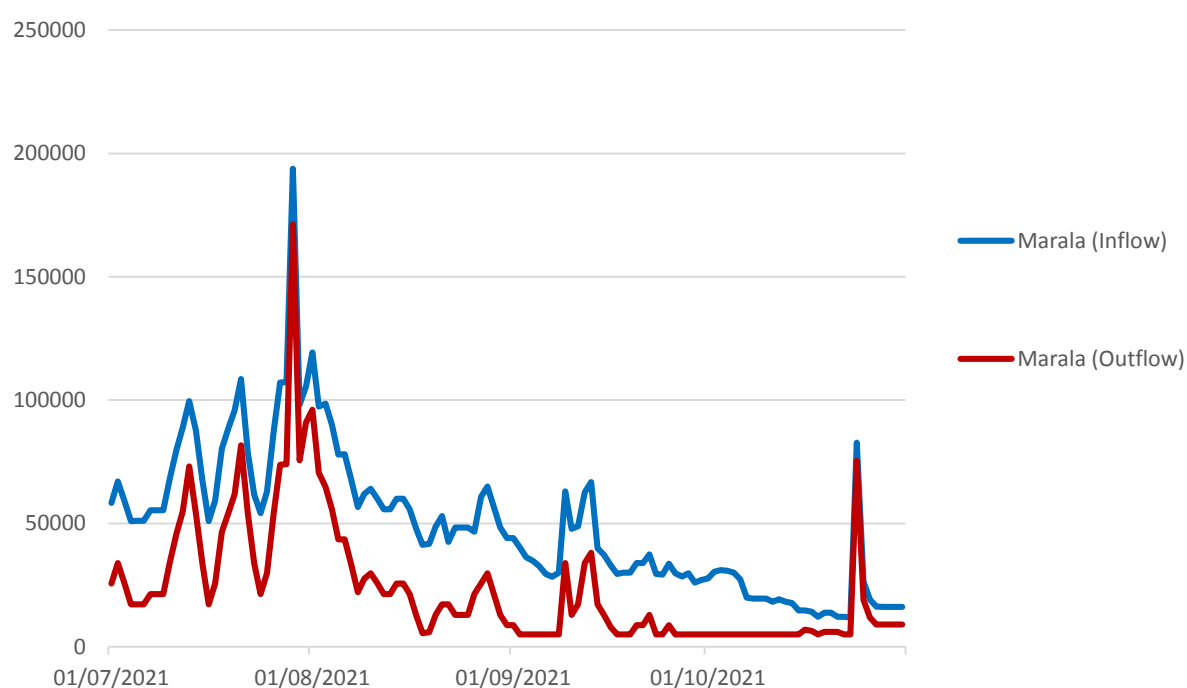
River Jhelum at Mangla (Jul-Oct 2021)



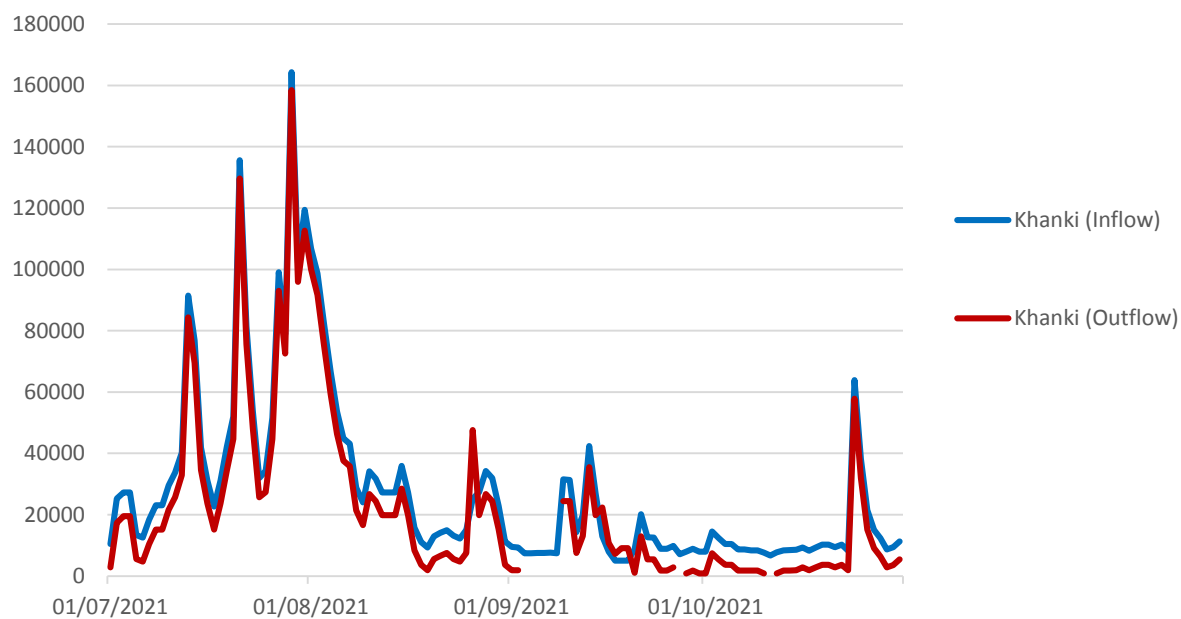
River Jhelum at Rasul (Jul-Oct 2021)



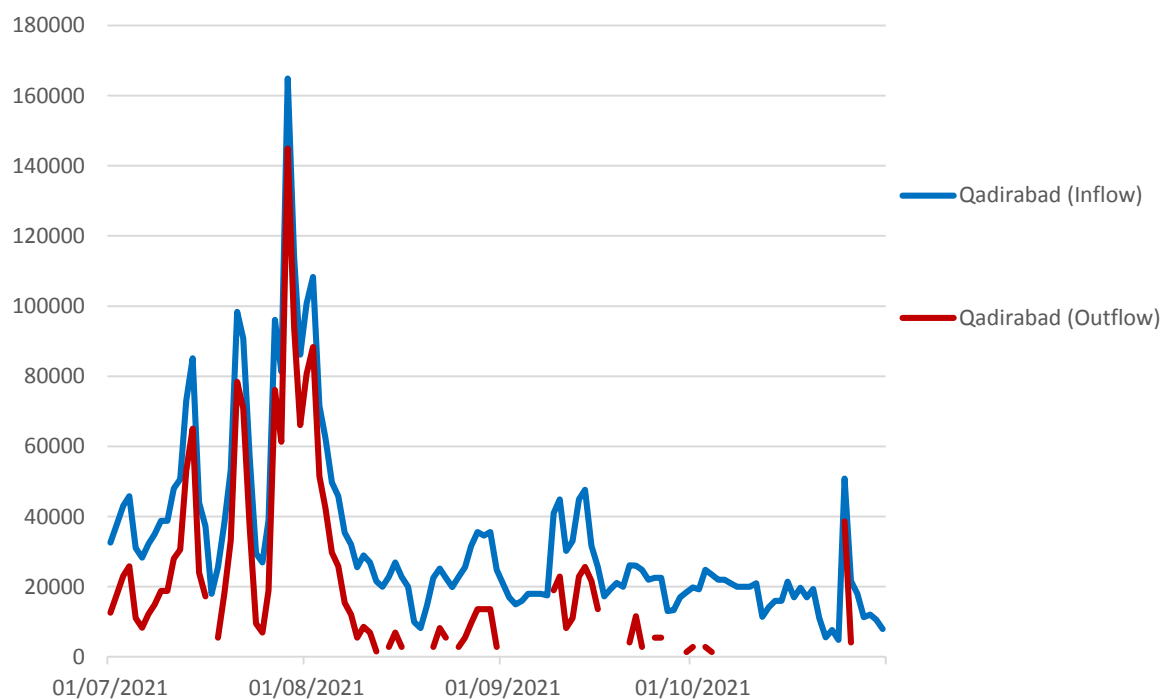
River Chenab at Marala (Jul-Oct 2021)



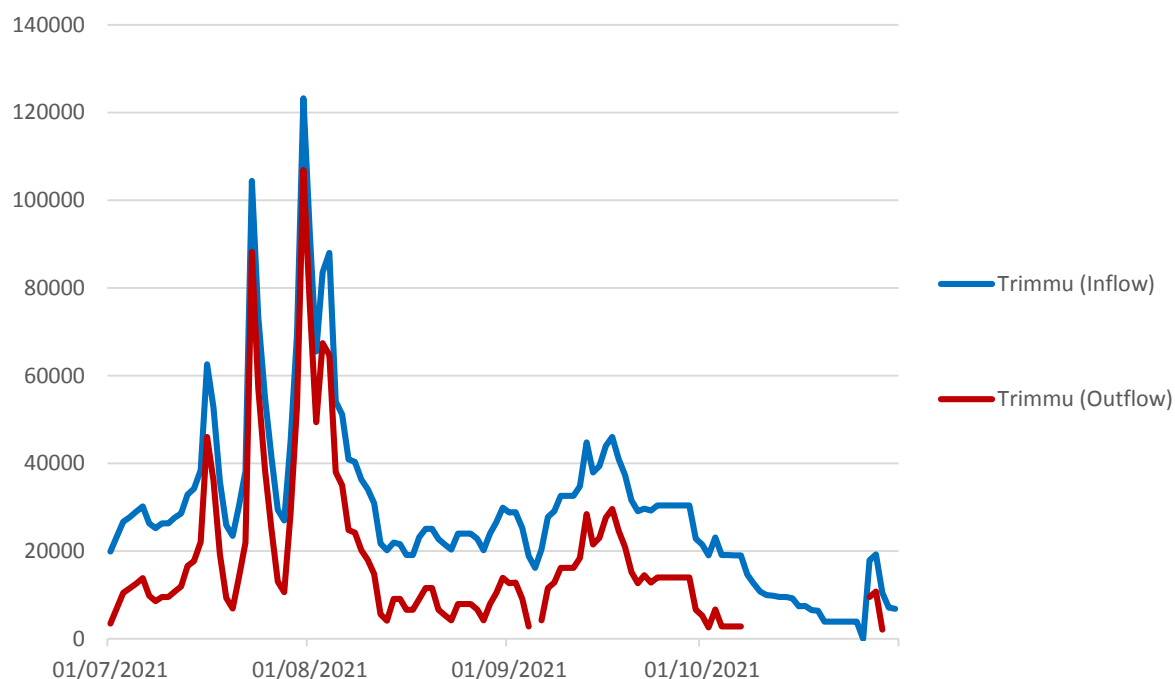
River Chenab at Khanki (Jul-Oct 2021)



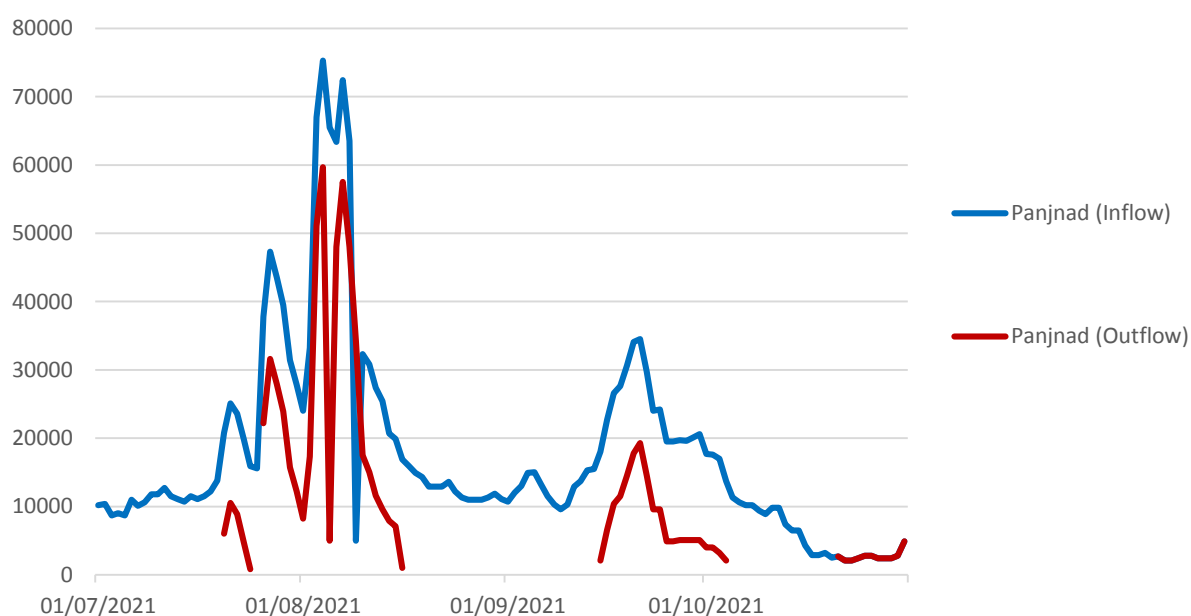
River Chenab at Qadirabad (Jul-Oct 2021)



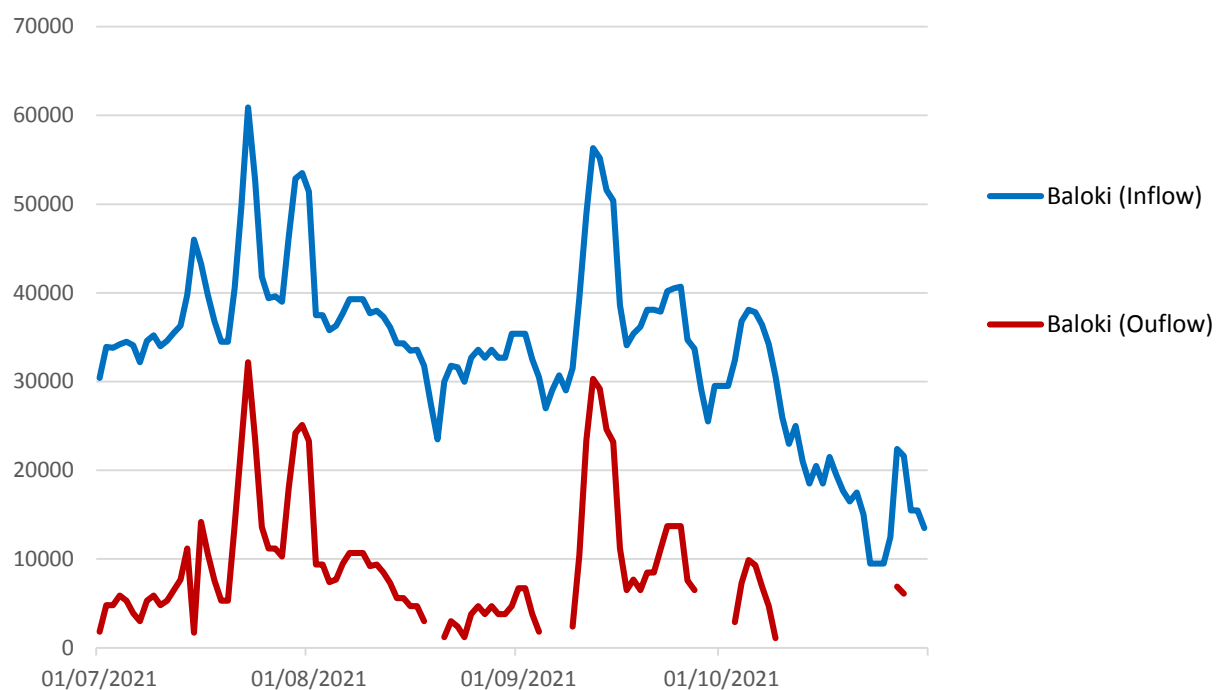
River Chenab at Trimmu (Jul-Oct 2021)



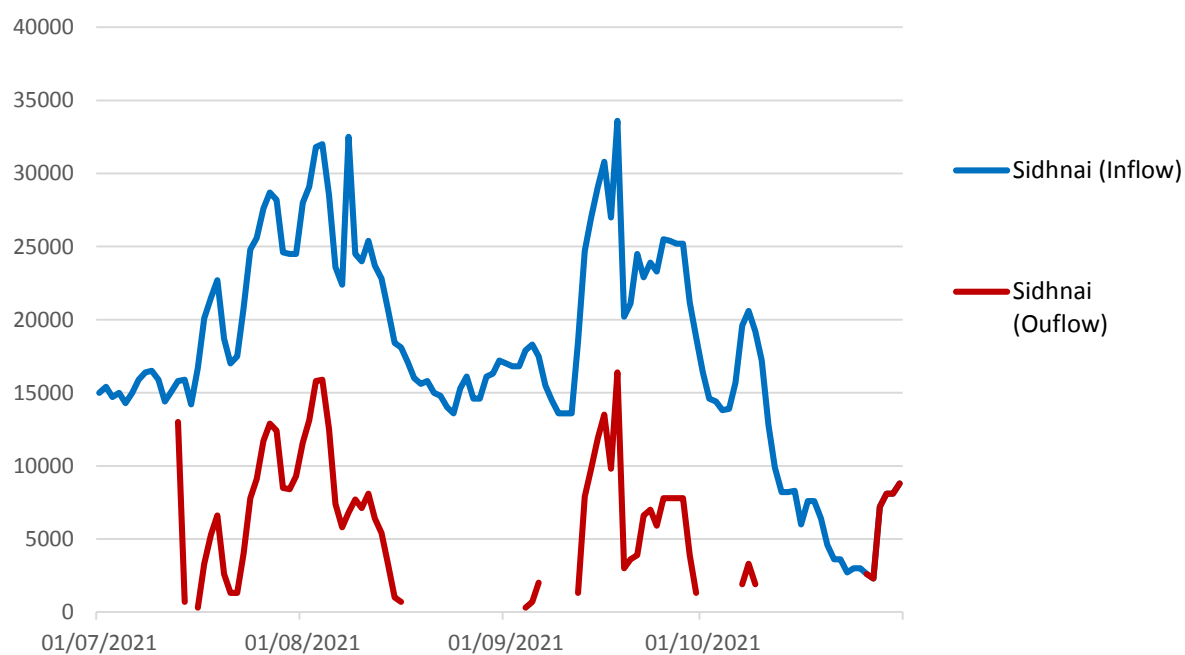
River Ravi at Panjnad (Jul-Oct 2021)



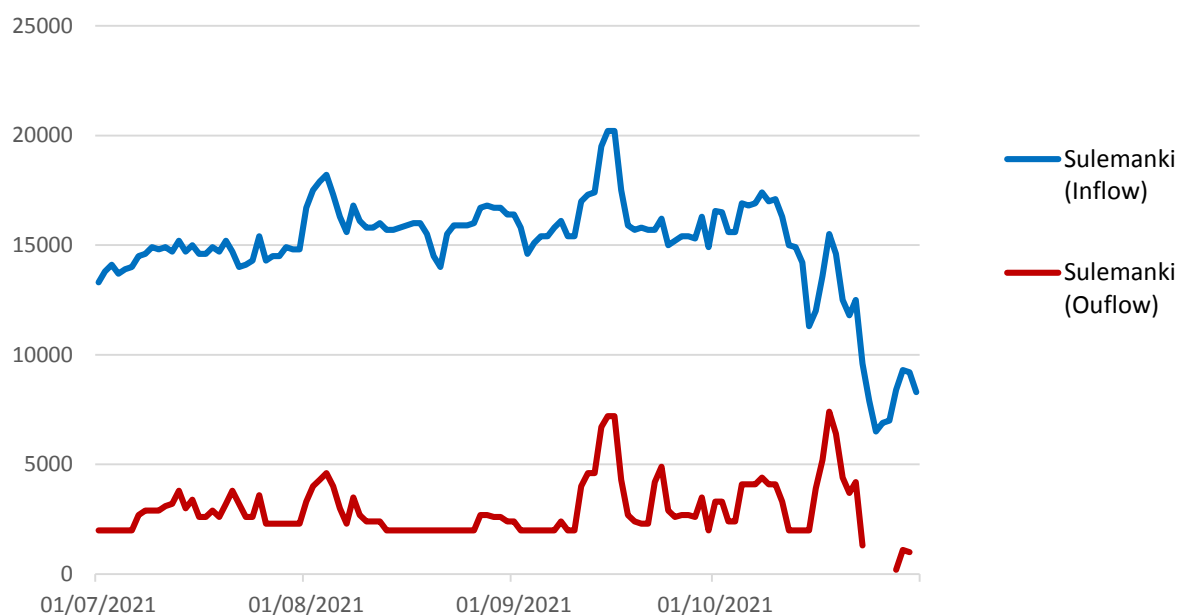
River Ravi at Baloki (Jul-Oct 2021)



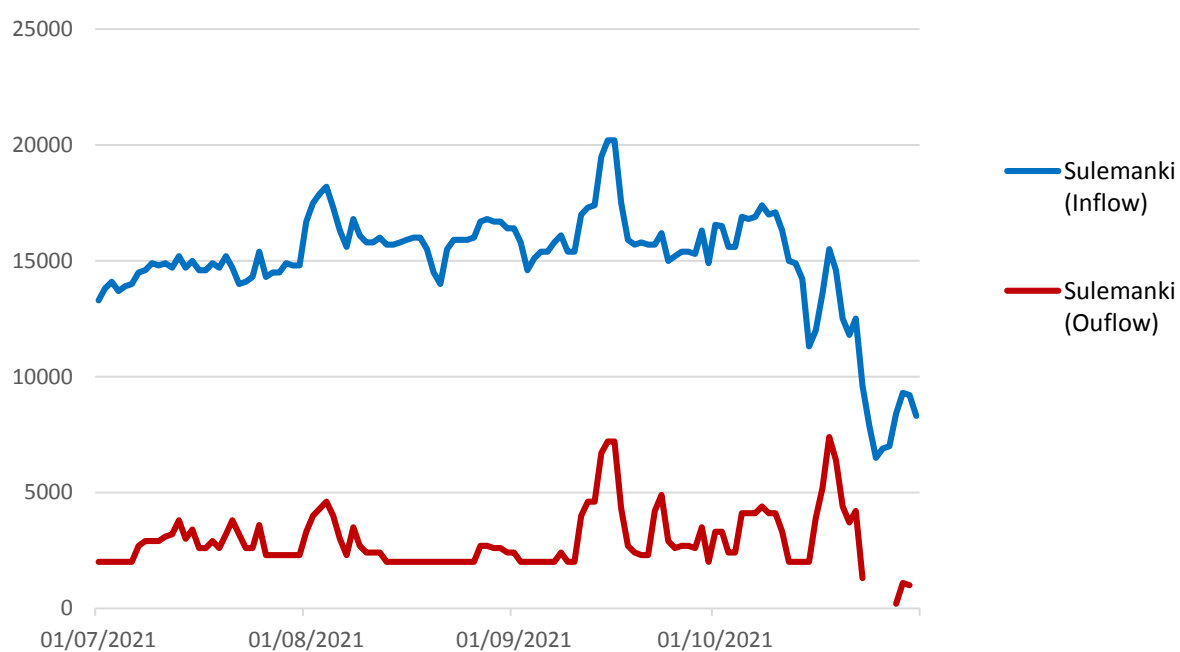
River Sutlej at Sidhnai (Jul-Oct 2021)



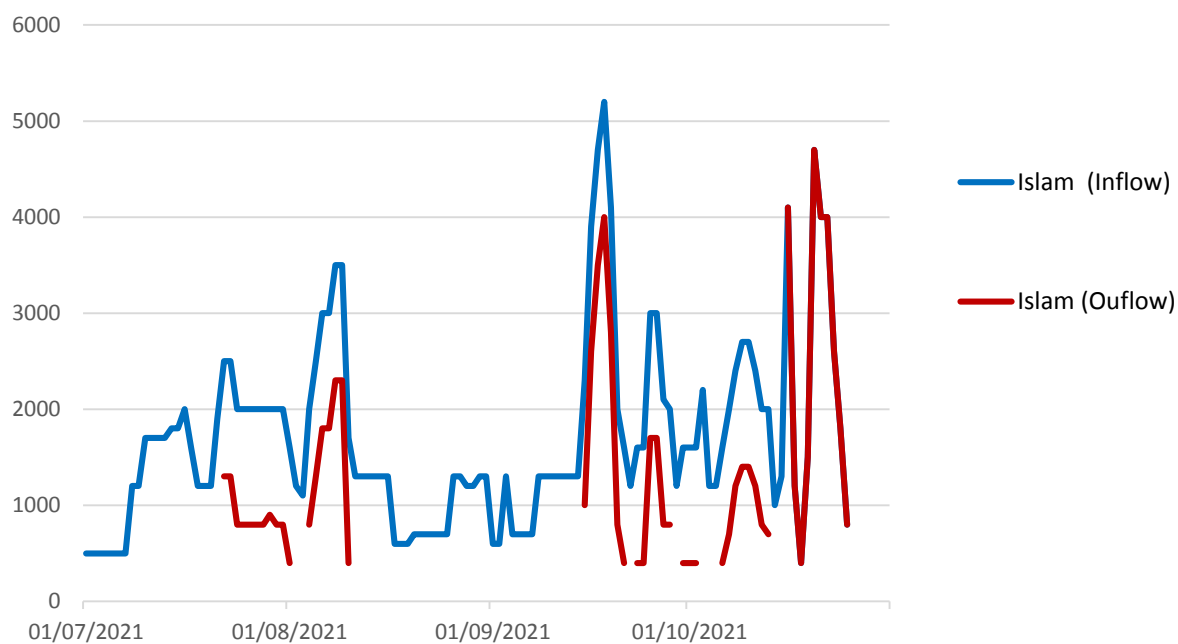
River Sutlej at Sulemanki (Jul-Oct 2021)



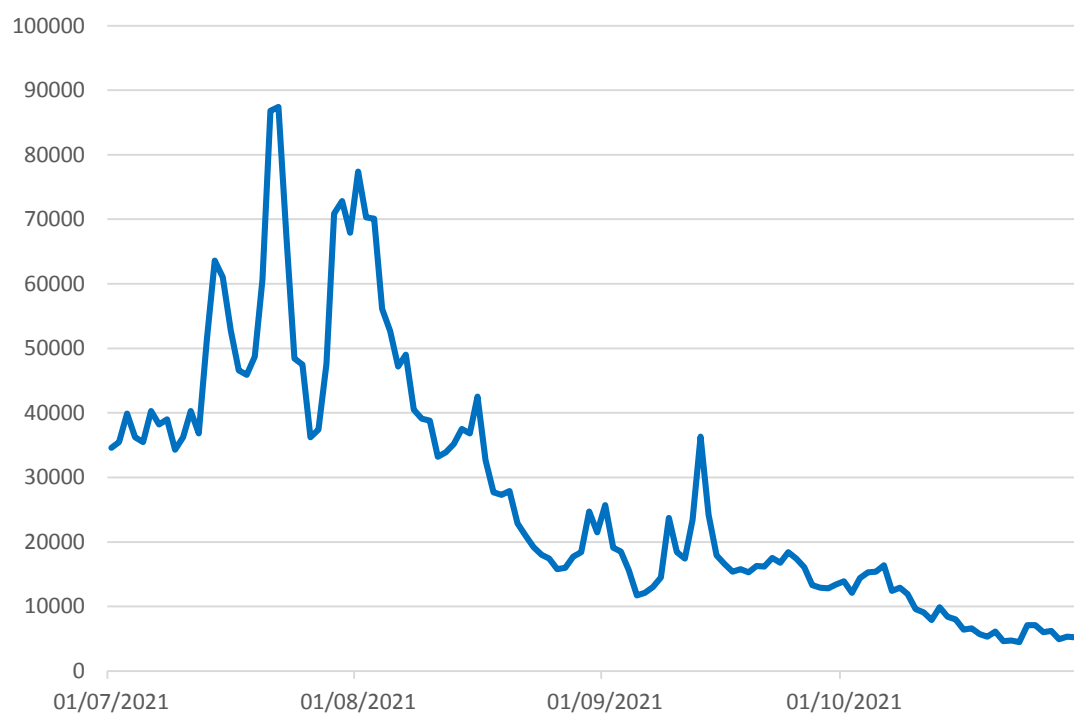
River Sutlej at Sulemanki (Jul-Oct 2021)



River Sutlej at Islam (Jul-Oct 2021)



River Kabul at Nowshera (Jul-Oct 2021)



Annexure-IV

**MONTHLY RAINFALL DATA
(JULY-SEPTEMBER 2021)**

(Source: PMD)

MONTHLY RAINFALL DATA (JULY-SEPTEMBER 2021)
(SOURCE: PMD)

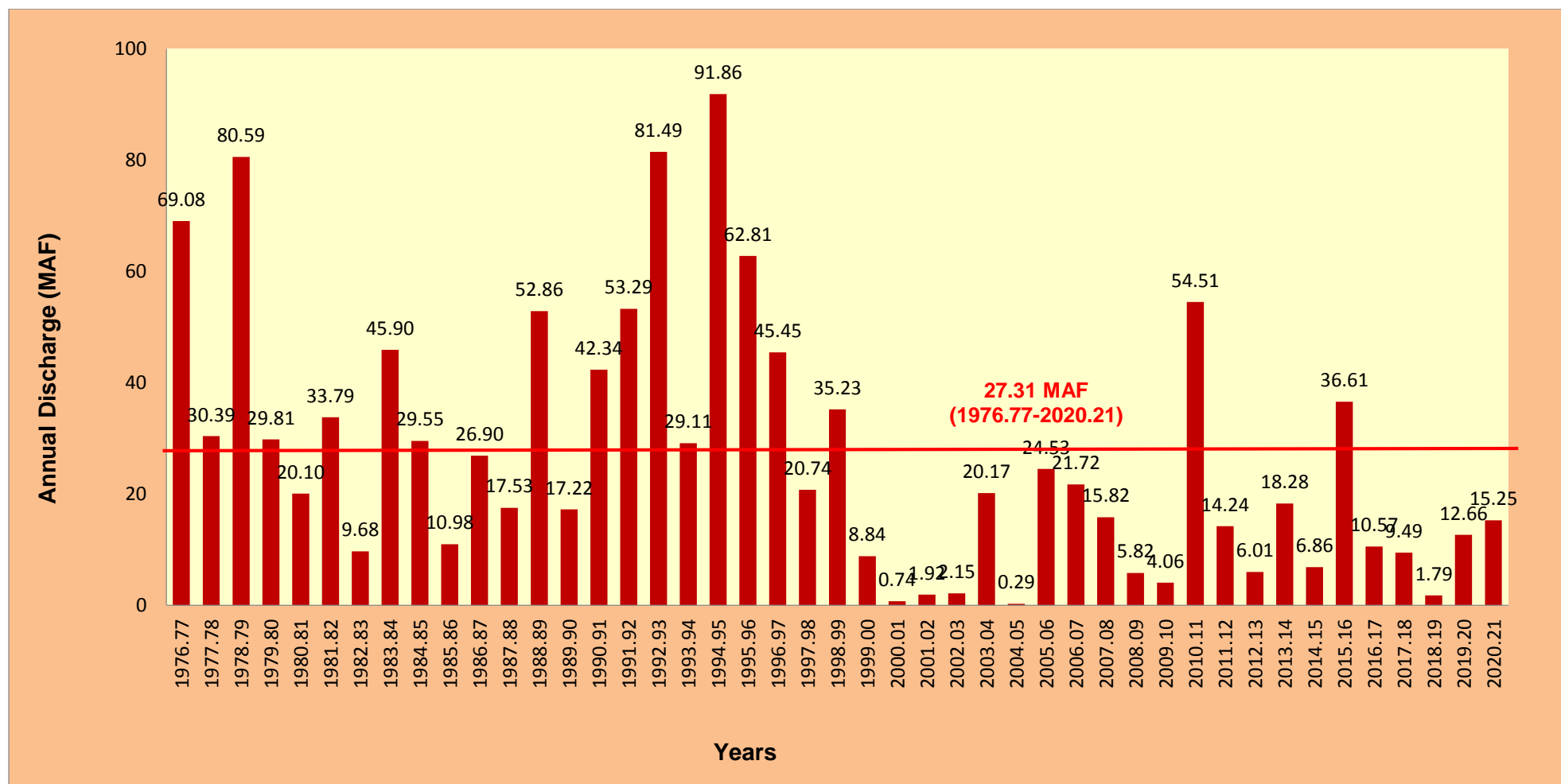
Stations	July 2021	August 2021	September 2021
	Monthly total	Monthly total	Monthly total
ASTORE	37.51	23.31	10.10
ATTOCK	84.20	170.21	77.50
BABUSAR	77.00	50.52	9.00
BACHA KHAN A/P	69.91	22.82	28.41
BADIN	53.32	0.01	144.72
BAGROTE	80.43	44.67	39.03
BAHAWALNAGAR	12.03	0.00	17.01
BAHAWALPUR,AIRPORT	69.02	42.80	16.93
BAHAWALPUR,CITY	21.31	41.80	17.01
BALAKOT	344.70	75.00	148.61
BANNU	173.40	69.00	22.01
BARKHAN	58.02	35.00	44.01
BHAKKAR	118.40	103.50	9.50
BUNJI	24.22	23.10	15.03
CHAKLALA AIRBASE	251.52	164.92	253.82
CHAKWAL	148.52	61.02	62.80
CHERAT	88.00	31.00	55.00
CHHOR	41.00	0.00	174.91
CHILAS	27.85	5.31	3.01
CHITRAL	1.42	1.02	0.01
D.G.KHAN	11.02	39.01	49.00
D.I.KHAN	60.01	42.00	16.00
DADU	16.00	0.00	24.00
DALBANDIN	55.21	0.00	0.00
DIR	134.00	171.00	25.70
DROSH	5.60	11.41	5.81
FAISALABAD	178.01	29.70	9.41
G.DOPATTA	171.40	141.40	151.70
GAWADAR	39.00	0.00	0.00
GILGIT	19.09	15.35	8.21
GUJRANWALA	305.42	60.51	80.13
GUJRAT	308.00	30.00	179.41
GUPIS	32.00	14.00	8.50
HAFIZABAD	228.50	21.01	56.10
HUNZA	14.40	0.00	14.20
HYDERABAD	33.60	0.00	45.61
ISLAMABAD, AIRPORT	222.02	103.02	123.10
ISLAMABAD,ZEROPOINT	297.90	124.03	222.70
JACOBABAD	1.00	0.00	12.00
JHANG	203.91	8.71	1.00

Stations	July 2021	August 2021	September 2021
	Monthly total	Monthly total	Monthly total
JHELUM	292.12	63.52	323.90
JIWANI	15.00	0.00	0.00
JOHARABAD	286.80	49.61	5.20
KAKUL	374.42	217.30	185.00
KALAM	59.41	31.00	12.70
KALAT	63.00	0.00	2.00
KAMRA AIRBASE	176.54	93.12	42.01
KARACHI A/P	45.49	0.08	88.36
KASUR	130.01	62.81	282.01
KHANEWAL	6.01	2.21	13.20
KHANPUR	0.70	0.00	0.00
KHUZDAR	34.90	3.21	28.20
KOHAT AIRBASE	128.02	36.02	52.01
KOT ADDU	54.81	67.01	0.00
KOTLI	316.62	57.00	88.01
LAHORE, AIRPORT	175.04	152.05	141.63
LAHORE, CITY	120.21	144.90	176.56
LARKANA	2.01	0.00	14.00
LASBELA	48.02	0.00	31.00
LAYYAH	82.22	9.01	6.31
LOWER DIR	101.00	58.00	75.00
M.JO.DARO	5.01	0.00	4.00
MALAMJABBA	434.00	231.00	134.00
MANDIBAHAUDDIN	295.56	64.01	89.00
MANGLA	314.02	126.53	201.90
MIANWALI AIRBASE	288.20	40.03	73.01
MIRKHANI	23.40	14.03	1.00
MIRPUR KHAS	30.01	0.00	7.51
MITHI	52.00	0.01	164.21
MULTAN AIRPORT	3.81	18.22	36.00
MULTAN CITY	0.04	41.51	36.00
MURREE	206.60	164.31	102.90
MUZAFFARABAD AIRPORT	215.50	65.03	168.81
MUZAFFARABAD CITY	289.00	69.31	167.01
NAROWAL	380.03	52.61	135.92
NOKKUNDI	0.01	0.00	0.00
NOORPUR THAL	254.01	51.85	19.01
OKARA	49.01	45.70	103.70
ORMARA	13.00	0.00	0.00
PADIDAN	35.04	0.00	23.52
PANJGUR	32.00	0.00	0.00
PARACHINAR	118.01	81.00	66.50
PASNI	24.00	0.00	0.00
PATTAN	39.00	89.00	9.00
PESHAWAR AIRBASE	64.52	25.15	28.30

Stations	July 2021	August 2021	September 2021
	Monthly total	Monthly total	Monthly total
PESHAWAR CITY	79.83	40.83	37.02
QUETTA (SAMUNGLI)	4.05	0.00	0.02
QUETTA (SH MANDA)	3.54	0.01	12.00
RAHIM YAR KHAN	2.01	0.00	0.01
RAWALAKOT	264.90	147.00	62.50
RISALPUR	130.04	113.61	43.06
ROHRI	32.02	0.00	0.00
SAHIWAL	22.05	8.52	57.62
SAIDU SHARIF	230.21	110.00	60.60
SAKRAND	21.00	0.00	52.60
SARGODHA AIRBASE	137.05	51.03	103.01
SARGODHA CITY	162.03	37.82	92.50
SH.B.ABAD	30.30	0.00	29.00
SHORKOT AIRBASE	49.55	3.03	17.32
SIALKOT AIRPORT	514.32	123.32	185.52
SIALKOT CANTT	544.93	65.64	158.31
SIBBI	28.01	11.01	3.02
SKARDU	11.74	7.86	2.14
SUKKUR	0.01	0.00	0.00
T.T. SINGH	174.81	74.11	0.00
TAKHT BAI	140.70	45.11	27.40
TANDO JAM	19.00	0.00	14.50
THATTA	66.00	0.00	120.00
TURBAT	59.60	0.00	0.00
ZHOB	73.00	118.00	0.00

Appendix-V

ESCAPAGE BELOW KOTRI HYDROLOGICAL YEAR FROM APRIL TO MARCH



Based on the data provided by Irrigation Department, Government of Sindh

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