

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



**ANNUAL REPORT
2020**



Urban Flooding in Karachi

**MINISTRY OF WATER RESOURCES
GOVERNMENT OF PAKISTAN**

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

(MARCH 2021)

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MINISTRY OF WATER RESOURCES**



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CHAIRMAN'S MESSAGE

The office of 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 at national level. It has played an instrumental role in formulation and subsequent approval of 4th 10-year National Flood Protection Plan and National Water Policy (NWP) 2018. NWP is entirely based on the concept of Integrated Water Resources Management (IWRM) and sets national targets in line with the SDGs.

It is very pertinent to mention that since NWP's approval, the water sector of the country has got clear direction to move towards IWRM for attaining sustainable development. In pursuance of the Plociy provisions, Government of Pakistan has increased the funding for water sector projects. The start of work on Diamer Bhasha, Mohmand Dams and many other small dams by the incumbent Government is worth appreciating. The country needs such major dams that could store 25 to 28 MAF of water as existing water reservoirs could only store approximately 13 MAF of water. In line with NWP targets, Provincial Governments have also revised their water policies/ master plans where establishment of Groundwater Regulatory Authorities remains the priority intervention.

Keeping in view the damages and inconveniences caused to increased population during the heavy rainfall events/ urban flooding attributed to climate change, drainage system of major cities need to be rehabilitated/ upgraded and hill torrent management shall also be given due priority for conservation and mitigation of floods. Like 2019, Monsoon Season of 2020 observed heavy rains leading to urban flooding in Karachi and torrential flash flooding in coastal areas of Balochistan. The cyclonic activity in coasts along Karachi and Balochistan has gradually increased due to rising sea levels caused by global warming. The other factors causing increased vulnerability to urban floods include unplanned urbanization, outdated water sewerage system and encroachments along the waterways.

For improved flood management in the country, besides promoting structural flood protection facilities, O/o CEA & CFFC has also put special emphasis on expansion of the existing flood telemetry system across the country. For that purpose, O/o CEA & CFFC has been closely coordinating with the concerned organizations for early preparation of the related plans/projects. Efforts have also been accelerated to seek the required international collaboration for early implementation of these Plans/ projects.

Foregoing in view, I am pleased to present Annual Report of O/o CEA & CFFC for the Calendar Year 2020. Last year, for the first time, we produced our Annual Report in a way that was aligned with the principles of integrated reporting and it combined the performance details of various Wings of O/o CEA & CFFC. We have continued that approach this year, confident that it provides a comprehensive and cohesive view of our performance and prospects. I wish to place on record my appreciation of the efforts put in by all the respected Heads of Wings who helped in making this Report. The overarching supervisory role performed by Member (Technical) Mr. Alamgir Khan is also well recognized and appreciated.

2020 had been a time of unprecedented challenge for us owing to Covid-19 crisis. I would like to thank the Senior Professionals and their associated officers for their continued support, hard work and dedication to work they demonstrated during the year (2020). Imbued with the passion of service and devotion, office of the CEA & CFFC will continue to work through the evolving impacts of COVID-19 with a focus on ensuring best advisory services to Ministry of Water Resources and other concerned organizations.

SENIOR MANAGEMENT AT O/o CEA & CFFC



Engr. Ahmed Kamal

*Chief Engineering Advisor & Chairman
Federal Flood Commission*



Engr. Ather Hameed

*Engineering Advisor (Civil) &
Chief Engineer (DSC)*



Engr. Alamgir Khan

Member (Technical)



Engr. Ashok Kumar

Chief Engineer (Floods)



Dr. Zia Ahmed

Engineering Advisor (Power)



Mr. Zahid Mahmood

*Director General
(Services & Financial Monitoring)*



Pictures showing 2020-Rains/ Floods in Pakistan

EXECUTIVE SUMMARY

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. Consequent upon the establishment of WAPDA in 1959, Government of Pakistan decided to substitute the authority with effect from 1st July 1959 with a compact engineering organization to be known as “*Office of the Chief Engineering Advisor*”. Prior to 1976, the Provincial Governments were mainly responsible for planning and implementation of flood protection projects. In the backdrop of disastrous floods of 1973 & 1976, Federal Government, while realizing the necessity for adopting an integrated and holistic flood management approach on country-wide basis, discussed the issue in the Inter-Provincial Conference held in January 1977 and decided to establish Federal Flood Commission (FFC) on 4th January 1977. It was then decided that Office of Chief Engineering Adviser (CEA) shall work as Secretariat of FFC, so the institute was named as Office of Chief Engineering Adviser & Chairman Federal Flood Commission i.e. O/o CEA & CFFC.

The Dams Safety Council was also constituted under the office of the CEA & CFFC in 1981 to take periodic technical inspections of the major dams and deal with the allied matters. In the backdrop of 2004 repair issues with Sukkur Barrage, the issue of Barrage safety was further added to the functions of the Dams Safety Council and it was renamed as ‘*Dams & Barrages Safety Council*’.

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:

- Civil Engineering Wing who is rendering its services since its creation in 1959.
- Federal Flood Commission- added to the Office of CEA in 1977.
- Power Wing – added to the office of CEA/ CFFC in fifties.
- Dam Safety Council – added to the office of CEA in 1981 (DBSC-Wing)
- 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. Subsequent to approval of NWP, Secretary Ministry of Water Resources designated O/o CEA/CFFC as *Secretariat of the National Water Council* on October 10, 2018. Extensive work regarding NWP Policy Implementation process, carried out by the Civil Engineering Wing, includes in-particular;

- i. Formulation of NWP Implementation Framework
- ii. Organizing first ever meeting of National Water Council.

- iii. Submission of Concept Paper on Establishment of NWP-Implementation Cell in Office of CEA/CFFC (Civil Engineering Wing).
- iv. Conducting Private Sector Consultation for their role in NWP Implementation.
- v. Advising federal units on formulation of respective Ground Water Regulatory frameworks,
- vi. Inclusion of water sector in education curriculum,
- vii. Building of data-bases of various sub-sectors of water was undertaken
- viii. Preparation of PC-I of the project “*Sino-Pakistan Smart Water Management Project*”, follow up with Chinese donor through EAD and M/o Water Resources, follow up approval process of PC-I and thereafter its implementation including coordination with implementing partners and monitoring progress.
- ix. National Report on SDG Indicator 6.5.1 was prepared and shared with UNEP, being the designated National Focal Agency/ Point
- x. Under the auspices of Civil Engineering Wing, CEA & CFFC is leading National Adaptation Committee for revision of Pakistan’s NDC’s
- xi. Collection of data on Rainwater Harvesting Projects and compile inventory on overall Pakistan basis
- xii. Cases of Bilateral Cooperation with the Govts of Hungary, China and some other countries in the field of intergrated water resources management & development.

Flood Management Wing/ FFC is a multistakeholder 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, MoWR 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.

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 (2020-21) for Normal/ Emergent Flood Programme. In Full Year Review Meeting regarding PSDP (2019-20) held on 21st September 2020 in Ministry of Planning, Development & Special Initiatives (PD&SI) under the Chairmanship of Deputy Chairman Planning Commission, it was decided to cap GoP funded Normal/ Emergent Flood Programme (PSDP Project # 995) and schemes approved up to 30th September 2020 were allowed to be processed. Therefore, no schemes could be processed through Scrutinizing Committee of FFC in FY 2020-21 so far. FFC has requested Ministry of Water Resources to take-up the matter with M/o PD&SI for review of the decision and allow FFC to continue with the Normal/Emergent Flood Programme till FPSP-III is approved, funds are allocated through prospective donor/NDRMF and the project is physically started.

Power Wing of Office of CEA/CFFC was established in fifties and is discharging the functions related to evaluation of power sector project/schemes prepared by WAPDA, NTDC, GENCOS, DISCOs, PPIB & AEDB, 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 and Barrages Safety Council (DBSC) 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 & Barrages 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 2020

Pakistan Meteorological Department (PMD) issued Seasonal Outlook for Summer Monsoon (July-September 2020) for Pakistan on 4th June 2020. The forecasted Outlook for Monsoon Season 2020 is as under:

- i. Monsoon rainfall is expected to be slightly above normal (+10%) during July to September 2020 in Pakistan.
- ii. Sindh and Kashmir are likely to receive moderately above normal (+20%) rainfall during the season.
- iii. 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 2020 (July to September), the rainfall remained above normal in upper Pakistan in July 2020. It remained above normal in lower parts of Sindh during August 2020. During the month of August, moisture was transported from the Arabian Sea which caused heavy rainfall and urban flooding in coastal belt of Sindh. PMD forecasted above normal rainfall in all parts of the country during September 2020. On the contrary, the month of September mostly remained dry throughout the country except lower parts of the country.

The storage situation in both the major reservoirs of the country (Tarbela & Mangla Dams) remained healthy. Both the Tarbela & Mangla achieved their respective Maximum Conservation Levels of 1550.00 feet and 1242.00 feet simultaneously on 28th August 2020. Tarbela Dam attained its MCL from 28th August to 22nd September 2020 (i.e. for 26 days) whereas Mangla Dam remained at its MCL from 28th - 29th August and 1st -15th September 2020 (i.e. for 17 days). *By the grace of Almighty Allah, the major reservoirs of the Indus River System (i.e. the Tarbela, Mangla and Chashma) achieved their maximum combined live storage of 13.614 MAF (i.e. 100% storage) & retained the precious resources for significant number of days which was a major breakthrough and a proud moment for the water-sector engineers of the country, especially for those working in O/o the CEA & CFFC.* This became possible due to effective management of reservoirs (especially by the WAPDA and IRSA) in line with the SOPs revised in 2018 based on Tarbela Dam 6th Periodic Inspection. As per previous SOPs, filling of only one (1) foot per day was permissible beyond elevation of 1510 feet, which under the revised SOPs has been raised to 5 feet/ day upto reservoir elevation of 1530 feet and 2 feet/ day upto MCL of 1550 feet for water short years thus enabling Tarbela Dam Management to fill the Tarbela Reservoir and augment precious water as storage.

Efforts of all stakeholders especially sensitization of stakeholders by FFC also resulted in a very effective reservoir regulation by Flood Management Committee (FMC) of Mangla Dam due to which not only potential flooding was averted but also the dam was filled to its MCL. A remarkable achievement of FMC was to absorb a flood peak of 415,000 cusecs received on 27th August 2020 by releasing only 125,000 cusecs downstream on 28th August 2020.

Heavy rainfall spell occurring in various parts of Sindh Province during 6th -8th August 2020 caused severe urban flooding in Karachi, Hyderabad and other big cities. Due to torrential rains in Khirther Hills Range on 6th - 8th August 2020, flash flooding generated in Gaj Nai and other local nullahs caused breaches in Gaj Diversion Bund in reach RD 11+000 to RD 15+000 and

F.P. Bund at five locations (RD 40+000, RD 43+000, RD 44+000, RD 52+000 & RD 75+000). Later on, all the breaches of F.P. Bund were plugged. Moreover, heavy rains in various cities of Sindh from 29th – 31st August 2020 generated urban flooding especially in Karachi where record-breaking rains wrecked havoc and lashed almost all parts of the city leading to deaths due to drowning, electrocution, as well as house and wall collapses. Personnel from the armed forces were called out to rescue stranded people and distribute food and medical aid.

Heavy rains in various parts of Balochistan (districts Khuzdar, JhalMagsi, Lasbela, Gwadar, Pasni, Kachhi & DeraBugti) during the 2nd week of August 2020 caused flash flooding in hill torrents & local nullahs. As a result, severe damages occurred to Gwadar - Karachi Coastal Highway near Pasni (Gwadar) and Quetta - Jacobabad Highway, which were later restored by the concerned Provincial and Federal Government agencies. According to NDMA, 410 lives were lost and 134,891 houses were damaged due to 2020 monsoon rains/floods.

Recommendations for better Flood Preparedness in Future

Provincial Irrigation Departments and Federal Line Agencies (PIDs & FLAs) may 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 2021. The encroachments in the floodplains and waterways/drains needs to 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 16th December 2020 and Pak. Army Post Flood 2020 Conference held on 17th December 2020 for timely completion of proposed works, so as to combat monsoon season 2021 with full preparation in a much better way. The decisions taken in FFC's Post Monsoon 2020 meeting held on 16th December 2020 are re-produced as under;

- i. **Federal Flood Commission** to issue D.O. Letters at the top level to ensure that the funds released to provinces for construction of flood protection works under Normal/Emergent Flood Programme are transferred to respective PIDs and then to field formations for expeditious completion of these works as the undue parking of Federal PSDP funds in provincial chest is badly compromising the purpose of their release.
- ii. **Provincial Irrigation Departments & Federal Line Agencies (PIDs & FLAs)** to ensure completion of all approved and ongoing flood protection schemes taken up under Provincial ADP and Normal/ Emergent Flood Programme, besides, rehabilitation and Flood Damages Restoration Works including O&M works related to Barrages/Head Works/Bridges, Irrigation, Drainage and Flood Protection Infrastructure well before the start of 2021 monsoon season.
- iii. **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 caseto be shared with FFC on regular basis.
- iv. **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 MonsoonSeason2021.
- v. **PIDs** to furnish details of O&M funds demanded as per yardstick , allocated, released & utilized during the past 10 years including current financial year (2019-20) and status of maintenance of flood protection infrastructure to FFC within a month's time.

- vi. **PID, Punjab** to coordinate with Ravi Urban Development Authority (RUDA) for conduct of model study for “Increasing Discharge Capacity of Shahdara Railway Bridge across River Ravi” and ensure its implementation on fast track being a highly sensitive project with respect to vulnerability and threat of high flows from cross border. A status report on this issue be shared with FFC and other stakeholders by January 31, 2021.
- vii. **PMD** to carry out a detailed assessment of fluctuation of daily temperatures at Skardu during Monsoon Season 2020 and its impact on seasonal flows and especially the inflows at Tarbela reservoir and furnish a detailed report to FFC within a months’ time.
- viii. **PMD** to ensure that the Weather Radar at Karachi is fully operational before the onset of next Monsoon Season 2021.
- ix. **PID, Sindh** to coordinate with concerned provincial authorities for timely provision of Environmental Study to EAD for actualization of CDWP approved PMD project of installation of Weather Radar at Sukkur.
- x. **PCIW** to coordinate with the concerned organizations and hold a meeting of Focal Persons within a fortnight to achieve a way forward for efficient working of Special Transfrontier Flood Desk at PCIW during monsoon 2021.
- xi. **Engineers Directorate, GHQ, Rawalpindi** to make arrangements relocation of Pak Army buildings by HQ 1-Corps 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 2021 to pass surplus flood water through Emergency Spillway in case of emergency situation.
- xii. **Engineers Directorate, GHQ, Rawalpindi** to conduct a meeting of all stakeholders including PID Punjab, NESPAK and FWO to achieve a viable solution regarding finalization and implementation of recommendations made in Kartarpur Corridor Project Model Study conducted by IRI, Nanipur.
- xiii. **Mangla Dam Organization (MDO), WAPDA** to expedite completion of ongoing topographic survey and geotechnical investigations by end of February 2021. The design of the channel alongwith quantum of work for rehabilitation of Barakas Nullah be optimized in consultation with Pak Army 1-Corp Mangla, for early start of proposed rehabilitation of Barakas Nullah e.i May 2021.
- xiv. **WAPDA’s (H&W Wing)** to make utmost efforts for early completion remaining work of repair and upgradation Flood Telemetry Network i.e **30th June 2021**. The progress report be shared with FFC on monthly basis till completion of task.
- xv. **Deputy Commissioner, Rawalpindi** to ensure removal of encroachments from the banks/ bed of Lai Nullah well before start of Monsoon Season 2021.
- xvi. **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.
- xvii. **Managing Director WASA Rawalpindi** to carry out fresh site survey and prepare plan for dredging/ desilting of Lai Nullah at critical reaches and process the same for approval and funding arrangements by Provincial Government. The desilting work be completed before start of Monsoon Season 2021. The progress be shared with FFC on monthly basis till completion of task.

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
Km²	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

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CIVIL ENGINEERING WING



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

SECTION – 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 most oldest and important technical organs of office of the CEA/CFFC.

1.2 Organogram

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

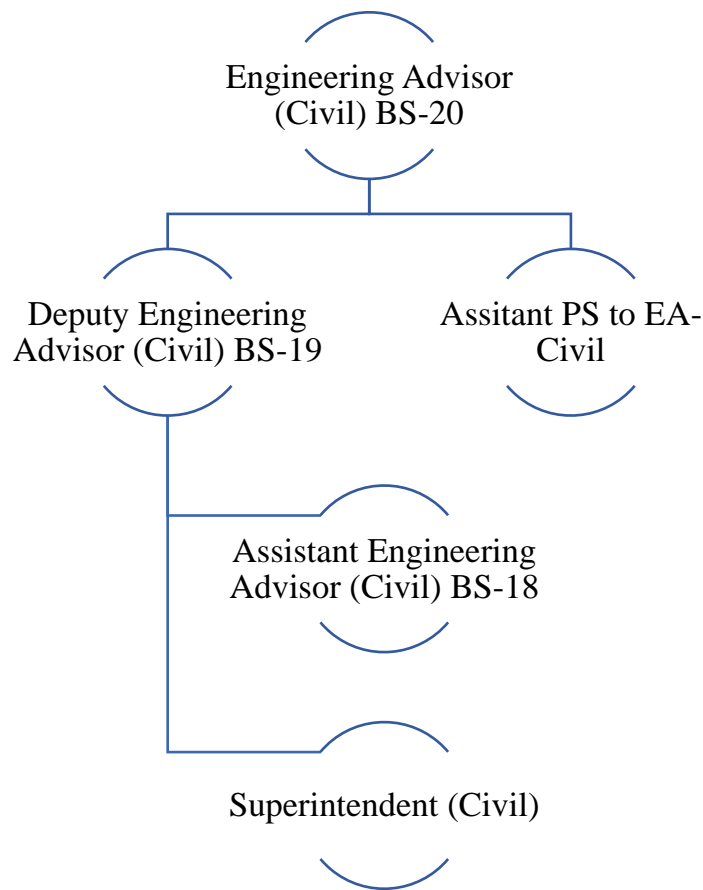


Figure 1.1: Organogram of the Civil Engineering Wing

The post of Deputy Engineering Advisor (Civil) is currently lying vacant. An Assistant Engineer from other technical wing of Office of CEA/CFFC is assisting the core team of Civil Engineering Wing.

1.3 Main Functions

The Civil Engineering Wing mainly deals with the matters pertaining to water, 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 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, SCARPⁱ, 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 neighbouring 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. Formulate the National Water Policy (NWP) implementation framework .
- vi. Inter departmental and inter provincial coordination for implementation of NWP guidelines;
- vii. Any additional duty including National Assembly and Senate Business
- viii. Pakistan is a member of the International Commission on Irrigation & Drainage (ICID) since 1953. The Civil Engineering Wing on behalf of O/o CEA/CFFC also 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 the 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 2020

During the calendar year 2020, Civil Engineering Wing of O/o the CEA/CFFC performed following annual functions related to its charter of duties given in the preceding segment;

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

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

- i. PC-I of “Indus Basin Irrigation System Automation of Discharge Monitoring at 07 pilot Key Sites” (Comments submitted on April 17, 2020 to Ministry of Water Resources)
- ii. 2nd Revised PC-I for “Remodeling of Warsak Canal System” (Views/comments were issued to Ministry of Water Resources on April 23, 2020).
- iii. PC-I of PSDP scheme titled “Construction of Mulkoh, Kosht and KaghLasht Irrigation Scheme, District Chitral” (Views/comments issued to Ministry of Water Resources on April 29, 2020).
- iv. Based on the compliance made by PID, KP, 2nd Revised PC-I for Remodeling of WARSAK Canal System, Estimated cost Rs. 16,695.81 Million was reviewed again and then forwarded to Ministry of Water Resources on May 21, 2020
- v. PC-I titled “Rehabilitation & Improvement of Canal Patrol Roads in Khyber Pakhtunkhwa” Estimated Cost Rs. 26,157.416 Million (Technical comments submitted to MoWR on May 21, 2020).
- vi. Technical comments on Revised PC-I of “Sindh Resilience Project (Irrigation Component) Estimated Cost Rs 13,827 Million” were shared with Flood Branch for onward submission to Ministry of Water Resources on June 25, 2020.
- vii. PC-I namely “Construction of Panjkora River left and right Bank Canal District Dir Lower, Estimated cost Rs.4,597.83 Million” (Technically scrutinized and views/comments sent to Ministry of Water Resource on June 30, 2020).
- viii. Technical comments were submitted to Ministry of Water Resources regarding Small Rubber Dams regarding subject “Admitted Resolutions (List No. 1)” on August 13th 2020 on the request of Ministry of Water Resources.
- ix. Inception Report of ‘Sindh Barrage Project’ was examined and comments were shared with WAPDA on November 02, 2020.
- x. PC-II titled “Environmental Study to determine the E-Flow under 969 MW NJHP” was examined and comments were shared with Ministry of Water Resources on November 09, 2020.

1.4.2 National Water Sharing Issues dealt and Expert Advices Rendered

The Civil Engineering Wing dealt the following cases related to national and international water sharing issues, based on which, expert advice was shared with M/o WR, IRSA and other concerned quarters:

- i. Technical comments on water distribution during Kharif 2020 by using newly development WAA-tool (CSIRO-Australia) were forwarded to Chairman IRSA on April 10, 2020.
- ii. Regarding the issue of sudden reduction in daily discharge in River Chenab at Marala Barrage, Office of the CEA/CFFC reviewed the case and shared historical annual flow data/ trend of River Chenab at Marala with IRSA on June 22, 2020.

- iii. Brief/information regarding 9th Round of Pakistan-CZECH Republic Bilateral Political Consultations on May 08, 2020.
- iv. Details forwarded to M/o WR regarding “Tasks for Inclusion in Performance Agreement” on May 18, 2020.
- v. Views/ Comments were sent on June 18, 2020 to Ministry of Water Resources on MOU regarding Transboundary Hydro Informatics between Pakistan and China. Further requisite information was shared again with Ministry of Water Resources regarding “MOU on Transboundary Hydro Informatics between Pakistan and China” on July 23, 2020.
- vi. Views/ comments were submitted again to Ministry of Water Resources on 24th August 2020 on “MOU on Trans-boundary Hydro-Informatics between Pakistan and China”.
- vii. MoWR was conveyed the requisite information related to implementation of Sino-Pakistan Smart Water Management Project on July 30, 2020.
- viii. On the advice of Ministry of Water Resources, technical comments were submitted to Ministry of Water Resources on the MOU titled “Implementation of SINO-PAKISTAN Smart Water Management Programme and Future Cooperation with Federal Flood Commission on Flood Control Research, Planning & Management” on August 17, 2020.
- ix. Views / comments were submitted to Ministry of Water Resources regarding “St. Petersburg Declaration of Council of Heads of States of SCO 2020” on August 17, 2020.

1.4.3 Bilateral International Collaborations Dealt during 2020

Following cases relating to bilateral international consultations and MoU’s were dealt during 2020:

Sino – Pakistan Smart Water Management Project – Phase-I

Concept Proposal (CP) namely “Sino-Pakistan Smart Water Management Project” was developed by the Office of Chief Engineering Adviser/Chairman, Federal Flood Commission with the assistance of Hohai University, China. The project proposal consists of establishing (i) a Smart Water Management Center to ensure resilience to floods hazards and water shortage, (ii) a Joint Hydrology Water Resources Research Center toward advanced research facilities and skills improvement on water management; and (iii) a Professional Training Center on Water Resources to support the capacity building for all institutions dealing with flood and drought management in Pakistan.

Concept Clearance Paper (CCP) of the project was forwarded on September 23, 2019 to the Ministry of Planning, Development and Special Initiatives through Ministry of Water Resources for further processing/approval. CCP stands approved by CDWP on March 03, 2020. CCP of the project was approved by CDWP on March 3, 2020. Draft PC-I titled “Sino-Pakistan Smart Water Management Project” was prepared and shared with stakeholders to give their views/suggestions/comments on July 09, 2020. A meeting was also held on October 27, 2020 in the Committee Room of Office of Chief Engineering Adviser & Chairman Federal Flood Commission to review, discuss and finalize PC-I of the Sino-Pakistan Smart Water Management Project (SPSWMP). The Meeting was held under the chairmanship of CEA & CFFC. The representative from Hohai University, Dr. Youwie Qin, attended the meeting via video link. Notice of the meeting was shared with all stakeholders on October 19, 2020 while minutes of meeting were shared on October 29, 2020. Draft PC-I was being amended in the light of inputs received from Chinese side, PCRWR and PMD. WAPDA is yet to share further input in spite of vigorous follow up from Civil Engineering Wing.

Grant Application Form regarding implementation of the project was sent on September 14, 2020 to Section Officer China (I&II), Economic Affairs Division Islamabad for arranging the external financing for project. Replies to the queries of Chinese Embassy on the Project titled “*Sino-Pakistan Smart Water Management Project (SPSWMP)*” alongwith amended Grant Application were shared with Ministry of Water Resources on 18th December 2020.

An MOU on the project was also being prepared. On the advice of Ministry of Water Resources, technical comments were submitted to Ministry of Water Resources on 17th August 2020. Draft MOU was submitted again to the Ministry of Water Resources on 21st August 2020 subsequently reframing it in the light of views/comments of this office already sent earlier on 17th August 2020. Subsequently, M/o WR circulated the MOU among concerned federal Ministries for their concurrence. Replies to observations of M/o WR regarding Memorandum of Understanding (MOU) on Cooperation in the Field of Hydrology, Flood and Water Resources Management between HOHAI University of Peoples Republic of China and Office of CEA/CFFC, were submitted to M/O W/R on December 22, 2020.

Urban Flood Management and Rainwater Harvesting in Islamabad

A Concept Proposal regarding ‘Urban Flood Management and Rainwater Harvesting in Islamabad Region’ proposed for implementation out of Adaptation Fund received from United Nations Human Settlements Programme was circulated among all concerned stakeholders for views/comments. Comments on Concept Proposal regarding ‘Urban Flood Management and Rainwater Harvesting in Islamabad Region’ were forwarded to UN Habitat Programme Manager, United Nations Human Settlements Programme, Islamabad.

A meeting was held on October 29, 2020 in the Committee Room of Office of Chief Engineering Adviser & Chairman Federal Flood Commission to review, discuss and finalize PC-I of the project titled “*Urban Flood Management through Integrated Rainwater Harvesting and Downstream Flood Reduction in Islamabad Region*”. Only M/o Climate Change has responded while response on the decisions of meeting is still awaited from other concerned departments inspite of follow up from Civil Engineering Wing. Last reminder was issued on December 23, 2020.

MoU's between Hungary & Pakistan in the field of Water Management

Contact details of Mr. Ahmed Kamal CEA/CFFC were shared with Section Officer (Water), Ministry of Water Resources regarding “MOU on 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.

In line with the decision taken during the Joint Commission meeting on Cooperation between Pakistan-Hungary held in EAD on August 26, 2020 and Note Verbale of Hungarian Embassy dated 2nd October 2020, the Concept Papers of the following two projects ere submitted to MoWR on November 24, 2020;

1. Contingency Planning for Mangla & Tarbela Dams in case of their failure due to historic floods - Para 20.1.4 of NWP
2. Establishment of River Hydraulics Modeling Facility in Federal Flood Commission - Para 29.2 of NWP

A virtual Pre-Meeting Conference of Joint Experts Group (JEG) regarding the implementation of MOU signed in the field of Water Management between Hungarian Ministry of Water Resources and Ministry of Water Resources, Islamabad, was held on December 17, 2020 at PST 15:30-17:30 hours (Budapest time 11:30-13:30 hours) to discuss draft Work Program (2021-23). Minutes of meeting were issued on December 31, 2020.

1.4.4 Issues dealt related to National Water Policy (NWP)

Pakistan first ever, National Water Policy was approved by the CCI in its 37th meeting held on April 24, 2018 along with signing of Pakistan Water Charter as a commitment towards assigning top most priority to the water sector. In pursuance of para 29.5.1 of the approved NWP, **National Water Council (NWC)** headed by the Honorable Prime Minister was notified by Ministry of Water Resources on June 14, 2018 for implementation of NWP. A Steering Committee was also notified on same day (June 14, 2018) to assist NWC through inter-provincial coordination, reviewing policy papers and monitoring reports before submission to NWC. Secretary Ministry of Water Resources designated O/o CEA/CFFC as Secretariat of the National Water Council on October 10, 2018. Later on it was shifted to MoWR in February 2020.

Details of various follow up actions performed by the by Civil Engg Wing related to implementation of NWP during year 2020 is given as under;

- i. Minutes of Second Review Meeting prior to the First National Water Policy Steering Committee Meeting, held on 29th January 2020 were issued to all stakeholders to intimate this office the status of follow up actions taken in pursuance of decisions pertaining to their organizations on February 13, 2020.
- ii. A letter for nomination for the Consultative meeting on Localization of Water, Energy and Food Nexus to Pakistan's Local Governance, planned for 6th February 2020, in Peshawar, was forwarded to PCRWR on February 04, 2020. Nomination for the similar meeting to be held on 27th February 2020 in Karachi was forwarded to PCRWP on February 20, 2020.
- iii. Nomination for one week international training on IWRM was forwarded to WCAP on February 14, 2020.
- iv. D.O letter to the Provincial Governments including Government of AJK and Government of Gilgit Baltistan, were issued regarding the subject regarding Nomination of Provincial Coordinator/ Focal Person on Implementation of National Water Policy.
- v. D.O letter to the Provincial Governments including Government of AJK and Government of Gilgit Baltistan issued to follow up the matter regarding Establishment of Ground Water Regulatory Authority.
- vi. 50 coloured copies on National Water Policy (NWP) along with brief on achievements made so far were submitted to M/o WR for onward submission to National Assembly.
- vii. Policy recommendations regarding "Implementation of Integrated Water Resources Management (IWRM)" as given in NWP were shared with PCRWR on September 01, 2020.
- viii. Follow up letter was written on September 14, 2020 to Director General, Small Dams Irrigation Department, Govt. of KP (Focal Person on NWP) requesting for submission of updated status regarding "Establishment of Groundwater Regulatory Authority".
- ix. Provincial Coordinators on NWP for PID, Punjab, PID Balochistan and Government of Gilgit Baltistan, Gilgit were requested on 7th September 2020 to provide detail of water sector initiatives/ projects related to "Enhancement of Allocation for Water Sector Projects in Federal PSDP and Provincial ADP". Follow up letters were also issued on September 23 & 29, 2020.

- x. Matter followed up with Project Coordinator, Irrigation Department, Government of Balochistan regarding “Establishment of Ground Water Regulatory Authority” on September 23, 2020. In this respect, another follow up letter was issued on September 29, 2020 to Director Water Management, Govt of Gilgit-Baltistan Gilgit.
- xi. Punjab Irrigation Department, Lahore was requested on September 30, 2020 to furnish the name of department/authority responsible for regulation of matters related to ground water management.
- xii. On October 23, 2020, Director General, Irrigation & Small Dams Directorate, Govt of AJ&K, Muzaffarabad was reminded to furnish a brief explaining the system in place with Irrigation & Small Dams Department, notified by the Government of AJ&K, authorizing the department for performing the functions related to groundwater regulations & monitoring as per provision of NWP. He was also requested to explain the system of enforcement of regulation/mechanism and standards to ensure sustainability, transparency, efficiency, safety and affordability of groundwater resources in AJ&K. Another follow up letter was issued on December 29, 2020.
- xiii. Matter was followed up with Water Management, Agriculture, Livestock & Fisheries Deptt, Govt of Gilgit-Baltistan, Gilgit regarding “Establishment of Ground Water Regulatory Authority” on October 23, 2020. Another follow up letter was issued on December 29, 2020.

In pursuance of targets set in NWP, , following initiatives/water sector projects have been carried out/being carried out for sustainable management and development of water resources in Pakistan:-

Enhanced Allocations for Water Sector under Federal PSDP

- The Government of Pakistan is fully committed to cope with the negative fall-outs of climate change. 'Vision 2025', blueprint for a future-oriented and growth-centric roadmap for Pakistan, clearly recognizes global warming and climate change as priority areas for effective action by the government. Availability of adequate finance is at the core of the battle to confront the adverse impacts of climate change. Based on the above stated allocation target and subsequent investment plan, allocation for the water sector in Federal PSDP increased up to Rs 61.616 billion (6.16%) in Financial Year 2018-19 and Rs 85.727 billion (9.01%) during Financial Year 2019-20.
- In current F.Y (2020-21) allocation of Rs. 182.96 billion for the water sector is 28.14% of total 650 billion budget of PSDP of current financial year which is considerably above target set by NWP for 2030.
- The provinces have also been requested to enhance their water sector allocation under their respective ADPs.

Construction of Water Storages/Dams

- Work on two mega dams (Diamer Bhasha Dam with live storage capacity of 6.4 MAF and Mohmand Dam with live storage capacity of 0.67 MAF) has been started.
- WAPDA has also prepared a comprehensive plan for construction of water storage projects upto 2050.
- In Punjab Province Ghabir Dam, Papin Dam Project and Cherah Dam Project are under construction in Islamabad region through federal PSDP.

Rainwater Harvesting

- In Sindh province, as of 2019, 28 small storage dams have been completed through federal funding whereas 7 more are in progress. Total storage capacity of the completed reservoirs is 166,743 acre-feet (i.e. 0.167 MAF), whereas, 85,191 acres area shall be benefitted. Under provincial ADP, 36 projects of construction of small storage dams / delay action dams, retention weirs and I.S.S.O (Impervious sub surface outflow) barriers have also been completed and 12 are in progress under provincial ADP. The total storage capacity of the completed dams is 230,951 acre-feet (0.231 MAF) whereas 91,409 acres shall be benefitted.
- In KP, 13 No. of small dams have been completed while 14 No. small dams are under various stages of execution. Reportedly work on two dam projects has also been started through financial assistance provided by the World Bank.
- Consistent with NWP, Rainwater Harvesting is a relatively new and innovative concept being used in the country for water conservation for crops and livestock as well as groundwater recharge. Based on the countrywide data received so far 3,606 rainwater harvesting schemes in KP, 180 in Punjab and 60 schemes in Sindh have been completed.

Establishment of Groundwater Regulatory Authorities

- In pursuance of approved National Water Policy, the Provincial Governments are working on establishment of Groundwater Regulatory Authorities to regulate groundwater extraction for appropriate water pricing for industrial, agricultural and domestic use.
- In the Punjab province, Punjab Water Act 2019' stands approved by the Punjab Assembly on November 20, 2019, the same had been enacted in the province after approval of competent authority for the purpose of regulation of water and sewerage services. Under the new Act, establishment of a new Authority had also been approved by the Punjab Government so as to regulate and monitor issues pertaining to water supply (including the abstraction of groundwater), sewerage and other issues like environment and recreation etc.
- Governments of Sindh and KP have initiated work on formulation of Groundwater Regulatory Act and subsequent enactment with the approval of their respective Provincial Assembly through establishment of Groundwater Regulatory Authorities.

Water Use Efficiency and Conservation

- PCRWR provided Irrigation advisory services to 21,000 farmers in 41 districts of Pakistan. The service is being up scaled to 100,000 farmers.
- Scientific monitoring of trans-boundary groundwater aquifers along the Eastern Rivers'' was also being done by the PCRWR. The study is expected to be completed by 2021.
- In collaboration with IRSA, PCRWR is planning to install state-of-the-art telemetry system along the main canals and barrages in Pakistan. The system has been piloted on 4 main canals in the provinces.

Lining of Distributaries & Minors

- Federal Government is financing a program for ‘Lining of Distributaries & Minors in Sindh province costing Rs 13,828.322 million’. Under this project, 109 channels have to be lined, out of which, 55 have been completed whereas 32 are in progress. The total length of 860 miles/ 1384 km has to be completed and it is expected to save 950 cusecs of water. Under provincial ADP, about 52 schemes have been completed with cost of Rs. 22,085.010 million, covering the lining of about 631.588 miles /1016.41 km of main canals, distributaries and minors. The lining work on 37 numbers of schemes of total 567.539 miles/ 913 Km is in progress with cost of Rs. 37,179.904 million, which after completion, is expected to save 1,100 cusecs of precious water.

Modernization of Irrigation and Drainage System

- Through World Bank funding, PID Sindh has been implementing a ‘Water Sector Improvement Project’ which aims to modernize irrigation & drainage system in a systematic way and deal with floods & drainage issues so as to increase agricultural production, employment and income through irrigation of over 1.8 million ha in Sindh province. The total cost of project is Rs. 30,353 million, out of which World Bank Loan is Rs. 28,840 million and Rs. 1513 million is Sindh share. Overall progress is 85%.
- PID KP has planned to expand/rehabilitate irrigation network in order to bring 300,000 acres additional area; increased ADP (from 7.4% to 11%).
- Irrigation Department, Government of the Punjab has completed the rehabilitation/ remodelling & modernization works at Jinnah, Taunsa, Baloki, and Khanki Barrages whereas rehabilitation/ remodeling& modernization work was near completion at Sulemanki (99.96%) and in progress at Trimmu (91%) and Panjnad (52%). New Khanki Barrage has the enhanced capacity of 11.0 lac cusecs as against old capacity of 8.5 lac cusecs. Capacity of Baloki Barrage has been increased from 2.25 lac cusecs to 3.8 lac cusecs.
- Rehabilitation work at Trimmu (with capacity to be enhanced from 6.45 to 8.65 lac cusecs) is planned to be completed by June 2022. Rehabilitation work at Panjnad Barrage (with capacity enhancement from 7.00 to 8.65 lac cusecs) is likely to be completed by June 2022.
- In Sindh, rehabilitation and modernization of Guddu Barrage and its associated structures is under process. Rehabilitation of Sukkur Barrage is also ongoing.
- Baran Dam Raising has been taken up by Irrigation Department, Government of KP which envisions raising the dam height from present 120 ft to 142.90 ft (by 7 meters), thus increasing its storage capacity from 12,500 acre-feet to 100,000 acre-feet.
- O/o CEA/ CFFC is collaborating with College of Hydrology and Water Resources, Hohai University for conducting Joint Research on hydrology, water resources, smart water management and mitigation of floods hazards. CCP of the project was approved by CDWP on March 03, 2020, based on which PC-I is at final stage of preparation.

Flood Protection

- FFC has played a pivotal role in improving the National Flood Protection, Forecasting & Warning System in the country under the umbrella of three 10 yearly National Flood Protection Plans (NFPPs). NFPP-IV formulation began in the aftermath of devastating

floods of 2010. It was formally approved by the CCI in May 2017, after a rigorous consultative process both at technical and political levels. NFPP-IV targeted to protect 2,479,555 hectares area from inundation by flood water, 779,250 hectares of lands from erosion besides reclamation of 154,180 hectares of eroded land.

- Based on the NFPP-IV, Concept Clearance Paper (CCP) for FPSP-III based on NFPP-IV (Cost of Rs 95.980 Billion) was prepared and forwarded to Ministry of Water Resources for further processing on 6th December 2019. CDWP approved the CCP on March 03, 2020 based on which Umbrella PC-I drafted through in-house capacity has been submitted to Planning Commission on June 23, 2020 through MoWR for further processing for approval by CDWP/ECNEC. PC-I has been approved by the CDWP on October 12, 2020 and recommended the project for approval by the ECNEC.
- Under FPSP-III, PMD has proposed four projects indicating their requirement for installation/ replacement of Weather Radars and Automatic Weather Stations (AWS) as well as establishment of Flood Early Warning Centers.
- Ministry of Climate Change project titled “Recharge Pakistan: Building Pakistan’s Resilience to Climate Change through Ecosystem Based Adaption for Integrated Flood Risk Management” is also included in 3rd Flood Protection Sector Project (FPSP-III) based on NFPP-IV. Concept Paper already stands approved by CDWP of Ministry of PD&SI on March 03, 2020. Four RAMSAR sites are included in this project for re-routing of flood water.
- WAPDA is developing a country-wide National Flood Telemetry Master Plan relating to provision of expansion and modernization of telemetry system in four (04) provinces, Gilgit-Baltistan and AJ&K. The Plan will cover the main river system, the secondary and tertiary rivers, all small streams/nullahs, hill torrents etc. having overall significance towards our precious water resources with regard to quantity, contribution and health of total surface water on efficient utilization. Once made and implemented on priority basis this will immensely support WAPDA’s real-time contribution in the issuance of most precise reservoir operation criteria by IRSA, real-time forecasting/now casting by PMD/FFD and effective country-wide management of floods by all concerned including the O/o CEA/CFFC.

1.4.5 Implementation Framework of National Water Policy

- Based on the NWP objectives, strategic priorities and national targets as well as the projects already initiated by the concerned Federal and Provincial organizations, O/o CEA & CFFC, through an in-house effort, has prepared an Implementation Framework (2018-2030) of NWP.
- Draft NWP implementation Framework stands submitted to M/o WR on July 01, 2020. Available in soft form on official website of O/o CEA & CFFC (ffc.gov.pk)
- NWP Implementation Framework contains 163 No. of interventions required to be adopted by the concerned departments/ organizations for implementation in four different timeframes so as to achieve the national targets within the stipulated timeframe i.e. by 2030.

- 18 No. immediate actions; (mainly including ongoing projects likely to be completed by the end 2020)
 - 71 short term measures;
 - 58 medium term measures; and
 - 16 long term measures
- Short term measures include feasibility studies for water programs, adoption of water conservation techniques/ need based irrigation approaches at farm level and nexus approach etc. besides promoting new national water saving campaign/ awareness programs and estimation of water demand for all sectors.
 - Small dam's construction for local and regional use, retrofitting of existing water infrastructure, rainwater harvesting, water quality monitoring, treatment of wastewater, and bioengineering measures to control urban floods etc. are added in Implementation Framework (2018-2030) of NWP as medium term interventions.
 - Long terms measures mainly include WAPDA's Plan for implementation of water storage/dam projects under short term priority upto 2030, mid-term priority upto 2040 and long term priority upto 2050, as included in Implementation Framework of NWP. Timely implementation of these projects shall result into availability of 11.52 MAF live storage plus 5,535 MW Hydropower under Short Term Priority, 17.10 MAF live storage plus 4,840 MW Hydropower under Mid Term and 7.60 MAF live storage plus 2,345 MW Hydropower under Long Term priority with cumulative effect upto 2050 of the order of 36.22 MAF in live storage and 12,720 MW in hydropower.

1.4.6 Role as PANCID Secretariat

The purpose of PANCID is to promote the aims and objectives of ICID in Pakistan and act as the liaison body for ICID activities by exchanging technical information with ICID and its member countries on irrigation, drainage and flood control. The PANCID is mandated to organize specialized and regional ICID conferences on matters relating to irrigation, drainage and flood control, either independently or in association with other organizations. The Committee encourages the submission of papers for presentation at ICID congresses, conferences, symposia and workshops.

Following actions were taken as PANCID Secretariat:

- i. Follow up letter regarding intimation of postponement of 24th ICID Congress and rescheduling of 71st IEC owing to the impact of the Covid-19 on global health and economies forwarded to all PANCID members on April 09, 2020.
- ii. Following detail was shared with ICID regarding activities carried out in 2019-20 for inclusion in their report on 29th May, 2020.
 - a) Country profile with details on agriculture scenario of the county.
 - b) Colored photographs of water sector projects.
- iii. Request was sent on June 10, 2020 to the concerned Provincial Departments and Federal Line Agencies to provide the inputs as per prescribed outline for incorporation in "ICID's Technical Book on Water Charging Polices".
- iv. Provinces and Federal Line Agencies were also requested on June 17, 2020 to furnish their feedback for incorporation in ICID's Annual Report 2019-20.

- v. PANCID members (both individual and organizational) were informed on June 30, 2020 regarding postponement of various ICID events due to Covid-19 crisis, new dates announced for these events and detail of various research articles published.
- vi. Country profile of Pakistan containing data related to irrigation and agriculture scenario and 3-4 pictures of water sector projects was updated based on the secondary information available on internet and shared with ICID for incorporation in its next yearly report.
- vii. Matter was followed up with concerned organization for sharing the details regarding Irrigation & Drainage Data for ICID Annual Report on July 10, 2020.
- viii. Information was shared with all stakeholders regarding Irrigation and Drainage-Journals (Volume 69 Number 1 February and Volume 69, Number 2 April 2020) on July 16,2020.
- ix. Matter was followed up with concerned organization for sharing the details regarding elections of Office Bearer of ICID for the position of President and three Vice Presidents will be held in 71stIEC meeting, Scheduled to be held on December 07, 2020 (tentatively) in Marrakech, on August 05, 2020.
- x. Questionnaire sent to all PANCID members regarding “Laws and regulations of countries for technical guidance on policy and legal approaches to water saving” on August 25, 2020.
- xi. Email sent to all members of PANCID regarding Water Save Awards and recognition of World Heritage Irrigation Structures (WHIS) on August 25, 2020.
- xii. In response to minutes of 10th meeting of PEC ThinkTank Sub-Committee on Water held on March 12, 2020 at PEC HQ., letter regarding information of office bearers of ICID was issued to PEC on September 03, 2020.
- xiii. Follow up letter was sent on September 03, 2020 to all Provinces requesting for sharing the requisite information as per requirements of ICID for inclusion in the “Technical Book on Water Charging Policies”.
- xiv. Follow up letter was sent on September 07, 2020 to all Provincial Irrigation Department regarding provision of Irrigation & Drainage Data for inclusion in the ICID Annual Report.
- xv. Pakistan Engineering Congress, Lahore requested for soft copies of “Irrigation and Drainage-Journals (Volume 69, Number 1, February 2020 & Volume 69, Number 2, April 2020). Accordingly PEC, Lahore was clarified about the downloading the same as per ICID policy.
- xvi. In response to request of ICID for payment of arrears, U.O Note was sent to Administrative Wing, O/o CEA/CFFC, Islamabad asking for processing the case for submission of arrears to ICID on October 20, 2020.
- xvii. 50th Annual meeting was held on December 14, 2020. Minutes of meeting were circulated among the members on December 31, 2020.

1.4.7 Important Meetings Attended/ Organized

The following important/ high level meetings were attended by the senior officers of Civil Engineering Wing;

- i. EA (Civil) attended the meeting regarding “*Real Time Flow Measurements Telemetric Monitoring by IRSA*” on June 10, 2020 and June 16, 2020.
- ii. 8th Meeting of BOG of Ministry of Science & Technology held on 23rd July 2020 was attended by CEA/CFFC via Internet Zoom link” on July 21,2020.

- iii. One day consultation workshop on ‘Raising Awareness on Water Resources Management’ was attended by AEA(Civil) in District Muzaffargarh on August 17th, 2020”.
- iv. The seminar on ‘Delivering on the National Water Policy in KP-flow monitoring in Canals’, Islamabad” was attended by the EA (Civil) on 21st August held in PCRWR Office Islamabad.
- v. PCRWR was conveyed on 31st August 2020 the nomination of Mr. Zafar Iqbal, AEA (Civil) to attend the meeting on subject “Consultation on localisation of water energy and Food nexus to Pakistan’s Local Governance, 3rd September 2020, Islamabad”. Meeting was accordingly attended by the nominated officer.
- vi. 11th Standing Committee Meeting on Water Resources held on 10th September 2020, was attended by the Chief Engineering Adviser/Chairman Federal Flood Commission along with Member (Technical) and Engineering Adviser (Civil)
- vii. 11th meeting of “PEC Think Tank Sub-Committee on Water was held on 30th September 2020 and was attended by the theChief Engineering Adviser/Chairman Federal Flood Commission and Engineering Adviser (Civil).
- viii. Engineering Advisor (Civil) attended the PCRWR event regarding “Consultation on Development of Groundwater Management Plan in Pakistan” held on 23rd September 2020.
- ix. 9thMeeting of BOGs of PCRWR held on 1stOctober 2020 was attended by the CEA/CFFC.
- x. CEA&CFFC also attended the discussion on ‘Water security Challenges and Conservation Strategy for Pakistan’ held in Centre for Global and strategic Studies Islamabad on October 06, 2020.
- xi. A meeting / presentation session on ‘*Underground Storm Water Reservoirs*’ was held on 5th October 2020 in the Committee Room of Office of the Chief Engineering Adviser/Chairman Federal Flood Commission, Islamabad. Professionals from WASA, Lahore made a detailed presentation about their master plan for construction of underground storm water reservoirs in Lahore. Salient features of one such facility constructed at Lawrence Garden, Lahore were also presented during the meeting.Minutes of meeting shared with all stakeholders on October 14, 2020.
- xii. Meeting was also held on October 27, 2020 in the Committee Room of Office of Chief Engineering Adviser & Chairman Federal Flood Commission to review, discuss and finalize PC-I of the Sino-Pakistan Smart Water Management Project (SPSWMP). Draft PC-I was being amended in the light ofsubsequents inputs received from Chinese side, PCRWR and PMD while response from WAPDA is still awaited inspite of vigorous follow up from Civil Engineering Wing
- xiii. Another meeting was held on October 29, 2020 in the Committee Room of Office of Chief Engineering Adviser & Chairman Federal Flood Commission to review, discuss and finalize PC-I of the project titled “*Urban Flood Management through Integrated Rainwater Harvesting and Downstream Flood Reduction in Islamabad Region*”. Only Mo Climate Change has responded while response on the decisions of meeting is still awaited from other concerned departments inspite of follow up from Civil Engineering Wing. Last reminder was issued on December 23, 2020.
- xiv. A virtual Pre-Meeting Conference of Joint Experts Group (JEG) regarding the implementation of MOU signed on July 13, 2020 in the field of Water Management between Hungarian Ministry of Water Resources and Ministry of Water Resources, Islamabad, was held on December 17, 2020 at PST 15:30-17:30 hours (Budapest time 11:30-13:30 hours) to discuss draft Work Program (2021-23).

1.4.8 National Report on SDG Indicator 6.5.1

The office of the CEA/CFFC was designated as the National Focal Point to report on Pakistan's progress to UNEP on SDG Indicator 6.5.1, as degree of Integrated Water Resources Management (IWRM) Implementation. In the above context, one-day obligatory Consultative Workshop/ Stakeholders Conference on SDG 6.5.1 Indicator (IWRM) was successfully organized by this office in collaboration with Pakistan Water Partnership (PWP) on July 20, 2020 at Millennium Hotel Islamabad, PAFSOM Arena, Sector E-9, Main Margalla Road, Islamabad. As per Workshop proceedings, comprehensive National Report on SDG Indicator 6.5.1 for Pakistan has been prepared which indicates improved degree of implementation of Integrated Water Resources Management (IWRM) in Pakistan.

Based on inputs obtained from all related Federal and Provincial stakeholders, during this exercise of 2020, **National SDG 6.5.1 score of '56' has been worked for Pakistan** which is considerably greater than earlier national SDG 6.5.1 score of '50' worked out in 2017 during the similar workshop held in Islamabad on 20th December 2017. National Report on SDG Indicator 6.5.1 (Integrated Water Resources Management) finalized by O/o CEA & CFFC for Pakistan was submitted to the concerned quarters on July 30, 2020. Secretary, Ministry of Water Resources was informed on September 01, 2020 about successful organization of Stakeholder Conference on sustainable Development Goal Indicator 6.5.1 held on 20th July 2020" and subsequent excellent remarks received from UNEP.

1.4.9 National Report on SDG Indicator 6.5.2

On request of Ministry of Water Resources, template for SDG Indicator 6.5.2 related to transboundary cooperation on water issues in Pakistan was also filled-in and submitted to Ministry of Water Resources on June 05, 2020. Following indicator values for SDG 6.5.2 were worked out for the country;

Surface waters:

Percentage of surface area of transboundary basins of rivers and lakes covered by an operational arrangement = 44.4 %

Aquifers:

Percentage of surface area of transboundary aquifers covered by an operational arrangement = 0 %

Sustainable Development Goal Indicator 6.5.2:

Percentage of surface area of transboundary basins covered by an operational arrangement = **22.5 %**

1.4.10 Preparation of Pro Poor Strategy

Draft Pro poor strategy document was prepared and submitted on September 22, 2020 to Ministry of Water Resources regarding "Prime Minister's Task Assigned to Ministry of Planning Development and Special Initiatives – PRO Poor Goals and Indicators for Every Ministry".

1.4.11 Revision of Pakistan Nationally Determined Contributions (NDCs)

On request of Ministry of Climate Change, Secretary, Water Resources designated CEA & CFFC as Lead of the Technical Review Committee on Adaptation regarding revision of Pak NDCs submitted earlier in November 2016 to UNFCCC. Subsequently, Concept Paper related

to revision of NDCs, as received from MoCC, was shared with concerned organizations on November 05, 2020 with the request to nominate suitable officers to act as member of Technical Review Committee on Adaptation and associated seven sectoral Working Groups.

Preliminary Meeting to finalize Composition/TORs of Technical Review Committee on Adaptation regarding revision of Pakistan's Nationally Determined Contributions (NDCs) was organized by this office on 16th November 2020. Notice of meeting was issued on 10th November, 2020. Minutes of the Preliminary Meeting regarding Revision of Pakistan NDCs were shared with all stakeholders on November 18, 2020.

2nd Progress Review Meeting of Technical Review Committee (TRC) on Adaptation and Associated Working Groups regarding Revision of Pakistan's NDCs was organized in Committee Room of GCISC. The meeting was chaired by CEA&CFFC being chair of TRC. Minutes of 2nd Progress Review Meeting of Technical Review Committee (TRC) on Adaptation and Associated Working Groups regarding Revision of Pakistan's NDCs, were circulated among stakeholder departments on 11th December 2020.

D.O letters were issued on 8th December 2020 to Chairman NDMA, Chairman PCRWR, PDMA Punjab, Sindh KP and Balochistan, SDMA AJ&K & PIDs of Four Provinces on 8th December 2020 regarding "Revision of Pakistan's Nationally Determined Contributions (NDCs) Submitted earlier in November 2016 to UNFCCC.D.G (Environment/CC), M/o Climate Change, Islamabad was requested to extend support for organizing one day workshop as Third Progress Review meeting regarding revision of Pakistan's Nationally Determined Contribution (NDCs).

Photographs: Some Activities of Civil Engineering Wing

NWP Implementation Framework contains 163 No. of interventions required to be adopted by the concerned departments/ organizations for implementation in four different timeframes so as to achieve the national targets within the stipulated timeframe i.e. by 2030.

18 No. immediate actions;
71 short term measures;
58 medium term measures; and
16 long term measures

FRAMEWORK FOR IMPLEMENTATION OF NATIONAL WATER POLICY (2018-2030)



JUNE 2020

OFFICE OF CHIEF ENGINEERING ADVISER & CHAIRMAN
FEDERAL FLOOD COMMISSION, ISLAMABAD

ACTIVA
Go to P...



SUSTAINABLE DEVELOPMENT GOAL 6
Ensure availability and sustainable management of water and sanitation for all

GOALS by 2030

1. Achieve universal and equitable access to safe and affordable drinking water for all.
2. Achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.
3. Improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.
4. Substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.
5. Implement integrated water resources management at all levels, including through transboundary cooperation as appropriate.
6. Protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.

Pakistan Water Partnership
Apartment # 116, Park Towers, Sector F-10 Islamabad Pakistan. Dh: +92 33 230 9000 Fax: 952 210 9002

STAKEHOLDERS WORKSHOP
Sustainable Development Goal Indicator on IWRM (6.5.1)
Islamabad, July 20th, 2020

Water is Life

Conserve it

Pakistan Water Partnership
Apartment # 116, Park Towers, Sector F-10, Islamabad-Pakistan
Tel: +9233231 210 0600 -1 | Email: pwp@pwp.org.pk

Save Water Save Life

Water is Life Conserve It





DAMS AND BARRAGES SAFETY COUNCIL



Mohmad Dam Project Site

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

SECTION – 2: DAMS AND BARRAGES SAFETY COUNCIL/ DBSC WING

2.1 Creation of Dams Safety Council

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

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

Large Dams are being operated & maintained by WAPDA which plays 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 245 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

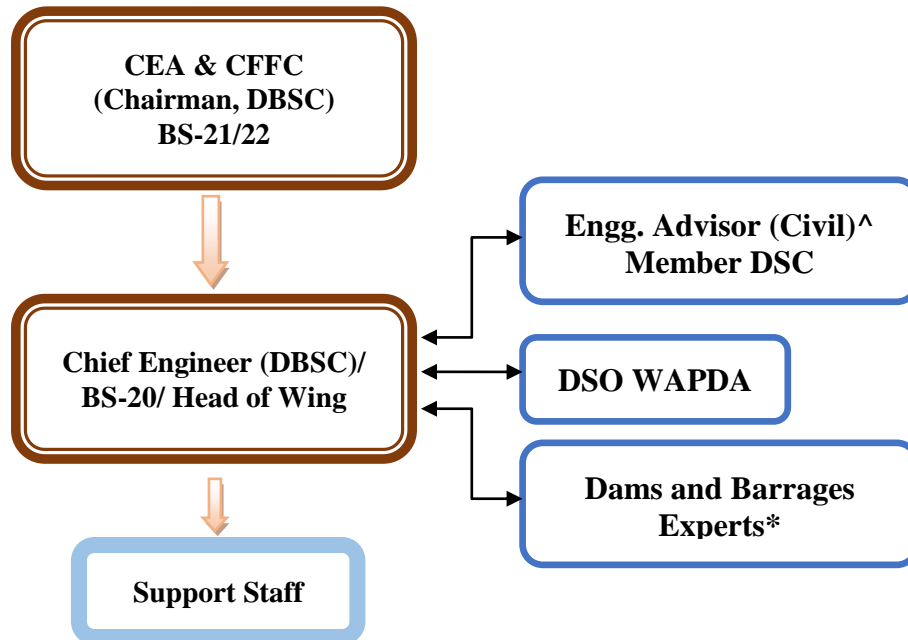
Sr. No.	Name of Province	Completed Dams (No.)		Ongoing (No.)	Proposed (No.)	Total * (No.)
		Total Dams	Large Dams [^]			
1	Punjab	59	59	6	2	67
2	Sindh	85	-	31	8	124
3	Khyber Pakhtunkhwa	27	27	13	25	65
4	Balochistan	614	150	31	65	710
5	Merged Area, KP	5	0	6	0	11
	Sub-Total	790	236	87	100	977
	WAPDA's Mega Dams	9	9	7	14	30
	Grand Total	799	245	94	114	1007

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

[^] Based on ICOLD Criteria regarding height of dam i.e. height > 15 meters i.e. 49.20 feet.

2.2 Organogram

Dams and Barrages Safety Council (DBSC) is headed by a Grade 20 officer designated as Chief Engineer (DSC). The organogram of Dams and Barrages Safety Wing is shown in **Figure 2.1**.



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

^ As per Establishment Division O.M No. 12/6/80-C.V. dated May 26, 1981

Figure 2.1: Organogram of Dams and Barrages Safety Council

2.3 Issues Faced by Dams and Barrages Safety Council

Dam and Barrages Safety Council is the most understaffed wing of O/o CEA & CFPC. A study for strengthening the regulatory capacity of Dam and Barrage Safety Council of O/o CEA & CFPC 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 the former Ministry of Water & Power (Now Ministry of Water Resources). Under this study, Pakistan's Dam and Barrages 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 & Barrages 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 DBSC has been submitted to MoWR and was being follow up as well. Matter has also been followed up through subsequent reminders written to Ministry of Water Resources on the issue.

2.4 Main Functions

Dams and Barrages Safety Council mainly deals with the matters pertaining to Dams projects and allied engineering issues at national level. The key function of the Dams and Barrages 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 and barrages 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 2020

During the year 2020, Dams and Barrages Safety Council of O/o the CEA & CFCC performed following functions related to its charter of duties given above;

2.5.1 Technical Review of PC-Is of Dam Projects

In all, 35 PC-Is evaluated during year 2020 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 Scrutinized by DBSC during the Year 2020

Sr. No.	Name of Project	Province	Remarks regarding Project Review
1.	PC-I for Construction of Sarozai Dam District Hangu, Estimated Cost Rs. 715.100 Million	PID KP	<ul style="list-style-type: none"> Comments communicated on January 07, 2020
2.	PC-I for Construction of Makh Banda Dam District Karak, Estimated Cost Rs. 814.519 Million	PID KP	<ul style="list-style-type: none"> PC-I signed and submitted to M/o WR on Jan.24, 2020 after compliance of Comments communicated on Jan 07, 2020
3.	PC-I for Construction of Small Dams Storage Dams/ Delay Action Dams, Retention Weir and I.S.S.O Barrier in Sindh Component-XII: Construction of Pukhan Small Dam near Karachat, Distt, Jamshoro	PID, Sindh	<ul style="list-style-type: none"> Comments communicated on April 21, 2020.
4.	Construction of 10 Nos Small Storage Check Dams Arenji Area, Wadh, District Khuzdar (Estimated cost Rs 504.43 million)	PID, Balochistan	<ul style="list-style-type: none"> PC-I signed and issued Jan. 13, 2020, after compliance of Comments communicated on November07, 2019&December 30, 2019
5.	Construction of Anjeeri Storage/Delay Action Dam District Nushki (Estimated Cost Rs 119.00 million)	PID, Balochistan	<ul style="list-style-type: none"> PC-I signed and issued Jan. 13, 2020 after compliance of Comments communicated on November07, 2019&December 30, 2019
6.	Construction of AzdhaKhol Storage/Delay Action Dam District Nushki (Estimated Cost Rs 123.00 million)	PID, Balochistan	<ul style="list-style-type: none"> PC-I signed and issued Jan. 13, 2020 after compliance of Comments communicated on November07, 2019&December 20, 2019
7.	Construction of Bugmaodwan Storage/Delay Action Dam District Chaghi (Estimated Cost Rs 221.00 million)	PID, Balochistan	<ul style="list-style-type: none"> PC-I signed and issued Jan. 13, 2020 after compliance of Comments communicated on November07, 2019&December 30, 2019
8.	Construction of Delay Action Dam at Western Bypass Akhtarabad, Quetta (Estimated Cost Rs 50.00 million)	PID, Balochistan	<ul style="list-style-type: none"> PC-I signed and issued Jan. 13, 2020 after compliance of Comments communicated on November07, 2019

Sr. No.	Name of Project	Province	Remarks regarding Project Review
9.	Construction of Gendar Storage/Delay Action Dam Kishingi Area, Nushki (E/Cost Rs 150.00 million)	PID, Balochistan	<ul style="list-style-type: none"> • PC-I signed and issued Jan. 13, 2020 after compliance of Comments communicated on November07, 2019&December 20, 2019
10.	Construction of Hushbalo Dam, District Mastung (Estimated cost Rs 350.00 million)	PID, Balochistan	<ul style="list-style-type: none"> • PC-I signed and issued Jan. 13, 2020 after compliance of Comments communicated on November07, 2019&December 12, 2019
11.	Construction of Jatti Small Storage Dam Lop Area Wadh, District Khuzdar (Estimated cost Rs 70.00 million)	PID, Balochistan	<ul style="list-style-type: none"> • Comments communicated on November07, 2019 • Further replies issued on December 20, 2019 • PC-I signed and issued Jan. 13, 2020
12.	Construction of Juli Storage/Delay Action Dam District Chaghi (Estimated cost Rs 244.74 million)	PID, Balochistan	<ul style="list-style-type: none"> • Comments communicated on November07, 2019 • PC-I signed and issued Jan. 13, 2020
13.	Construction of Mashkichah Storage/Delay Action Dam District Chaghi (Estimated cost Rs 158.00 million)	PID, Balochistan	<ul style="list-style-type: none"> • Comments communicated on November07, 2019 • PC-I signed and issued Jan. 13, 2020
14.	Construction of MashraqiKoh-e-Sultan Storage Delay Action Dam at District Chaghi (Estimated cost Rs 80.00 million)	PID, Balochistan	<ul style="list-style-type: none"> • Comments communicated on November07, 2019 • Further replies issued on December 17, 2019 • PC-I signed and issued Jan. 13, 2020
15.	Construction of Posti Storage/Delay Action Dam at BooloArbabin in District Chaghi (Estimated cost Rs 123.13 million)	PID, Balochistan	<ul style="list-style-type: none"> • Comments communicated on November07, 2019 • Further replies issued on December 30, 2019 • PC-I signed and issued Jan. 13, 2020
16.	Construction of Sari Kalag Delay Action Dam in U/C Raskoh District Kharan (Estimated Cost Rs 510.00 million)	PID, Balochistan	<ul style="list-style-type: none"> • Comments communicated on November07, 2019
17.	Construction of Small Storage Dam KunjFerozabad District Khuzdar (Estimated cost Rs 46.26 million)	PID, Balochistan	<ul style="list-style-type: none"> • Comments communicated on November07, 2019 • PC-I signed and issued Jan. 13, 2020

Sr. No.	Name of Project	Province	Remarks regarding Project Review
18.	Construction of Small Storage Dam Shank, Tehsil Wadh, District Khuzdar (Estimated cost Rs 60.00 million)	PID, Balochistan	<ul style="list-style-type: none"> • Comments communicated on November07, 2019 • Further comments issued on Dec.16, 2019 • PC-I signed and issued Jan. 13, 2020
19.	Construction of Delay Action Dam at Hanna Urak District Quetta (Estimated Cost Rs 100.00 million)	PID, Balochistan	<ul style="list-style-type: none"> • Comments communicated on November07, 2019 • PC-I signed and issued Jan. 13, 2020
20.	Construction of Karudi Storage/Delay Action Dam District Chaghi (Estimated Cost Rs 131.00 million)	PID, Balochistan	<ul style="list-style-type: none"> • Comments communicated on November07, 2019 • Further replies issued on December 17, 2019 • PC-I signed and issued Jan. 13, 2020
21.	Construction of Delay Action Dam at Sara Ghurgai, District Quetta (Estimated cost Rs 50.00 million)	PID, Balochistan	<ul style="list-style-type: none"> • Comments communicated on November07, 2019 • PC-I signed and issued Jan. 13, 2020
22.	PC-I for Construction of Delay Action Dam at Zarkhune District Quetta Estimated Cost Rs 100.00 million	PID, Balochistan	<ul style="list-style-type: none"> • Comments communicated on November22, 2019 • Further comments issued on Dec.16, 2019 • PC-I signed and issued Jan. 13, 2020
23.	PC-I for Construction of Delay Action Dams in SiaroHazarGanjiNall Area of District Khuzdar (Estimated Cost Rs 162,385 Million)	PID, Balochistan/ Federal	<ul style="list-style-type: none"> • Comments communicated on December16, 2019 • PC-I signed and issued Jan. 13, 2020
24.	<p>Construction of small storage dams/delay action dams, retention weirs and I.S.S.O barriers in Sindh (Component-XII):</p> <p>Construction of three (03) Nos: small dams/weirs namely WalarNalSanhariNala&LuthiNai originating from Quba Qadir Bux to Ubhan Shah hills in Sukkur &Khairpur Districts- estimated cost Rs 926.535 million.</p>	PID, Sindh	<ul style="list-style-type: none"> • Comments communicated to M/o WR on July 13, 2020 • Further comments communicated on July 27, 2020

Sr. No.	Name of Project	Province	Remarks regarding Project Review
25.	PC-I for Construction of Small Dams Storage Dams/ Delay Action Dams, Retention Weir and I.S.S.O Barrier in Sindh (Component-XII): Construction of Pukhan Small Dam near Karachat, Distt, Jamshoro	PID, Sindh/ Federal	<ul style="list-style-type: none"> • Comments communicated to M/o WR on April 21, 2020 • Further comments communicated on July 23, 2020
26.	Construction of 20 Nos. Small Dams in Khyber Pakhtunkhwa (Zamir Gul Dam Kohat and Bada Dam Swabi) Sub-work: PC-I Proforma for Construction of Bada Dam Project District Swabi (Revised PC-I) E/Cost Rs 1921.519 Million	PID, KP	<ul style="list-style-type: none"> • Comments communicated to M/o WR on December 01, 2020
27.	PC-I/Estimate for Construction of 10 Nos Dams in District Loralai, Estimated Cost Rs 437.54 Million	PID, Balochistan	<ul style="list-style-type: none"> • Comments communicated on June 26, 2020 • Further comments communicated to M/o WR on October 28, 2020
28.	Revised PC-I for construction of 100 dams in Balochistan (Package-III) (Revised Estimated Cost Rs 8,877.283 Million)	PID, Balochistan	<ul style="list-style-type: none"> • Comments communicated on July 28, 2020 • Further comments sent to M/o WR on Aug 24, 2020
29.	PC-I for Construction of Chagai Storage/Delay Action Dam in District Chagai (Estimated Cost Rs 100.00 million)	PID, Balochistan	<ul style="list-style-type: none"> • Comments communicated to M/o WR on December 07, 2020
30.	PC-I for Construction of Zangi Storage/Delay Action Dam at Gate-Baroth District Chagai (Estimated Cost Rs 100.00 Million)	PID, Balochistan	<ul style="list-style-type: none"> • Comments communicated to M/o WR on December 07, 2020
31.	PC-I for Construction of Shingero Storage/Delay Action Dam District Chagai (E/Cost Rs 100.00 Million)	PID, Balochistan	<ul style="list-style-type: none"> • Comments communicated to M/o WR on December 07, 2020
32.	Pc-I for Construction of Deewanag Storage/ Delay Action Dam at Union Council Julli in Districts Chagai, Chagai (Estimated Cost Rs 100.00 Million)	PID, Balochistan/ Federal	<ul style="list-style-type: none"> • Comments communicated to M/o WR on December 07, 2020
33.	Pc-I for Construction of ZiaratBalanosh Storage/Delay Action Dam in District Chagai (Estimated Cost Rs 100.00 Million)	PID, Balochistan	<ul style="list-style-type: none"> • Comments communicated to M/o WR on December 07, 2020

Sr. No.	Name of Project	Province	Remarks regarding Project Review
34.	PC-I for Construction of Saindak Storage/Delay Action Dam in District Chagai (Estimated Cost Rs 200.00 million)	PID, Balochistan	<ul style="list-style-type: none"> Comments communicated to M/o WR on December 07, 2020
35.	PC-I for Construction of Amuri Storage/Delay Action Dam in District Chagai (Estimated Cost Rs 100.00 Million)	PID, Balochistan	<ul style="list-style-type: none"> Comments communicated to M/o WR on December 07, 2020

2.5.2 Technical Review of PC-IIs of Dam Projects

PC-II Proforma for the project titled “Detailed Engineering Design, Preparation of Tender Documents & PC-I of Hingol Dam Project” (new site) (Estimated Cost Rs. 421.372 million)” was reviewed and comments sent to WAPDA on January 07, 2020.

2.5.3 Technical Review of PC-IVs of Dam Projects

This year, some six PC-IVs were technically scrutinized . Details are given in **Table 2.3**;

Table 2.3: PC-VIs Scrutinized by Damsand Barrages Safety Council in Year 2020

Sr. No.	Name of Project	Remarks regarding Project Review
1	PC-IV in respect of Construction of Small Dams Storage Dams/ Delay Action Dams, Retention Weir and I.S.S.OBarrier in arid zone, Sindh, E/Cost Rs 12211.00 Million Construction of Five (5) Recharge Dams/Weirs Hassan Jo Kunn, German Dhor, Sukkan, WatanWari and Layari in Khostan area, Sindh (Component-VI)	Technical comments communicated to M/o WR on November 11, 2020
2	PC-IV in respect of Construction of Small Dams Storage Dams/ Delay Action Dams, Retention Weir and I.S.S.OBarrier in arid zone, Sindh, E/Cost Rs 12211.00 Million Acquiring Consultancy Services for Preparation of Detailed Design of 40 Small Dams, Recharge Dams and Detention Weirs and their Detailed Supervision etc. in Sindh (Component-I)	Comments communicated to M/o WR on November 11, 2020
3	PC-IV in respect of Construction of Small Dams Storage Dams/ Delay Action Dams, Retention Weir and I.S.S.OBarrier in Sindh. Construction of Two (02) Recharge Dams Malir Bakshan and Ran Pathani in Lower Kohistan Division Sindh	Comments communicated to M/o WR on November 06, 2020

Sr. No.	Name of Project	Remarks regarding Project Review
4	PC-IV in respect of Construction of Small Dams Storage Dams/ Delay Action Dams, Retention Weir and I.S.S.OBarrier in arid zone, Sindh, E/Cost Rs 12211.00 Million Construction of Six (6) Gravity Weirs/Small Dams in Upper & Central Kohistan, E/Cost Rs 773.005 Million(Component-VIII)	Comments communicated to M/o WR on November 11, 2020
5	PC-IV in respect of Construction of Small Dams Storage Dams/ Delay Action Dams, Retention Weir and I.S.S.OBarrier in arid zone, Sindh, E/Cost Rs 12211.00 Million Construction of Seven (7) Gravity Weirs/Small Dams in Lower Kohistan	Comments communicated to M/o WR on October 15, 2020
6	Project Completion Report (PC-IV) in respect of Diamer Basha Dam Project, WAPDA, Chilas: Formal Closure of Previous PC-I	Comments communicated to M/o WR on December 01, 2020

2.5.4 Activities Performed as PANCOLD Secretariat

The 45th Annual Meeting of PANCOLD was held in February 26, 2020 to promote cause of ICOLD with respect to its activities in Pakistan. The list of dams included in the National Register of Dams has been updated based on the latest information from WAPDA, Punjab, KP and Sindh and Balochistan Provinces. In order to make PANCOLD, a more vibrant and dynamic entity, a Memorandum of Cooperation to be signed by the PANCOLD Secretariat with Pakistan Engineering Council has been processed with Ministry of Water Resources. Replies to observations of Ministry on draft MOU have also been submitted to MoWR in December 2020.



FEDERAL FLOOD COMMISSION



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

SECTION – 3: FEDERAL FLOOD COMMISSION (FFC)/ NATIONAL FLOOD MANAGEMENT WING

3.1 Floods in General Perspective

3.1.1 Causes of Floods: Broad-spectrum

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

Disaster experts classify floods according to their likelihood of occurring in a given time period. A hundred-year flood, for example, is an extremely large, destructive event that would theoretically be expected to happen only once every century. But this is a theoretical number. In reality, this classification means there is a one-percent chance that such a flood could happen in any given year. Over recent decades, 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 is humanly impossible but protection from floods 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 of 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 in the country 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, 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 provinces. The construction of Khanki Barrage on River Chenab and rehabilitation of Jinnah and Taunsa Barrages on River Indus and Sulemanki Barrage on Sutlej has been completed. The remodeling work regarding Trimmu and Panjnad Barrage is underway. Remolding works on Guddu Barrage across River Indus are in progress. The remodeling works on Sukkur Barrage across River Indus would be started as soon as feasibility and detailed design is completed.

3.1.3 Flood Control Objectives & 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, drains 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 characteristics 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 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 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 inflow 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.

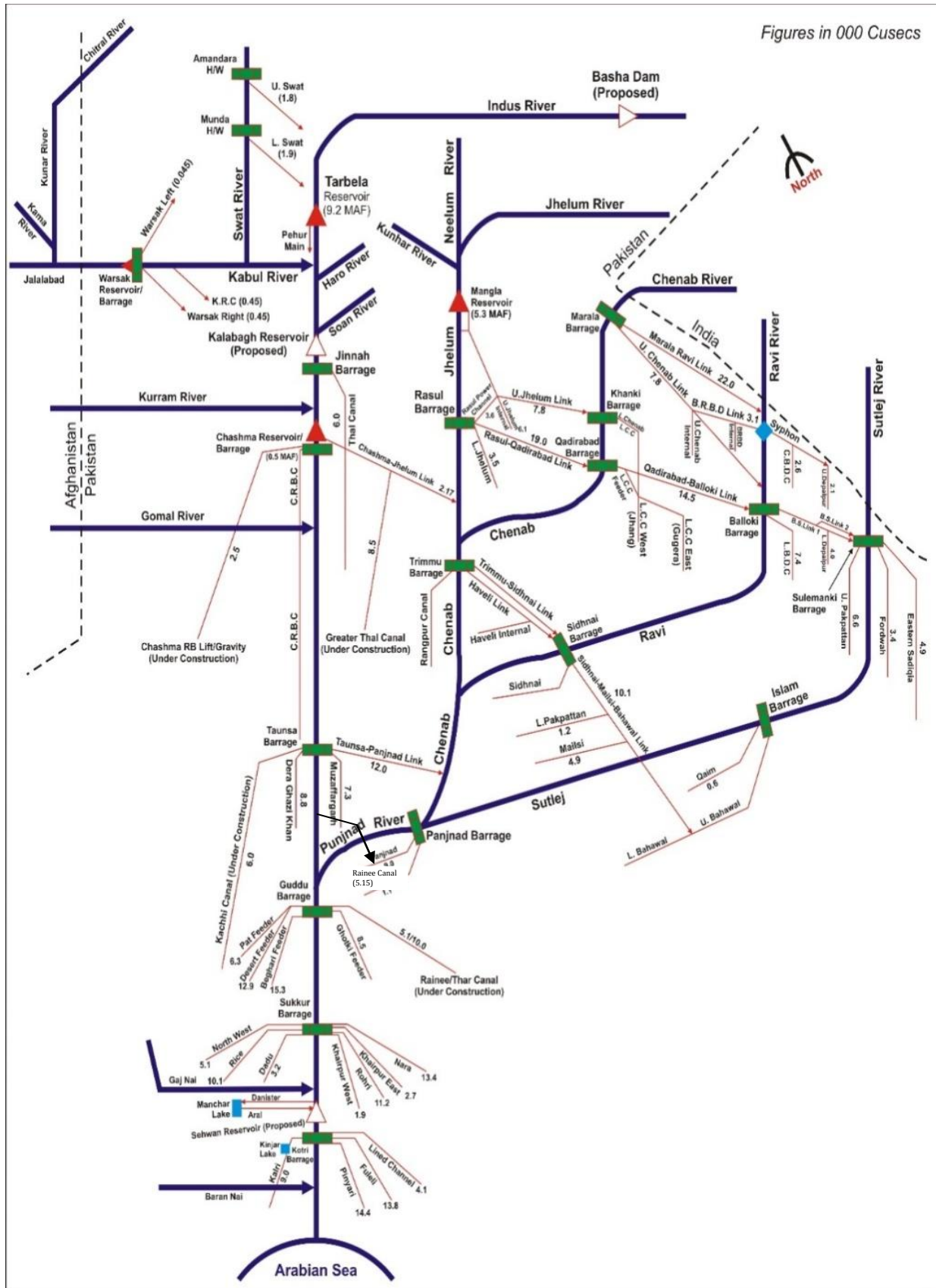


Figure 3.1: Schematic Diagram of Indus Basin Irrigation System

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
KhyberPakhtunkhwa		
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

Sr. No.	Zone/Region/ Agency/District	No. of Protection Works
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
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 neighbouring countries in the coming years. Pakistan's 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, 19981, 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 flood of 2010 was 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 historical flood events experienced in the past and their damages are given in **Table 3.2** as provided on next page.

3.1.9 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 spiralling 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.

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	-	-
Total		38,169	13,262	197,273	616,558

* Economic Survey of Pakistan 2011-12

** NDMA (<http://www.claimsjournal.com/news/international/2012/10/05/214891.htm>)

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

^^ Economic Survey of Pakistan (2014-15)

3.1.10 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

Remodelling 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 dangerous 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 storage 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.

3.1.11 The 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 near river banks or coastal areas, which have concentration of population, assets, economic & industrial development and infrastructures.

In addition to riverine floods, Pakistan is also facing urban flooding, which is mainly caused due to torrential rains/heavy falls in urban areas, especially those cities which are overcrowded and having inadequate storm water drainage facilities are badly affected almost every year. Flash floods in semi mountainous regions are causing severe damages to private and public properties. 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.

3.1.12 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.

3.1.13 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 suffer throughout the year in terms of high rainfall variability. It is also observed that more snowfall has been 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 cost of projects under NFPPs.

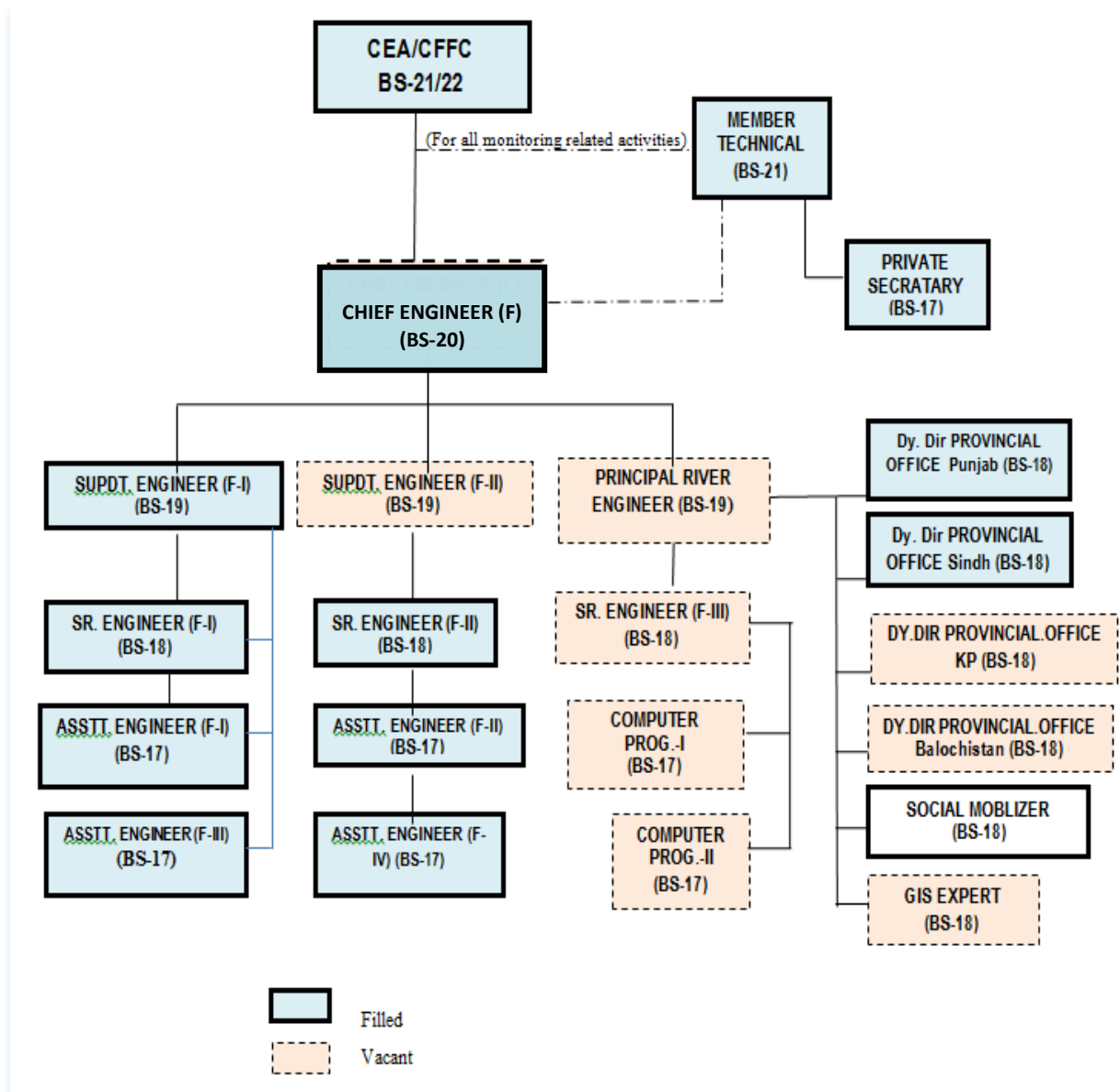


Figure 3.2 Organogram of FFC

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%)

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-Sea Reaches).

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

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

4. 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%)

5. 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%)

6. 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%)
	Rs 432.12 Million

Flood Forecasting and Warning System

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.

7. 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 million 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 observations 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 on the same day 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 SecortProject-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 & Reforms 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 Ministry of Planning, Development and Reforms 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 funding of 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 Department Government of Punjab, Sindh, KP, Balochistan & Federal Line Agencies (Merged Area, KP, G-B, AJ&K, NDMA, PMD, and WAPDA) 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 Ministry of Water Resources 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

Concept Clearance Paper (CCP) for FPSP-III based on NFPP-IV (Cost of Rs 95.980 Billion) was forwarded to Ministry of Water Resources 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. Sequal to that Ministry of Water Resources forwarded the case for approaching prospective donor for FPSP-III financing to Economic Affairs Division (EAD). In the meanwhile, Umbrella PC-I of FPSP-III was submitted to Ministry of Planning, Development and Special Initiatives enroute Ministry of Water Resources on 23rd June 2020 for approval of CDWP/ECNEC. The umbrella PC-I of FPSP-III was considered in the Pre-CDWP meeting held on 9th September 2020 and recommended for consideration in CDWP. It was considered in the CDWP meeting held on 12th October 2020 and CDWP approved the Umbrella PC-I at an estimated cost of Rs 95,980 Million, including FEC Component of Rs 6,905 Million, with a condition to confirm financing from donors before consideration of the project by ECNEC. In this regard, MoWR was requested for taking-up the issue of external financing of FPSP-III with NDRMF/ADB through EAD, as NDRMF has been put in place through MoU between ADB and EAD, GoP for the purpose of

implementation of National Disaster Management Plan (NDMP) of which NFPP-IV covers more than 75% portion.

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 358 number flood projects costing Rs 8.409 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 un-attended 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. Million)

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 (2020-21) for Normal/ Emergent Flood Programme. Detailed list of schemes to be executed under Normal/ Emergent Flood Programme during Financial Year (2020-21) is attached as **Appendix-I**. In Full Year Review Meeting regarding PSDP (2019-20) held on 21st September 2020 in Ministry of Planning, Development & Special Initiatives (PD&SI) under the Chairmanship of Deputy Chairman Planning Commission, it was decided to cap GoP funded Normal/ Emergent Flood Programme (PSDP Project # 995) and schemes approved up to 30th September 2020 were allowed to be processed. Therefore, no schemes could be processed through Scrutinizing Committee of FFC in FY 2020-21 so far. FFC has requested Ministry of Water Resources to take-up the matter with M/o PD&SI for review of the decision and allow FFC to continue with the Normal/Emergent Flood Programme till FPSP-III is approved, funds are allocated through prospective donor/NDRMF and the project is physically started. After getting consent from Ministry of Planning, Development & Special Initiatives about Normal/ Emergent Flood Programme, survey of the proposed sites, has been planned in January 2021 and the flood protection schemes will be executed after fulfilling all codal formalities before onset of Monsoon-2021.

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 2020 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>

Sr. No.	Flood Plans/ Programs	Location	No. of Schemes	Expenditure (Rs Million)
4.	Normal/Emergent Flood Programme (2008-09 to 2019-20)	All over country	364	8,524
	<i>Sub-Total (NFPP-IV)</i>		364	8,524
	<i>Total(1+2+3+4)</i>		1,596	25,204.383
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
	Total:		4,008	8,762

3.3 Flood Management Mechanism

3.3.1 Organizations involved and Responsibilities

Flood management is a multifunctional process involving 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.
- WAPDA.
- Pakistan Commissioner for Indus Waters (PCIW).
- Federal Flood Commission (FFC).
- NDMA.
- Pak Army.
- 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

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

- Operation and maintenance of Barrages, Irrigation & Drainage Networks, including flood protection structures, besides, measurement of discharges at control points (Barrages/Headworks) across main rivers;
- Planning, design, construction of new Irrigation, Drainage & Flood Protection/ River Training projects;
- 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 Power 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 Governments 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, which 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 Indus Waters Commissioners, 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 Rivers (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 governments 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 scheduled on **25.03.2020** under the Chairmanship of Chief Engineering Advisor/ Chairman Federal Flood Commission in the Committee Room of office of CEA & CFCC in order to review the progress on post 2019 floods activities and preparatory works for Monsoon Season 2020. However, it could not be held due to COVID-19 situation in the country. Accordingly, necessary directions regarding pre-emptive measures for monsoon season 2020 were issued to concerned organizations;
- The 55th Annual meeting of FFC was organized on **15.06.2020** 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 2020.

Role of FFC during Monsoon Season

- The Flood Communication Cell established in FFC started working on round the clock basis since 15th June 2020 and worked on 24 hours basis during the entire monsoon season (15th June - 15th October 2020) 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, sixteen (16) Weather Advisories, one (01) GLOF forecast and three (03) significant flood forecasts were issued by Flood Communication Cell.
- Responsibility for response/reaction to warnings issued by PMD/FFD, Lahore & FFC rests upon concerned Federal/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 (2020-21) 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. One meeting of Scrutinizing Committee of FFC was organized in Jan. 2020, wherein flood protection schemes were technically examined and recommended to Ministry of Water Resources for approval of CDWP;
- Two (2) meetings were organized by FFC for review of progress on implementation of flood projects under GOP funded Normal/Emergent Flood Programme;

- The 11th Progress Review meeting of Federal Flood Commission was organized on 28.10.2020 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 Post Flood Meeting was organized on 16.12.2020, 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;
- Sixteen (16) 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 Contingency Planning By FFC for Monsoon Season 2020

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 55th Annual Meeting of FFC was organized on 15th June, 2020 to review the arrangements made by the concerned organizations for flood management during monsoon season 2020. 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 scheduled on 25.03.2020 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 2019 floods activities and preparatory works for monsoon season 2020. However, it could not be held due to COVID-19 situation in the country. Accordingly, following necessary directions regarding pre-emptive measures for monsoon season 2020 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.
- b) Rehabilitation/Strengthening works at all vulnerable locations and weak sections of flood protection infrastructure, besides, completion of 2019-Flood Damages Restoration Works (if any).
- 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 2020.
- e) Vigorous follow-up of pending cases of fund releases under Normal/ Emergent Flood Programme (2019-20) for their early release and utilization well within June 30, 2020.
- f) Ensuring enactment of River Act based on approval from the respective Provincial Governments/Cabinets well before 30th June 2020 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 2020.
- h) 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 2020 Monsoon Season.
- i) 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 2020.

Above actions be completed well before **30th June 2020**. Regular progress report on the same may please be shared.

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

- a) To expedite preparation of their respective Contingency Plans for monsoon season 2020, finalize them and put in place the same before 30th June 2020 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 2020 Monsoon Season.

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

- a) Complete clearance/ cleaning of the silted up bays of Barrages.
- b) Ensure 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 2020.

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 (Lahore, Sialkot, Mangla, Islamabad & Karachi, Rahimyar Khan & 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 2020 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 2020.
- 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. Deputy Commissioner, Rawalpindi:

- a) To expedite action on all necessary measures for removal of encroachments from the waterways and banks of Lai Nullah and its tributaries. Progress report be submitted to FFC on monthly basis till completion of the task.

- b) Progress on demarcation of Lai Nullah be accelerated so as to complete the task at the earliest.

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 2020.
- b) WASA Rawalpindi to complete all necessary de-silting works of critical sections of Lai Nullah well before the start of monsoon 2020.
- c) Progress on above (a, b) be shared with FFC on regular basis till completion of the task.

ix. Pakistan Commissioner for Indus Waters (PCIW):

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

- x. KW&SB, WASA/ Municipal Corporation of all Big Cities Punjab (Lahore, Gujranwala, Sialkot, Faisalabad, Sargodha, Multan, Rawalpindi), Sindh (Karachi, Sukkur, Hyderabad, Thatta, Jacobabad, Shikarpur, Kashmore), Khyber Pakhtunkhwa (Peshawar, Mardan, D.I. Khan), 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 2020, to ensure unhindered flow of storm water to avoid any urban flooding during Monsoon Season 2020.
- 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 2020 till end monsoon season (15th October 2020) 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 2020.

3.4.3 55th Annual Meeting of FFC (15th June 2020)

The 55th Annual Meeting of Federal Flood Commission was held on **15th June 2020** under the Chairmanship of CEA & CFFC Islamabad, in order to review the status of preparedness of the Provinces & Federal Line Agencies for Monsoon Season 2020. The following directions were given to PIDs/ Federal Line Agencies, WAPDA, WASA & PMD etc.:

i. O/o Chief Engineering Adviser/ Chairman, Federal Flood Commission:

- (a) To write D.O. letters to Chief Secretaries of all Federating Units (Four Provinces, G-B and AJ& K) for early approval and enforcement of Flood Plain Management/

River Act ensuring removal of existing settlements in river flood plains/ water ways and placing restrictions on future encroachments.

- (b) To hold a special meeting of all stake-holders on 25th June 2020 regarding modalities of passing some discharges through Emergency Spillway of Mangla Dam in case of high flood in the coming Monsoon-2020.
- (c) To prepare TORs in consultation with all stakeholders and carry out a comprehensive research study to review the existing Lag Time and Flood Classification of all major & other rivers and update.
- (d) Write a D.O. letter to PID, Punjab to support early procurement and installation of Weather Radar at Multan by PMD through JICA/Government of Japan.
- (e) To write a D.O. letter to MD NESPAK for extending NESPAK's services on gratis basis as member of Mangla Dam Flood Mitigation Committee (FMC).

ii. **Provincial Irrigation Departments & Federal Line Agencies (PIDs & FLAs):**

- (a) To ensure completion of all ongoing flood protection schemes taken-up under ADP & PSDP, besides, strengthening/rehabilitation works of all critical reaches including O&M works related to Barrages/ Headworks/ Bridges at the earliest.
- (b) Priority lists of new flood protection schemes proposed to be implemented under PSDP (2020-21) through Normal/Emergent Flood Programme be submitted to FFC **by/before July 06, 2020**. The PC-Is of proposed schemes alongwith clearance of PDWP be submitted to FFC **latest by 31st July 2020** for technical clearance by Scrutinizing Committee of FFC and administrative approval by DDWP of Ministry of Water Resources.
- (c) To remain vigilant and ensure Round-the-Clock patrolling of flood protection infrastructure, especially vulnerable sections, 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/River Act and its enactment for removal of existing encroachments and restricting new settlements in the waterways/ flood plains of major & other rivers.

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 2020 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 the 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 2020 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) Pursue with their respective Finance Department for early release of Normal/ Emergent Flood Programme funds without any further loss of time.
- v. **Engineers Directorate, GHQ** to expedite the design work for rehabilitation of Barakas Nullah Phase-II works as per CDO WAPDA review. The tendering formalities, contract award and implementation of physical work be carried out on fast track basis, so that Phase-II works could be completed in minimum short time span but not later than **30th June 2021** or the work be handed over to WAPDA for early completion.
- vi. **PCIW:**
- (a) To ensure continuity of all necessary arrangements being in place for obtaining reservoirs/rivers flows data and other information from Indian Counterpart (ICIW) on River Chenab and Eastern Rivers during Monsoon Season 2020 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) PMD's/FFD's forecast relating to River Chenab and eastern rivers depends greatly on the inputs of O/o PCIW obtained from O/o ICIW and for that matter O/o PCIW shall exercise all possible efforts to ensure availability of authentic, reliable and real time cross border data to PMD/FFD.
- vii. **PMD:**
- (a) To closely watch the weather situation during monsoon season. Further PMD in collaboration with **PCIW and SUPARCO** shall also carefully determine the validity/ reliability through its own Weather Radar Network and other Flood Forecasting & Warning System facilities, of data provided by India, while using the same for flood management operation in the country.
 - (b) 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.
 - (c) To ensure that Lahore, Sialkot and Mangla Weather Radars remain in good operational conditions and that their products are efficiently utilized in precise forecast operation.
 - (d) To ensure that recently commissioned Islamabad and Karachi Weather Surveillance Radars, under JICA/ Japan Grant-in-Aid, are fully functional and contribute towards overall flood management through forecasts of high precision level.

viii. **WAPDA:**

- (a) To ensure the operation of Tarbela Dam on 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-2020.
- (c) To ensure mock-up exercise of Mangla Dam as per approved SOPs as and when the desired level was achieved.
- (d) To prepare and submit a working paper for discussion in June 25, 2020 meeting regarding modalities of passing some discharges through Emergency Spillway of Mangla Dam in case of high flood in the coming Monsoon-2020.
- (e) 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 and sewers clearance work by 30th June 2020.

xi. **Deputy Commissioner, Rawalpindi** to ensure removal of encroachments from the waterway and banks/bed of Lai Nullah before start of monsoon season 2020.

3.4.4 Meeting regarding National Master Plan For Flood Telemetry (29th July 2020)

A joint meeting of representatives of ADB, WAPDA, PMD and FFC was held on **29th July 2020 at 1200 hours** in the Committee Room of Office of Chief Engineering Adviser/ Chairman, Federal Flood Commission, under the Chairmanship of Secretary, Ministry of Water Resources, Islamabad. After thorough discussion, following decisions were made:

- (i) Federal Flood Commission (FFC) not to attend the future meeting of Technical Advisory Committee (TAC) of NDRMF as the NDRMF authorities are not giving weightage to the technical observations of FFC regarding its compliance.
- (ii) WAPDA to finalize the Master Plan for Flood Telemetry Network by the end of September 2020 and submit PC-I to the Ministry of Water Resources through FFC for further processing.
- (iii) ADB is requested to consider possible financing of interventions proposed under FPSP-III fully or partially to implement interventions proposed under FPSP-III to build resilience against floods.

3.4.5 1st Progress Review Meeting of Financial Year (2020-21) regarding Normal/Emergent Flood Programme (August 05, 2020)

The 1st Progress Review Meeting regarding Normal/Emergent Flood Programme of financial year (2020-21) was held on **5th August 2020 at 1100 hours** in the Committee Room of Federal Flood Commission, Islamabad. After detailed discussion, following decisions were taken:

- (i) PIDs & FLAs to ensure that the schemes taken-up for implementation under Normal/ Emergent Flood Programme of current financial year (2020-21) should be prepared for the benefit of community and not for an individual family. The reference of NFPP-IV must be mentioned in the PC-I. Reason of inclusion/ selection be given in PC-I, in case it is not recommended under NFPP-IV.
- (ii) PIDs & FLAs should submit coloured pictures of all proposed sites indicating the abadies, private & public property to be protected in the PC-Is of schemes being implemented under Normal/ Emergent Flood Programme of current financial year (2020-21) for further processing.
- (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 PC-1s of prioritized schemes duly cleared by the respective provincial DDWPs to Federal Flood Commission (FFC) before **31st August 2020** for further processing of technical clearance from the Scrutinizing Committee (SC) of FFC and approval from the DDWP of Ministry of Water Resources.
- (v) PIDs & FLAs to submit request for obtaining extension of execution period of all those flood protection schemes of previous years, which could not be completed within the target period given in the approved PC-Is on the prescribed proforma of Planning Commission **by/ before 31st August 2020**, for obtaining approval from Ministry of Water Resources.
- (vi) PIDs & FLAs to submit demand proforma for release of 1st instalment of budget allocated under PSDP (2020-21) alongwith other necessary documents to FFC without further delay by **16th August 2020** for further processing of the case.
- (vii) 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.
- (viii) 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.

- (ix) 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.
- (x) 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 for further action.
- (xi) PIDS & FLAs to fully comply with the recommendations of Federal Flood Commission's Technical and Financial Monitoring Team's Reports and will submit compliance reports to Federal Flood Commission before 31st August 2020 for taking further action in the matter.

3.4.6 11th Progress Review Meeting of FFC on Supreme Court Inquiry Recommendations (October 28, 2020)

The 10th PR meeting of Federal Flood Commission was held on **28th October, 2020** 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 fortnight.
- 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 & submit report to FFC within 3 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. H&WM Wing of WAPDA to keep on sharing the progress on Up-gradation of Flood Telemetric Stations with FFC regularly on monthly basis till completion of the job.
- vi. 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.
- vii. PMD to ensure that the Weather Radar at Karachi is fully operational before the onset of next Monsoon Season 2021.
- viii. 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.
- ix. WAPDA will re-submit PC-II for formulation of National Watershed Management Plan after incorporating comments/ observations of FFC within fortnight.
 - x. PID, Punjab will provide to FFC on regular basis the updated progress on Construction of Hydro Power Station along right side of Taunsa Barrage.
 - xi. WASA, in consultation with RDA, to share progress on construction of Lai Expressway with FFC on monthly basis.
 - 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 updated progress report regarding 57 vulnerable sites identified by the consultants containing the sub-project wise recommendations and their status of implementation.
 - xv. WAPDA to keep on providing progress on Munda/Mohmand Dam Project to FFC on regular basis.
 - xvi. Point was dropped from the agenda during the previous meeting.
 - xvii. PIDs (Sindh, KP and Balochistan) 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.
 - 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 (Sindh, KP and Balochistan).
 - 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 would submit detailed updates regarding the steps taken/being taken after the urban flooding in Karachi during monsoon season 2020 for rehabilitation/up-gradation of storm drainage system of the city.
 - xxi. PID, Sindh to submit latest updates to FFC within fortnight 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 expedite action on the observations of Ministry of Planning, Development & Special Initiatives as mentioned above and pursue the case aggressively with Ministry of Water Resources and Ministry of Planning, Development & Special Initiatives for early approval of competent forum.
 - xxiii. WAPDA and PID Sindh to keep on sharing the progress about Rainee Canal regularly on monthly basis to FFC.

3.4.7 Post Monsoon Meeting of FFC (16th December 2020)

The Post Monsoon Meeting of Federal Flood Commission was held on **16th December 2020** 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 2020. The following directions were given to PIDs/ Federal Line Agencies, WAPDA, WASA & PMD etc. as a way forward for Monsoon 2021:

- i. **Federal Flood Commission** to issue D.O. Letters at the top level to ensure that the funds released to provinces for construction of flood protection works under Normal/Emergent Flood Programme are transferred to respective PIDs and then to field formations for expeditious completion of these works as the undue parking of Federal PSDP funds in provincial chest is badly compromising the purpose of their release.
- ii. **Provincial Irrigation Departments & Federal Line Agencies (PIDs & FLAs)** to ensure completion of all approved and ongoing flood protection schemes taken up under Provincial ADP and Normal/ Emergent Flood Programme, besides, rehabilitation and Flood Damages Restoration Works including O&M works related to Barrages/Head Works/Bridges, Irrigation, Drainage and Flood Protection Infrastructure well before the start of 2021 monsoon season.
- iii. **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 caseto be shared with FFC onregular basis.
- iv. **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 MonsoonSeason2021.
- v. **PIDs** to furnish details of O&M funds demanded as per yardstick , 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.
- vi. **PID, Punjab**to coordinate with Ravi Urban Development Authority (RUDA) for conduct of model study for “Increasing Discharge Capacity of Shahdara Railway Bridge across River Ravi” and ensure its implementation on fast track being a highly sensitive project with respect to vulnerability and threat of high flows from cross border. A status report on this issue be shared with FFC and other stakeholders by January 31, 2021.
- vii. **PMD** to carry out a detailed assessment of fluctuation of daily temperatures at Skardu during Monsoon Season 2020 and its impact on seasonal flows and especially the inflows at Tarbela reservoir and furnish a detailed report to FFC within a months’ time.
- viii. **PMD** to ensure that the Weather Radar at Karachi is fully operational before the onset of next Monsoon Season 2021.
- ix. **PID, Sindh**to coordinate with concerned provincial authorities for timely provision of Environmental Study to EAD for actualization of CDWP approved PMD project of installation of Weather Radar at Sukkur.
- x. **PCIW** to coordinate with the concerned organizations and hold a meeting of Focal Persons within a fortnight to achieve a way forward for efficient working of Special Transfrontier Flood Desk at PCIW during monsoon 2021.
- xi. **Engineers Directorate, GHQ, Rawalpindi** to make arrangements relocation of Pak Army buildings by HQ 1-Corps 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 2021 to pass surplus flood water through Emergency Spillway in case of emergency situation.

- xii. **Engineers Directorate, GHQ, Rawalpindi** to conduct a meeting of all stakeholders including PID Punjab, NESPAK and FWO to achieve a viable solution regarding finalization and implementation of recommendations made in Kartarpur Corridor Project Model Study conducted by IRI, Nanipur.
- xiii. **Mangla Dam Organization (MDO), WAPDA** to expedite completion of ongoing topographic survey and geotechnical investigations by end of February 2021. The design of the channel alongwith quantum of work for rehabilitation of Barakas Nullah be optimized in consultation with Pak Army 1-Corp Mangla, for early start of proposed rehabilitation of Barakas Nullah e.i May 2021.
- xiv. **WAPDA's (H&W Wing)** to make utmost efforts for early completion remaining work of repair and upgradation Flood Telemetry Network i.e **30th June 2021**. The progress report be shared with FFC on monthly basis till completion of task.
- xv. **Deputy Commissioner, Rawalpindi** to ensure removal of encroachments from the banks/ bed of Lai Nullah well before start of Monsoon Season 2021.
- xvi. **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.
- xvii. **Managing Director WASA Rawalpindi** to carry out fresh site survey and prepare plan for dredging/ desilting of Lai Nullah at critical reaches and process the same for approval and funding arrangements by Provincial Government. The desilting work be completed before start of Monsoon Season 2021. The progress be shared with FFC on monthly basis till completion of task.

3.4.8 2nd Progress Review Meeting of Financial Year (2020-21) regarding Normal/Emergent Flood Programme (December 16, 2020)

The 2nd Progress Review Meeting regarding Normal/Emergent Flood Programme of financial year (2020-21) was held on **16th December 2020** under the chairmanship of Chief Engineering Advisor & Chairman, Federal Flood Commission (FFC). After detailed discussion, following decisions were taken:

- i. Provincial Irrigation Departments (PIDs) (Punjab, Sindh, KP & Balochistan) of the FLAs (GB, Merged Area & AJ&K) to submit fifteen (15) copies of the PC-Is of each scheme proposed for implementation under Normal/ Emergent Flood Programme (2020-21) alongwith clearance of PDWP to FFC without further delay for the technical clearance from Scrutinizing Committee (SC) of FFC and admin approval from the DDWP of Ministry of Water Resources.
- ii. The sites of the proposed schemes to be implemented under Normal/ Emergent Flood Programme (2020-21) would be visited by FFC's Monitoring Team for their technical and financial viability before their consideration in Scrutinizing Committee of FFC as per decision taken in the meeting held on **24th September 2020** in MoWR. For that purpose, Member (Technical), FFC will be the Focal Person to;
i) Formulate site inspection/ visit(s) program(s) for each of the Executing Agency & FLA; ii) Decide on the format of site inspection visit Team; iii) Exclusively decide on inclusion or other-wise of the scheme (based on site inspection) in the Normal/ Emergent Flood Programme (2020-21); iv) Exclusively ensure timely processing of all schemes of Executing Agencies & FLAs through Scrutinizing Committee of FFC and DDWP of MoWR well within the stipulated time lines; v) Timely release of funds against approved schemes & (vi) During

- construction, planning & executing inspection visits to the approved schemes under the program through dedicated team.
- iii. **PIDs & FLAs** to ensure that the schemes taken-up for implementation under Normal/ Emergent Flood Programme (2020-21) shall exclusively for the benefit of a community rather than for an individual family. The reference of NFPP-IV must be mentioned in the PC-I. Reason of inclusion/ selection be given in PC-I, in case it is not recommended under NFPP-IV, besides to certify that scheme is not proposed for implementation under any other programme.
 - iv. **PIDs & FLAs** to include coloured pictures of all proposed sites in the PC-Is of schemes clearly indicating the abadies, private & public property to be protected and for implementation under the programme for further processing.
 - v. **FFC** will write a letter to Accountant General Gilgit-Baltistan for conducting the Audit of GB-PWD against the funds released/utilized of Normal/Emergent Flood Programme. **(Action stands already taken by FFC)**
 - vi. **FFC** will write a letter to Finance Department of all the four Provinces, for non-adhering to the procedure of Assignment Account and General Financial Rules (GFR) for the released funds under Normal/Emergent Flood Programme. **(Action stands already taken by FFC)**
 - vii. **PIDs & FLAs** to strictly follow the implementation schedule of flood protection works approved by the ECNEC dated **27th July 2004** shared time and again.
 - viii. **PIDs & FLAs** to Immediately and without further delay submit requests 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 for obtaining approval from Ministry of Water Resources. Only those extension requests will be entertained that are supported with adequate reasons and necessary documentary proofs.
 - ix. **PIDs & FLAs** to submit Demand Proforma for release of 1st instalment of budget allocated under PSDP (2020-21) alongwith all necessary documents to FFC without further delay for further processing.
 - x. **PIDs & FLAs** to submit physical & financial progress reports of all on-going/new schemes taken under Normal/ Emergent Flood Programme positively by **5th of each following month** on the prescribed proforma of Planning Commission on the regular basis till the completion of the scheme.
 - xi. **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 if any damage, occurred to the ongoing structures, during monsoon season that would be restored by PIDs & FLAs exclusively through their own resources and the restoration expenditure would not be charged to the capital cost of the projects.
 - xii. **PIDs & FLAs** without further delay to submit to FFC, utilization account of funds released during previous years (2015-16 to 2019-20), for further action.
 - xiii. **PIDs & FLAs** to submit to FFC Project Completion Reports (PCRs) of flood protection schemes carried out during (2007-08) to (2019-20) under Normal/ Emergent Flood Programme on prevailing PC-IV Proforma in triplicate alongwith as built drawings, X-sections & coloured site pictures for further action.

- xiv. **PIDs & FLAs** to fully comply with the recommendations of Federal Flood Commission's Technical and Financial Monitoring Team's Reports and will submit compliance reports to FFC well within **31st January 2021** for taking further action.

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 effects 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 Miscellaneous R & D Activities of FFC during 2020

Considering the importance of research in innovative solution of flood management Federal Flood Commission has carried out following key initiatives for innovative flood management in the country;

1. Floods in Pakistan is a recurring problem and the country spent financial resources in flood fighting during the Monsoon Season each year. Owing to the large river system in Pakistan, flood fighting is considered as huge challenge which is presently managed with the traditional approach of strengthening of Flood Protection bund, spur, guide bank and embankment with earthen material. Federal Flood Commission has developed a draft concept proposal regarding usage of Tube Barrier System, an innovative solution being used by the advanced countries like Hungary and Denmark which consists of Rubber

Tube filled with water to act as temporary wall to divert the flood flows for protection of important installations, land and abadies. The draft Concept Paper has circulated to all provinces and federal line agencies for their views/comments and further adaptation of the new innovative technology.

2. For improvement in the early warning system the availability and accuracy of real time data of flood flows are very important. In order to achieve the same, Federal Flood Commission invited the CDigital, a technology based solution provider and arranged meeting of all stockholders on countrywide bases dealing with integrated flood management in September, 2020. In the meeting the following decisions were made for inclusion of the innovative technology to improve the early warning system.
 - i. CDigital will work out the possibility of participation of private sector in the field of Hydro-met services in shape of PPP mode. They will prepare detailed position Paper, in coordination with IRSA, WAPDA, PCRWR, Irrigation Department of four Provinces, GBPWD and Irrigation and Small dam AJ&K, and submit to O/o CEA/CFFC for further submission and consideration of the Steering Committee of National water Cpouncil.
 - ii. For preparation of position paper as per para-1 above, Irrigation Departments of four Provinces, GBPWD, Irrigation and Small Dam AJ&K, IRSA, PMD, PCRWR, and FFC will nominate respective focal person for close coordination in requisition of any data desired by CDigital for preparation of Position Paper.
 - iii. For installation of future project of Telemetry System, capacity building of the officers/officials of the executing agencies as well as institutions and international trainings shall be included for professionals working environment in water sector institution and to ensure the smooth O&M of the innovative technology after installation.
 - iv. CDigital will submit detailed position paper regarding innovative technology solution for Urban Flood management to O/o CEA/CFFC for further consideration at higher level.
3. Although the management of urban flooding is not included in the mandate of Federal flood commission, however, to facilitate the provincial governments in managing urban floods, Federal Flood Commission hosted a meeting of WASA Lahore, WASA Rawalpindi, CDA, PMD and Ministry of Climate Change on 5th October, 2020 in order to construct the underground water reservoirs to store the rainfall water during Monsoon Season. The meeting concluded with the following decisions:
 - i. WASA Lahore to complete ongoing feasibility studies/detailed design work at other locations and submit the detailed project proposal to O/o CEA/CFFC for exploring possible collaboration and funding options with the potential development partners/donors through requisite Government channels for implementation of proposed underground reservoirs in Lahore.
 - ii. WASA Rawalpindi to provide details of rainwater harvesting projects completed so far in Rawalpindi and proposal for future projects requiring possible support for their implementation.
 - iii. CDA will share the details of rainwater harvesting projects completed in the past along-with their current status.

- iv. CDA to initiate rain/storm water projects and implement them in line with the objectives and targets set under NWP.
- v. Work on construction of a Rainwater Harvesting Pond in F-9 Park and Storage Tanks in Margalla Hills may be reinitiated by CDA

3.7 Monsoon Season 2020 and Analysis

3.7.1 Monsoon Season 2020

Pakistan Meteorological Department (PMD) issued Seasonal Outlook for Summer Monsoon (July-September 2020) for Pakistan on 4th June 2020. The forecasted Outlook for Monsoon Season 2020 is as under:

- i. Monsoon rainfall is expected to be slightly above normal (+10%) during July to September 2020 in Pakistan.
- ii. Sindh and Kashmir are likely to receive moderately above normal (+20%) rainfall during the season.
- iii. 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 2020 (July to September), the rainfall remained above normal in upper Pakistan in July 2020. It remained above normal in lower parts of Sindh during August 2020. During the month of August, moisture was transported from the Arabian Sea which caused heavy rainfall and urban flooding in coastal belt of Sindh. As per PMD's forecast for September, it (rainfall) would remain above normal in all parts of the country during September 2020. On the contrary, the month of September mostly remained dry throughout the country except lower parts of the country.

FFD, Lahore had forecasted **Category-I Flood** (Range: 300,000 cusecs to 500,000 cusecs) in River Jhelum at Mangla (inflow) from 26th to 28th August 2020. Their forecast turned out to be correct as River Jhelum at Mangla experienced **Cat-I Flood Situation** (inflow 320,000 cusecs) at 1300 hours on 26th August and Exceptionally High Flood Level (inflow 415,000 cusecs) at 1800 hours on 27th August 2020.

The perusal of DFSR from 1st July to 30th September 2020 reveals that the storage situation in both the major reservoirs of the country (Tarbela & Mangla Dams) remained healthy/encouraging. **Both the Tarbela & Mangla achieved their respective Maximum Conservation Levels of 1550.00 feet and 1242.00 feet simultaneously on 28th August 2020.** Tarbela Dam attained its MCL from 28th August to 22nd September 2020 (i.e. for 26 days) whereas Mangla Dam remained at its MCL from 28th-29th August and 1st-15th September 2020 (i.e. for 17 days). By the grace of Almighty Allah, the major reservoirs of the Indus River System (i.e. the Tarbela, Mangla and Chashma) achieved their maximum combined live storage of 13.614 MAF (i.e. 100% storage) which was a major breakthrough and a proud moment for the

water-sector engineers of the country. This has become possible due to effective management of reservoirs (especially by WAPDA and IRSA) in line with the SOPs revised in 2018 based on Tarbela Dam 6th Periodic Inspection. As per previous SOPs, filling of only one (1) foot per day was permissible beyond elevation of **1510 feet**, which under the revised SOPs has been raised to **5 feet/ day upto reservoir elevation of 1530 feet and 2 feet/ day upto MCL:1550 feet** for water short years thus enabling Tarbela Dam Management to fill the Tarbela Reservoir and augment precious water as storage. Efforts of all stakeholders involved in revision of SOPs in 2018 are highly appreciated.

The twin cities of Islamabad- Rawalpindi experienced heavy downpour on **14th August 2020** (Friday) during the time **0320 - 0900 hours**, which generated high flood flows in Lai Nullah. The Nullah attained **18.40 feet gauge level (Alert Position)** at **Kattarian Bridge** at 0510 hours and **14.00 feet gauge level (Pre-Alert Level Position)** at **Gawalmandi Bridge** at 0530 hours on that morning. Afterwards, the rainfall stopped and the situation became normal. Apart from that, on **31st August 2020**, due to heavy rains in the upstream catchment area, Rawal Dam and Simly Dam reached their highest levels (i.e. 1752.00 feet & 2315.00 feet respectively). Subsequently, Spillway Gates of both the dams were operated to reduce their levels & announcements were made to alert people regarding rising levels of these Dams.

Moreover a meeting regarding resolution of Mangla Emergency Spillway operation issue and devising some interim modality was held on **29th July 2020** under the chairmanship of Secretary, Ministry of Water Resources in the Committee Room of office of the Chief Engineering Adviser/Chairman, Federal Flood Commission, Ministry of Water Resources, Islamabad. In the said meeting, following decisions were taken:

- i. WAPDA would sensitise the Engineers Directorate, GHQ Rawalpindi and share with them the present scenario with regards to non-operation of Barakas Nullah and its financial implications of (i) not storing water in Mangla Dam, (ii) downstream damages and (iii) a scenario of flood routing by passing 20, 000 cusecs discharge via Emergency Spillway through Barakas Nullah.
- ii. Next meeting regarding operation of Emergency Spillway of Mangla Dam through Barakas Nullah would be held at Mangla Garrison before 15th August 2020.
- iii. WAPDA would share with Engineers Directorate, GHQ Rawalpindi different scenarios for 20,000 cusecs and 2,30,000 cusecs discharge through Barakas Nullah along with list of structures/buildings to ascertain what buildings/area would come in its way, that would require contingency measures.
- iv. Under the circumstances, the rehabilitation work of Barakas Nullah to pass discharge of 20,000 cusecs would be taken up by WAPDA itself and completed in minimum possible time i.e. before June 2021.
- v. In order to safely pass the 100 year flood (1992 Flood) through Mangla Dam, both MDO & HQ Engineers 1 Corps would prepare a joint Contingency Plan indicating the area/buildings to be evacuated in case 20,000 cusecs discharge is allowed through Emergency Spillway/Barakas Nullah and submit the same to MOWR at the earliest.

Another meeting of stakeholders to discuss way forward for Barakas Nullah issue and implications for release of water from Emergency Spillway was held on 19th August 2020 at Engineers Directorate, GHQ Rawalpindi. After thorough discussion, a committee of stakeholders to be headed by Member (Water) WAPDA was constituted. This office also forwarded certain suggestions on the matter vide its letter dated 25th August 2020. Sensitization of stakeholders resulted in a very effective reservoir regulation by FMC of Mangla Dam which avoided losses as

well as filled the dam to its MCL. A remarkable achievement of FMC was to absorb a flood peak of 4,15,000 cusecs received on 27.8.2020 by releasing only 1,25,000 downstream on 28.8.2020.

Heavy rainfall spell occurring in various parts of Sindh Province during **6th-8th August 2020** caused severe urban flooding in Karachi, Hyderabad and other big cities. Due to torrential rains in Khirther Hills Range on **6th - 8th August 2020**, flash flooding generated in GajNai and other local nullahs had breached Gaj Diversion Bund in reach RD 11+000 to RD 15+000 and F.P. Bund at five locations (RD 40+000, RD 43+000, RD 44+000, RD 52+000 & RD 75+000). Later on, all the breaches of F.P. Bund were plugged. Moreover, heavy rains in various cities of Sindh from **29th – 31st August 2020** generated urban flooding especially in Karachi where record-breaking rains wrecked havoc and lashed almost all parts of the city leading to deaths due to drowning, electrocution, as well as house and wall collapses. Personnel from the armed forces were called out to rescue stranded people, distribute food and medical aid.

Heavy rains in various parts of Balochistan (districts Khuzdar, JhalMagsi, Lasbela, Gwadar, Pasni, Kachhi & DeraBugti) during the **2nd week of August 2020** caused flash flooding in hill torrents & local nullahs. As a result, severe damages occurred to Gwadar - Karachi Coastal Highway near Pasni (Gwadar) and Quetta - Jacobabad Highway, which were later restored by the concerned Provincial and Federal Government agencies. According to NDMA, **410 lives** were lost and **134,891** houses were damaged due to 2020 monsoon rains/floods. 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
1.	04-07-2020	Hafizabad=51mm
2.	11-07-2020	Islamabad (Zerpoint= 58mm &, Shamsabad= 52mm)
3.	12-07-2020	Rohri= 56mm
4.	15-07-2020	Mithi=55mm
5.	17-07-2020	Karachi (Faisal Base= 64mm)
6.	19-07-2020	Hafizabad=92mm, Shadiwal=72mm, Mangla=70mm & Kasur=57mm
7.	20-07-2020	Faisalabad=89mm, Shadiwal=73mm, Lahore (Gulshan e Ravi=73mm, Johar Town=63mm & Punjab University=52mm), Noorpur Thal=70mm, Multan (City=61mm, Shujabad, Mumtazabad & Sameejabad=60mm each)
8.	21-07-2020	Jhelum=88mm, Kotli=80mm & Bahawalpur (Airport)=54mm
9.	25-07-2020	Islamabad (Chaklala Airbase=97mm, Bokra=56mm & Golra=55mm)
10.	26-07-2020	Karachi (Gulshan e Hadeed=86mm, University Road=81mm, Sarjani Town=73, North Karachi= 62mm, Jinnah Terminal=58mm, Saddar and Kemari= 51mm each & Airport=50mm)
11.	28-07-2020	Islamabad (Saidpur = 57mm) & Hajira=50mm
12.	29-07-2020	Haraman=79mm, Lahore (Airport=68mm) & Gujranwala=53mm

Sr. No.	Date	City with Rainfall
13.	30-07-2020	Balakot=60mm
14.	31-07-2020	Sialkot =85mm & Mangla =54mm
15.	01-08-2020	Lahore (TajPura=71mm, Lukshmi=69mm, Shahdara=65mm, ShahiQilla=63mm & Misri Shah=55mm)
16.	03-08-2020	Daggar=52mm
17.	06-08-2020	Karachi (Faisal Base=94mm, Sarjani Town=73mm, Saddar=70mm, Airport=68mm, University Road=57mm & Gulshan e Hadeed=53mm)
18.	07-08-2020	Kotli=98mm, Ormara=88mm, Sibbi=76mm, Karachi([Masroor Base=69mm, Gulshan e Hadeed=60mm, Saddar&Kemari=50mm each), Pasni=62mm, Balakot=61mm, Islamabad (Saidpur=51mm), Murree, Khuzdar & Padidan=51mm each & Larkana=50mm)
19.	08-08-2020	Nauseri=85mm, Balakot=83mm Mithi=56mm&, Buner=53mm
20.	09-08-2020	Lahore (TajPura=126mm, Lukshmi=121mm, Township=96mm, Misri Shah=94mm, ShahiQilla=86mm, Mughal Pura=85mm, Upper Mall=79mm, Shahdara=71mm, Airport & Samanabad=68mm each, Gulshan e Ravi=65mm, Punjab University=52mm & Gulberg & Johar Town=51mm each) & Narowal=54mm.
21.	10-08-2020	Multan (Chungi No.9=63mm), Islamabad (Shamsabad=54mm)& Lahore (Johar Town=52mm)
22.	13-08-2020	Islamabad (Golra=114mm, Saidpur=91mm & New Airport=57mm)
23.	17-08-2020	Shinkiari=68mm
24.	18-08-2020	Rohtas=51mm & Domel=50mm
25.	19-08-2020	Lahore (Lukshmi=207mm, TajPura=192mm, Shahdara=171mm, Gulshan e Ravi=169mm, Samanabad=167mm, ShahiQilla=160mm, Upper Mall=159mm, Township=152mm, Punjab University=147mm, Iqbal Town=142mm, Misri Shah=132mm, Jail Road=125mm, Johar Town=123mm, Airport=104mm, Gulberg=95mm & Mughal Pura=93), Hafizabad=155mm, Joharabad=97mm, Jhang=93mm, Kasur=81mm, Faisalabad=72mm, Mandi Bahauddin=60mm, Chakwal=57mm & Gujranwala=54mm.
26.	20-08-2020	Malam Jabba=82mm & Faisalabad=64mm
27.	21-08-2020	Karachi (Surjani Town=186mm, North Karachi & Nazimabad=106mm each, Gulshan e Hadeed=84mm & Masroor Base=54mm)
28.	23-08-2020	Mithi=76mm
29.	24-08-2020	Mirpur Khas=162mm, Mithi=135mm, Hyderabad (City=133mm & Airport=128mm), Chhor=111mm, Badin=109mm, Karachi Gulshan e Hadeed=105mm) Tando Jam=94mm & Thatta=72mm
30.	25-08-2020	Malam Jabba=153mm, Dadu=142mm, Karachi (Faisal Base=134mm,

Sr. No.	Date	City with Rainfall
		Gulshan e Hadeed=122mm, Nazimabad=91mm, Saddar=88mm, Landhi=85mm, Airport=81mm, University Road=79mm, Sadi Town=72mm, Masroor Base=68mm, Jinnah Terminal=67mm & North Karachi=50mm), Padidan=110mm, Balakot= 103mm, Islamabad (Shamsabad=102mm, Zeropoint=98mm & Chaklala Airbase=64mm) Thatta=89mm, Moin-jo-Daro=82mm, , Kohat=70mm, Larkana=66mm, Attock=60mm Sakrand=56mm & Mirpur Khas=54mm
31.	26-08-2020	Kotli=110mm, DG Khan (Zain Sanghar=104mm), Moin-jo-Daro=100mm, Gujranwala=95mm, Lahore (Shahdara=82mm), Jhelum=78mm, Sibbi=74mm, Palandri=73mm, Mianwali (Airbase=66mm), Mangla=61mm, Jacobabad=60mm, Larkana=57mm, Kot Addu=53mm & Hajira=50mm
32.	27-08-2020	Karachi (Faisal Base=231mm, Sarjani Town=195mm, Kemari=170mm, North Karachi=168mm, Nazimabad=162mm, Masroor Base=154mm, Saddar=142mm, Landhi=126mm, Airport=122mm & University Road & Saadi Town=105mm each), Kotli=192mm, Sialkot (Cantt=159mm & Airport=85mm), Kallar=123mm, Palandri=112mm, Mangla & Shadiwal=92mm each, Chakdara=88mm, Jhelum=84mm, Narowal=81mm, Rawalakot=78mm, Lahore (Taj Pura=74mm, Lukshmi=71mm, Jail Road=67mm, Johar Town=63mm, Township=58mm, Gulberg=57mm, Gulshan e Ravi=56mm, Airport=55mm & Mughal Pura=53mm), Cherat=68mm & Malam Jabba & Buner=51mm each
33.	29-08-2020	Shadiwal =57mm
34.	30-08-2020	Chhor=82mm, Lahore (Shahdara=76mm, Shahi Qilla=70mm & Gulshan e Ravi=68mm) Mithi=73mm & Islamabad (Saidpur=50mm)
35.	31-08-2020	Joharabad=166mm, Bhoun=160mm, Noorpur Thal=143mm, Malam Jabba=129mm, Mianwali (Airbase=102mm), Multan (Shujabad=102mm, Chungi No.9=99mm, Sameejabad=75mm, City=69mm & Airport=59mm), Attock=93mm, Sargodha (Airbase=93mm), Kamra=85mm, Chhor=83mm, Bahawalpur (City=75mm & Airport=62mm), Kot Addu=70mm, Oghi=66mm, Layyah=64mm, Besham, Cherat & Bhakkar=62mm each, DG Khan (Vehova=61mm), Kalam & Risalpur=57mm each, Daggar=56, Palandri & Chattar Kallas=53mm each, Saidu Sharif=51mm & Pattan=50mm
36.	01-09-2020	Oghi=165mm, Malam Jabba=135mm, Muzaffarabad (City=130mm), Balakot=112mm, Noorpur Thal=103mm, Besham=102mm, Shinkhari=94mm, Pattan=91mm, Phulra=90mm, Brarkot & Cherat=85mm each, Kakul=82mm, Kamra=79mm, Domel=78, Jhang=75mm Islamabad (New Airport=73mm), Attock & Risalpur=72mm each, DI Khan=70mm, Buner & Chakdara=66mm each, Joharabad=65, Saidu Sharif=61mm,

Sr. No.	Date	City with Rainfall
		Haraman=59, Daggar=58mm, Kohat=55mm & Bhakkar & Kalam=50mm each
37.	03-09-2020	Lahore (Shahi Qilla=135mm, Shahdara=132mm, Lukshmi=131mm, Gulberg=100mm, Johar Town=95mm, Taj Pura=89mm, Airport=86mm, Punjab University=82mm, Gulshan e Ravi=81, Samanabad=80, Misri Shah=78, Township & Upper Mall=75mm each, Jail Road=60mm & Iqbal Town & Mughal Pura=50mm each), Islamabad (New Airport=115mm), Kasur=95mm, Bhoun & Bahawalnagar=78mm each & Palandri=69mm
38.	04-09-2020	Mirpur Khas = 90mm, Lahore (Iqbal Town=62mm, Mughal Pura=59mm & Airport=58mm), & Mangla =50mm
39.	06-09-2020	Palandri=119mm & Haraman=56mm

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 2020 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 & III** whereas rainfall data of Monsoon Season 2020 is attached as **Appendix-IV**. Escapages below Kotri Barrage as received from IRSA are attached as **Appendix-V**.

3.7.3 Country-Wide Losses/ Damages due to 2020 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 2020 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 2020 as reported by the concerned organizations.

Table 3.7: HISTORICLY MAXIMUM PEAK DISCHARGES RECORDED IN MAJOR RIVERS OF PAKISTAN (Continued)

River	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	Max of 1995	Max of 1996	Max of 1997	Max of 1998
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	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
	Kalabagh	9,50,000	9,50,000 14-7-42	5,64,000	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	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
	Chashma	9,50,000	10,36,673 2-8-2010	5,10,000	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	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
	Taunsa	11,00,000	9,59,991 28-8-2010	5,67,623	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	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
	Guddu	12,00,000	11,99,672 15-8-76	10,83,742	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	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
	Sukkur	9,00,000	11,61,000 16-8-76	10,77,000	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 8-93	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
	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 8-93	5,82,639 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
Jhelum	Mangla	10,60,000	10,90,000 10-9-92	2,20,000	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	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
	Rasul	8,50,000	9,52,170 10-9-92	2,69,976	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	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
Chenab	Marala	11,00,000	11,00,000 26-8-57	7,70,000	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	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
	Khanki	8,00,000	10,86,460 27-8-57	10,00,496	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	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
	Qadirabad	9,00,000	9,48,530 11-9-92	8,54,341	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	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
	Trimmu	6,45,000	9,43,225 8-7-59	7,52,910	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	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
	Panjnad	7,00,000	8,02,516 17-8-73	8,02,516	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	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

Table 3.7: HISTORICLY MAXIMUM PEAK DISCHARGES RECORDED IN MAJOR RIVERS OF PAKISTAN (Continued)

River	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	Max of 1995	Max of 1996	Max of 1997	Max of 1998
Ravi	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	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
	RaviSyphon	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	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
	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	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
	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	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
	Sidhani	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	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
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	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
	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	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

Table 3.7: HISTORICLY MAXIMUM PEAK DISCHARGES RECORDED IN MAJOR RIVERS OF PAKISTAN (Continued)

River	Site	Design Capacity	Historic Max. Flood	Max of 1999	Max of 2000	Max of 2001	Max of 2002	Max of 2003	Max of 2004	Max of 2005	Max of 2006	Max of 2007	Max of 2008	Max of 2009
Indus	Tarbela	15,00,000	6,04,000 30-7-2010	3,82,000 4-9-99	1,99,200 1-7-2000	2,29,900 22-8-2001	2,90,900 14-8-2002	3,50,000 21-7-2003	2,69,900 16-7-2004	3,72,900 16-7-2005	3,71,800 5-8-2006	2,92,600 03-8-2007	2,58,500 12-8-2008	3,06,000 16-8-2009
	Kalabagh	9,50,000	9,50,000 14-7-42	4,63,700 10-8-99	2,61,100 2-8-2000	4,17,200 24-7-2017	3,79,600 14-8-2002	3,99,400 03-8-2003	2,45,100 10-7-2004	5,15,100 02-7-2005	4,89,600 6-8-2006	3,59,900 16-8-2007	3,36,500 5-8-2008	3,48,300 17-8-2009
	Chashma	9,50,000	10,36,673 2-8-2010	5,48,300 11-8-99	2,54,800 2-8-2000	3,00,500 25-7-2017	3,48,800 15-8-2002	4,63,800 05-8-2003	2,20,300 11-7-2004	5,33,200 20-7-2005	5,84,700 06-8-2006	4,03,400 15-8-2007	3,21,300 21-7-2008	3,80,800 19-8-2009
	Taunsa	11,00,000	9,59,991 28-8-2010	4,09,700 13-8-98	2,03,100 5-7-2000	2,81,900 27-7-2017	3,06,700 17-8-2002	4,21,200 06-8-2003	1,82,400 14-7-2004	5,31,200 20-7-2005	6,12,300 9-8-2006	3,35,400 18-8-2007	2,63,300 8-8-2008	3,20,300 21-8-2009
	Guddu	12,00,000	11,99,672 15-8-76	4,19,800 17-8-99	1,71,600 6-8-2000	2,30,100 30-7-2017	2,55,100 21-8-2002	3,65,300 02-8-2003	1,32,500 18-7-2004	5,15,900 23-7-2005	5,70,500 13-8-2006	3,22,600 22-8-2007	2,56,200 13-8-2008	2,32,300 25-8-2009
	Sukkur	9,00,000	11,61,000 16-8-76	3,90,000 19-8-99	1,17,700 8-8-2000	1,68,900 31-7-2017	1,81,100 23-8-2002	2,97,700 07-8-2003	64,800 20-7-2004	4,47,400 25-7-2005	5,14,000 16-8-2006	2,58,700 24-8-2007	1,91,700 15-8-2008	1,34,600 26-8-2009
	Kotri	8,50,000	9,81,000 14-8-56	2,20,700 23-8-99	47,800 12-8-2000	62,800 03-9-2017	84,300 11-9-2002	2,31,400 11-8-2003	9,000 5-7-2004	2,74,300 12-8-2005	3,56,500 25-8-2006	1,28,400 28-2007	2,00,000 20-8-2008	1,15,800 31-8-2009
Jhelum	Mangla	10,60,000	10,90,000 10-9-92	1,23,900 7-8-99	42,200 22-9-2000	42,800 15-9-2017	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 21-7-2009
	Rasul	8,50,000	9,52,170 10-9-92	22,800 15-9-99	37,800 22-7-2000	37,800 24-7-2017	34,700 13-8-2002	85,300 4-9-2003	42,800 22-7-2004	95,700 16-7-2005	1,42,000 4-8-2006	43,400 8-7-2007	44,500 25-9-2008	81,300 16-8-2009
Chenab	Marala	11,00,000	11,00,000 26-8-57	1,90,300 7-8-99	2,23,400 22-7-2000	1,32,500 23-7-2017	2,24,800 14-8-2002	52,900 05-9-2003	15,800 4-9-2004	92,200 17-7-2005	1,65,900 13-7-2006	34,100 7-7-2007	20,600 16-9-2008	56,800 17-8-2009
	Khanki	8,00,000	10,86,460 27-8-57	1,60,200 7-8-99	3,03,300 23-7-2000	1,31,900 24-7-2017	2,40,400 14-8-2002	1,37,200 15-8-2003	93,200 17-8-2004	3,33,700 07-7-2005	3,33,000 3-9-2006	1,13,800 12-8-007	1,63,500 31-7-2008	93,200 28-7-2009
	Qadirabad	9,00,000	9,48,530 11-9-92	1,42,400 8-8-99	2,91,300 23-7-2000	1,18,100 15-8-2017	2,26,400 14-8-2002	1,72,600 05-8-2003	1,06,900 17-8-2004	3,68,100 08-7-2005	4,18,700 4-9-2006	1,41,100 14-8-2007	1,93,400 31-7-2008	97,100 29-7-2009
	Trimmu	6,45,000	9,43,225 8-7-59	82,500 22-7-99	1,16,200 26-7-2000	72,400 18-8-2017	1,08,600 17-8-2002	1,69,300 05-8-2003	90,000 18-8-2004	3,69,800 8-7-2005	4,43,200 4-9-2006	61,900 1-7-2007	1,90,400 1-8-2008	76,400 29-7-2009
	Panjnad	7,00,000	8,02,516 17-8-73	3,82,000 4-9-99	63,400 7-8-2000	46,600 22-8-2017	56,800 21-8-2002	1,22,800 08-8-2003	42,800 20-8-2004	1,62,100 11-7-2005	2,66,300 7-9-2006	55,300 2-7-2007	54,200 6-8-2008	43,800 21-8-2009

Table 3.7: HISTORICLY MAXIMUM PEAK DISCHARGES RECORDED IN MAJOR RIVERS OF PAKISTAN (Continued)

River	Site	Design Capacity	Historic Max. Flood	Max of 1999	Max of 2000	Max of 2001	Max of 2002	Max of 2003	Max of 2004	Max of 2005	Max of 2006	Max of 2007	Max of 2008	Max of 2009
Ravi	Jassar	2,75,000	6,80,000 5-10-55	4,63,700 10-8-99	34,500 28-7-2000	46,100 15-8-2001	69,500 14-5-2002	37,900 5-8-2003	30,600 18-8-2004	40,200 8-7-2005	36,400 3-9-2006	22,900 4-7-2007	38,600 20-8-2008	10,100 29-7-2009
	Ravi Syphon	4,50,000	6,59,000 6-10-55	5,48,300 11-8-99	41,200 30-7-2000	44,100 15-8-2001	42,100 15-8-2002	40,700 23-9-2003	37,600 19-8-2004	30,700 8-7-2005	29,300 2-9-2006	38,000 24-7-2007	32,000 17-8-2008	23,900 30-8-2009
	Shahdara	2,50,000	5,76,000 22-9-88	4,09,700 13-8-98	51,800 29-7-2000	41,000 16-8-2001	37,000 15-8-2002	38,800 5-8-2003	51,900 2-8-2004	30,200 17-8-2005	23,600 28-7-2006	30,600 1-7-2007	32,000 18-8-2008	22,200 13-8-2009
	Balloki	2,25,000	3,36,200 28-9-1988	4,19,800 17-8-99	46,500 30-7-2000	46,900 16-8-2017	28,100 15-8-2002	44,700 06-8-2003	40,400 20-8-2004	25,200 8-7-2005	41,300 3-9-2006	37,900 1-7-2007	67,200 18-8-2008	14,000 31-7-2009
	Sidhani	1,50,000	3,30,210 2-10-88	3,90,000 19-8-99	37,200 2-8-2000	30,600 19-8-2017	16,100 18-8-2002	25,500 09-8-2003	12,800 23-8-2004	6,200 17-8-2005	10,700 1-8-2006	14,700 19-8-2007	38,700 24-8-2008	8,500 24-8-2009
Sutlej	Sulemanki	3,25,000	5,98,872 8-10-55	2,20,700 23-8-99	16,000 22-7-2000	13,600 20-8-2017	8,500 3-9-2002	7,000 09-9-2003	4,200 10-8-2004	18,000 13-8-2005	9,100 10-9-2006	9,100 8-8-2007	90,100 18-8-2008	3,400 3-8-2009
	Islam	3,00,000	4,92,581 11-10-55	1,23,900 7-8-99	13,800 27-7-2000	3,500 23-8-2017	2,100 20-9-2002	1,700 15-9-2003	8,000 16-8-2004	16,400 16-8-2005	1,800 4-7-2006	2,800 13-7-2007	35,800 25-8-2008	1,200 10-9-2009

Table 3.7: HISTORICLY MAXIMUM PEAK DISCHARGES RECORDED IN MAJOR RIVERS OF PAKISTAN (Continued)

River	Site	Design Capacity	Historic Max. Flood	Max of 2010	Max of 2011	Max of 2012	Max of 2013	Max of 2014	Max of 2015	Max of 2016	Max of 2017	Max of 2018	Max of 2019	Max of 2020
Indus	Tarbela	15,00,000	6,04,000 30-7-2010	6,04,000 30-7-2010	2,68,500 16-9-2011	278000 05-8-12	3,38,100 14-8-13	240,100 15-8-14	486,900 26-7@ 1800	3,02,900 17-7@ 2359	3,36,000 03-8@1200	2,42,300 2-8@1200	311700 9-8@2359	3,35,800 02-9@1200
	Kalabagh	9,50,000	9,50,000 14-7-42	9,36,453 30-7-2010	2,68,400 26-7-2011	277000 17-7-12	4,72,303 13-8-13	249,992 25-7-14	528,698 2-8-@ 1800	3,51,490 05-7@ 1800	4,19,460 03-08@0600	3,11,154 15-8@1200	354830 15-8@2359	4,57,031 02-@2359
	Chashma	9,50,000	10,36,673 2-8-2010	1,036,673 2-8-2010	3,49,700 28-7-2011	285500 08-7-12	6,20,672 14-8-13	257,632 22-6-14	636,512 3-8@ 1200	3,73,659 05-7@ 1200	4,46,361 05-8@0600	3,19,912 15-8@1500	370823 2-8@1200	4,73,447 04-9@1800
	Taunsa	11,00,000	9,59,991 28-8-2010	9,59,991 2-8-2010	2,23,200 31-8-2011	235400 10-9-12	5,16,017 17-8-13	247,400 18-7-14	604714 5-8@ 1000	3,43,024 05-7@ 1800	4,23,861 06-9@1200	2,76,215 17-8@1200	378194 14-8@2359	4,79,866 06-9@1200
	Guddu	12,00,000	11,99,672 15-8-76	1,148,200* 8-8-2010	2,72,200 4-9-2011	236100 10-9-12	5,42,100 20-8-13	34,0864 18-9-14 2359 hrs	735,246 3-8@ 1200	2,97,928 11-7@ 0600	4,28,640 09-8@0600	2,27,270 20-8@0600	386041 21-8@0600	5,40,750 09-09@ 0600
	Sukkur	9,00,000	11,61,000 16-8-76	1,108,795** 10-8-2010	2,60,800 6-9-2011	210000 14-9-12	4,54,995 24-8-13	26,8935 20-9-14 1200	660216 5-8@ 0600	2,25,205 19-8@ 0600	3,33,108 11-8-@0600	1,56,025 21-8@0600	303625 22-8@0600	4,58,390 10-9@1800
	Kotri	8,50,000	9,81,000 14-8-56	9,39,442 27-8-2010	2,60,400 16-9-2011	138800 21-9-12	3,44,866 30-8-13	11,0345 25-9-14 0600 hrs	603084 5-8@ 0600	1,38,455 10-8@ 0600	2,10,923 18-08@0600	60,740 26-8@0600	198579 29-8@0600	2,83,910 19-9@2359
Jhelum	Mangla	10,60,000	10,90,000 10-9-92	2,49,100 10-8-2010	7,200 12-8-2011	44700 05-8-12	45,214 13-8-13	500,000 5-9-14	109,232 26-7@ 1800	62,701 07-8@ 0600	67,882 22-@1800	69,127 7-7@1800	125171 17-6@2359	1,25,803 28-8@1400
	Rasul	8,50,000	9,52,170 10-9-92	2,25,496 30-7-2010	1,31,300 16-9-2011	31400 05-8-12	23,610 19-9-13	516,000	99100 27-7@ 1800	46,562 27-8@ 1200	39,230 22-09@1200	39,230 8-7@1800	90554 19-6@0600	1,26,951 28-8@2300
Chenab	Marala	11,00,000	11,00,000 26-8-57	2,63,795 30-7-2010	9,69,00 17-9-2011	149200 04-8-12	3,69,690 15-8-13	858,000 6-9-14	153408 12-7@ 2100	3,93,690 07-8@ 1500	1,87,472 19-7@0100	1,68,278 13-8@1200	211000 31-7@1600	2,98,884 27-8@0600
	Khanki	8,00,000	10,86,460 27-8-57	2,82,418 6-8-2010	1,42,500 16-9-11	186400 04-8-12	4,10,331 15-8-13	947,000 7-9-14	152000 13-7@ 0300	4,18,736 07-8@ 2359	1,70,021 13-7@0600	1,82,025 13-8@2359	181944 31-7@2359	2,86,230 28-8@0100
	Qadirabad	9,00,000	9,48,530 11-9-92	3,27,637 7-8-2010	1,42,500 17-9-2011	180800 05-8-12	4,03,403 15-8-13	904,000 7-9-14	161100 13-7@ 1200	4,05,542 08-8@ 0300	1,57,842 19-7@1200	1,72,031 14-8@0600	159544 1-8@0600	2,67,540 28-8@1500
	Trimmu	6,45,000	9,43,225 8-7-59	3,19,733 7-8-2010	1,66,400 17-9-2011	73700 07-8-12	2,67,609 20-8-13	626,000 10-9-14	135000 13-7@ 0300	1,53,339 10-8- @1800	89,345 05-08@1200	81,680 16-8@2359	93021 22-8@1200	1,96,077 01-9@0600
	Panjnad	7,00,000	8,02,516 17-8-73	3,23,026 11-8-2010	1,27,800 20-9-2011	65600 17-9-12	3,17,261 25-8-13	45,3570 16-9-14 0600 hrs	135866 30-7@ 2359	116029 13-8@ 2359	63488 8-8@1800	87383 27-8@2359	70556 26-8-1800	133646 05-9@0600

* It does not include flood flows passed through breaches occurred in LMB Guddu Barrage; ** It does not include flood flows passed through breaches occurred in Tori Flood Bund.

Table 3.7: HISTORIC MAXIMUM PEAK DISCHARGES IN MAJOR RIVERS OF PAKISTAN

River	Site	Design Capacity	Historic Max. Flood	Max of 2010	Max of 2011	Max of 2012	Max of 2013	Max of 2014	Max of 2015	Max of 2016	Max of 2017	Max of 2018	Max of 2019	Max of 2020
Ravi	Jassar	2,75,000	6,80,000 5-10-55	21,100 21-8-2010	24,300 13-8-2011	30500 26-8-12	67,700 16-8-13	67,700 7-9-14 1200 hrs	36100 15-8@ 2359	38,400 08- 8@1200	46,439 10-08@1200	66,641 25-9@0600	51000 18-8@0600	30690 28-8@1500
	Ravi Syphon	4,50,000	6,59,000 6-10-55	41,200 21-8-210	42,300 14-8-2011	39800 24-8-12	73,600 18-8-2013	93,300 8-9-14 1200 hrs	39200 24-9@ 1800	45081 28-7@ 2359	46100 2-8@ 1800	37,936 14-8@1800	37936 19-8@0600	34,531 28-8@ 0600
	Shahdara	2,50,000	5,76,000 22-9-88	41,900 21-8-2010	43,000 14-8-2011	40800 22-8-12	74,880 17-8-13	91,400 8-9-14	38400 24-9@ 1500	44,595 08-8@ 1800	39,313 02-08@1200	37,587 14-8@1800	37200 19-8@0600	34,308 28-8@ 0600
	Balloki	2,25,000	3,36,200 28-9-1988	41,200 23-8-2010	44,000 15-8-11	29300 23-8-12	97,970 18-8-13	118,000 9-9-14	57700 24-9@ 1800	37,165 09-8@ 1200	36,790 11-8-@1800	39,310 16-8@2359	34900 19-8@1800	37,250 29-8@ 0600
	Sidhani	1,50,000	3,30,210 2-10-88	16,800 28-7-2010	2,39,00 2-9-11	24600 14-9-12	73,504 23-8-13	71,112 12-9-14	38500 28-7@ 0600	12325 1-8@ 0600	26954 7-8@ 0600	8857 1-8@ 1800	15384 2-9@1200	28800 31-8@2359
Sutlej	Sulemanki	3,25,000	5,98,872 8-10-55	44,300 30-9-2010	76,200 29-8-11	16900 9-9-12	78,846 22-8-13	21,383 7-9-14	49600 17-8@ 1800	24492 30-8@ 1800	20,893 15-8-@0600	34,722 19-8@1800	66459 24-8-@0600	11,897 24-7@ 1800
	Islam	3,00,000	4,92,581 11-10-55	28,900 20-9-2010	49,900 4-9-11	12700 13-9-12	70,932 25-8-13	17,807 8-9-14	43300 21-8@ 1200	11145 31-8@ 2359	14221 16-8@ 1800	16460 3-10@ 0600	52355 31-8@ 0600	6609 26-8@1800

Table 3.8: Flood Peaks Recorded During 2020 Monsoon Season In Major Rivers

RIVER	SITES	IN FLOW (Cusecs)	RETENSION (DATE & TIME)	OUT FLOW (Cusecs)	CLASSIFICATION	RETENSION (DATE & TIME)
INDUS	Tarbela	3,84,000	02-09-2020 @ 0600hrs	3,35,800	Low Flood	02-09-2020 @ 1200hrs
INDUS	Kalabagh	4,60,231	02-09-2020 @ 2359hrs	4,57,031	Medium Flood	02-09-2020 @ 2359hrs
	Chashma	4,75,947	04-09-2020 @ 1800hrs	4,73,447	Medium Flood	04-09-2020 @ 1800hrs
	Taunsa	4,79,866	06-09-2020 @ 1200 hrs	4,79,866	Medium Flood	06-09-2020 @ 1200 hrs
	Guddu	5,70,722	09-09-2020 @ 0600 hrs	5,40,750	High Flood	09-09-2020 @ 0600 hrs
	Sukkur	5,01,125	10-09-2020 @ 1800 hrs	4,58,390	Medium Flood	10-09-2020 @ 1800 hrs
	Kotri	3,00,595	19-09-2020 @ 2359 hrs	2,83,910	Low Flood	19-09-2020 @ 2359 hrs
KABUL	Warsak	63,100	25-06-2020 @ 0600 hrs	63,100	Low Flood	25-06-2020 @ 0600 hrs
	Nowshera	1,51,000	02-09-2020 @ 0600 hrs	1,51,000	High Flood	02-09-2020 @ 0600 hrs
JHELUM	Mangla	4,15,000	27-08-2020 @ 2200 hrs	1,25,803	Medium Flood	28-08-2020 @ 1400 hrs
	Rasul	1,26,951	28-08-2020 @ 2300 hrs	1,26,951	Medium Flood	28-08-2020 @ 2300 hrs
CHENAB	Marala	3,03,884	27-08-2020 @ 2359 hrs	2,98,884	High Flood	27-08-2020 @ 0600 hrs
	Khanki	2,92,093	28-08-2020 @ 0100hrs	2,86,230	High Flood	28-08-2020 @ 0100hrs
	Qadirabad	2,84,540	28-08-2020 @ 1500hrs	2,67,540	High Flood	28-08-2020 @ 1500hrs
	Trimmu	2,06,077	01-09-2020 @ 0600hrs	1,96,077	Low Flood	01-09-2020 @ 0600hrs
	Panjnad	1,47,296	05-09-2020 @ 0600hrs	1,33,646	Normal	05-09-2020 @ 0600hrs
RAVI	Jassar	30,690	28-08-2020 @ 0600 hrs	30,690	Normal	28-08-2020 @ 0600 hrs
	R.Syphon	34,531	28-08-2020 @ 0600 hrs	34,531	Normal	28-08-2020 @ 0600 hrs
	Shahdara	34,308	28-08-2020 @ 0600 hrs	34,308	Normal	28-08-2020 @ 0600 hrs
	Balloki	63,250	29-08-2020 @ 0600 hrs	37,250	Normal	29-08-2020 @ 0600 hrs
	Sidhnai	33,036	31-08-2020 @ 2359 hrs	28,800	Normal	31-08-2020 @ 2359 hrs
SUTLEJ	Suleimanki	24,829	25-08-2020 @ 1800 hrs	11,897	Normal	24-07-2020 @ 1800 hrs
	Islam	8,439	26-08-2020 @ 1800 hrs	6,609	Normal	26-08-2020 @ 1800 hrs

Table 3.9: Country-Wide Losses/Damages due to Rains/Floods 2020*

Province/ Region	Persons Died	Persons Injured	Houses Damaged	Roads/ Bridges	Masajid/ Shops/ Hotels	Power Houses
Punjab (incl.ICT)	104	175	220	-	17(S)	-
Sindh	145	96	133,279	-	-	-
KP (incl. merged areas)	116	101	178	3(B)	4(M),2(S)	-
Balochistan	21	17	906	13(R) 3(B)	2(H)	1
AJ & K	12	09	50		1(S),1(H)	4
Gilgit Baltistan	12	02	258	22(B)	1(M)	2
G. TOTAL	410	400	134,891	41	28	7

*Source; NDMA

PHOTOGRAPHS: IMPORTANT MEETINGS OF FFC



A meeting Regarding Installation of Early Flood Warning System (CCP)



A meeting Regarding Installation of Early Flood Warning System (CCP)

**FLOOD PROTECTION WORKS BEING EXECUTED UNDER
NORMAL EMERGENT FLOOD PROGRAMME**

QADIRPUR LOOP BUND MILE 7/2 TO 8/4 (JANUARY – 2020)



QADIRPUR LOOP BUND MILE 7/2 TO 8/4 (DURING – 2019)



**PROVIDING STONE PITCHING AND STONE APRON ALONG MORIA LOOP
BUND MILE 0/0 TO 1/0**



PICTORAL DEMONSTRATION OF NFPP-IV



PICTORAL DEMONSTRATION OF NFPP-IV

NON-STRUCTURAL MEASURES

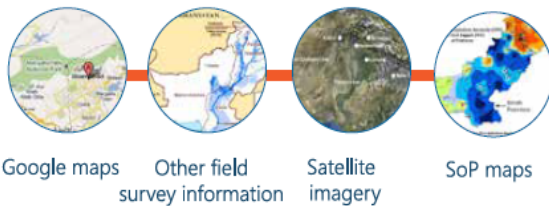
FLOOD FORECASTING AND EARLY WARNING SYSTEMS

Pakistan Meteorological Department has the key responsibility for flood forecasting and early warning



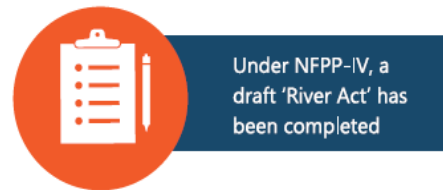
FLOODPLAIN AND FLOOD RISK MAPS

Under FPSP-II, floodplain maps were prepared along all five rivers using :



FLOODPLAIN POLICIES & LEGISLATION

Prior to NFPP-IV there was no firm policy, Act or legislation to prevent encroachments in the floodplains



HYDRO-METEOROLOGICAL OBSERVATION NETWORK

The current hydro-meteorological network for flood forecasting and communication systems comprises:



High Frequency (HF) radio based network,



VHF real-time telemetry system



Meteor-burst telemetry system



Weather radars at Sialkot, Lahore, Mangla, Karachi and Islamabad

COMMUNITY ROLE

Communities living along riverine areas are unwilling to pay heed to flood warnings as they lack resources to quickly move their assets out of floodways

- » Floodproofing, such as concrete foundations and plinth levels above HFL of 100 years return period, a measure practiced in developed countries, cannot be practiced for lack of resources



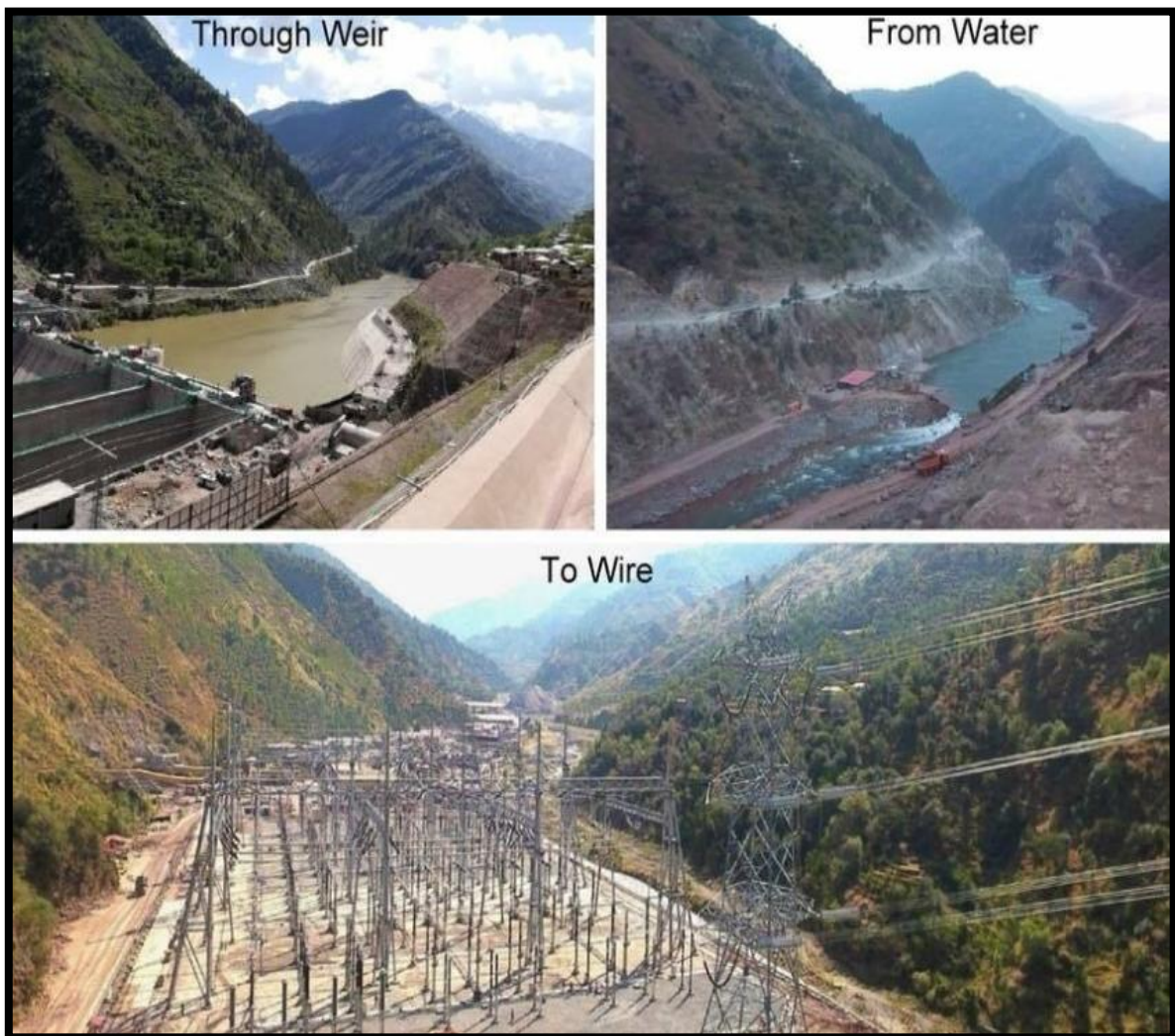
RESERVOIR OPERATION POLICIES



- » Tarbela dam is operated according to its O&M manual and existing SOPs
- » Existing SOPs have been recently revised for Mangla Dam



POWER WING

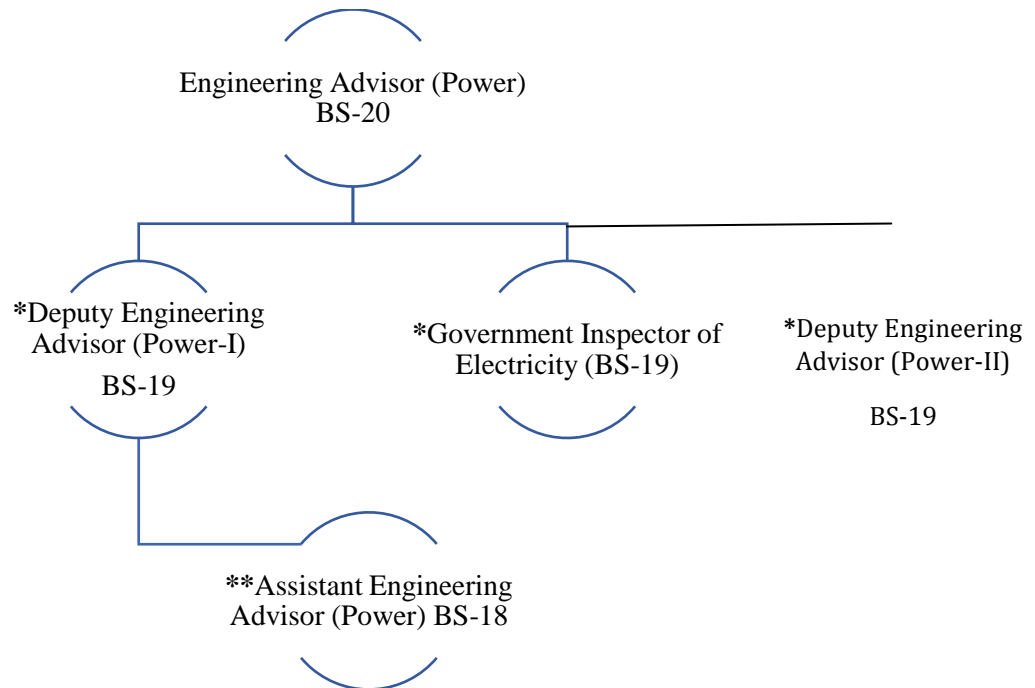


**OFFICE OF THE CHIEF ENGINEERING ADVISOR & CHAIRMAN
FEDERAL FLOOD COMMISSION, ISLAMABAD**

SECTION – 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 Advisors (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 2020

The summary of annual performance of Power Wing for the year 2020 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	04	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.	Transmission & Distribution Projects and Technical Matters.	30	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 to assist the approving authority. Detail of projects is given in Table 4.3 .
3.	WAPDA Inquiries	08	WAPDA Inquires involving technical and contractual matters, were completed. Detail is given in Table 4.4 .
TOTAL		42	

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

PROJECT PC-Is & PC-IIs RELATED TO HYDROPOWER PROJECTS	
Sr.No.	Name of Project/Work
1.	PC-I Proforma for Tarbela 4 th Extension Hydropower Project.
2.	3 rd Revised PC-I for 128 MW Keyal Khwar Hydropower Project.
3.	Provision of Water for the 4.0 Jarri-II Hydropower Project Jarrikas, MirPur, AJ&K- Resolution of Dispute between WAPDA & Investor.
4.	Tarbela 5 th Extension HPP-Draft Feasibility/Design Basis Report Concerning Floating Solar Project in Ghazi Barotha Ponds and Tarbela Reservoir.

Table 4.3: Project PC-Is/PC-IIs related to Power Transmission & Distribution Projects and Technical Matters.

Sr. No.	Name of Project/Work
1.	PC-Is of 18 new Projects in PSDP 2019-20.
2.	PC-Is of 38 Electrification Schemes in QESCO.
3.	Proforma PC-I Provision of 50 KVA T/F & HT/LT line for Degree College area Dalbandin, District Chaghi.
4.	Proforma PC-I Village Electrification in (NA-226) District Quetta.
5.	Proforma PC-I 33 KV Sub Station at Ahmed Wall District Noushki.
6.	Proforma PC-I Provision of 50 KVA T/F & HT/LT line for Killi Hassan Abad & Mengalabad Noukandi.
7.	Proforma PC-I Construction of 33 KV Sub Station Totazai, District Kharan.
8.	Proforma PC-I Construction of 33 KV Sub Station at GhurakNall, District Khuzdar.
9.	Proforma PC-I Construction of 33 KV Sub Station Keshangi, District Noushki.
10.	Proforma PC-I Provision of 50 KVA T/F & 250 Poles for NA-268 District Kharan, Noushki & Chaghi.
11.	Proforma PC-I 11 KV line from Dalbandin Killi Haji Mir Muhammad Azeem Sargesha, District Chaghi.
12.	Proforma PC-I Provision of 50 KVA T/F & HT/LT line for Killi Hassan Abad & Mengalabad Noukandi.
13.	Proforma PC-I Electrification in (NA-66) District Quetta.
14.	Proforma PC-I Provision of 50 KVA T/F & 250 Poles for NA-268 District Kharan, Noushki & Chaghi.
15.	Proforma PC-I Construction of 132 KV Grid Station at Kapoto with Allied 132 KV D/C Transmission Line (in & out arrangement) (35 KM).
16.	PC-Is of new projects in PSDP 2019-20.
17.	Revised PC-I for 220 KV GIS Substation Ghazi Road Lahore.
18.	PC-Is of Mir Pur Khas Under SDGs Program.
19.	PC-Is of Sanghar Under SDGs Program.
20.	3 rd Revised PC-Is for 128 MW Keyal Khawar Hydropower Project.
21.	PC-I for 220 KV QUAID-E-AZAM Business Park Grid Station for Provision of Electricity to PIEDMC Special Economic Zone (SEZ).

Sr. No.	Name of Project/Work
22.	PC-Is of BADIN under SDGs Program.
23.	PC-I for Construction of 132 KV D/C KHANOZAI-PISHIN T/Line (60 KM) and 2 nd Circuit Stringing of 132 KV Kala –Surab T/Line under PSDP 2020-21.
24.	PC-I for Establishment of National Electric Vehicle Research Centre (NEVRC).
25.	PC-I for Industrial Energy Efficiency Initiatives to Supplement Sustainable Energy for All.
26.	PC-I for Building Sector Energy Efficiency Initiatives.
27.	Construction of 132 KV Grid Station at HazarGanji (QESCO) with Allied 132 KV Double Circuit Transmission Line (06 KM) in & out arrangement).
28.	Construction of 132 KV (AIS) Grid Station at deep Sea Port (GWADAR) and Allied 132 KV Double Circuit Transmission Line (11 KM).
29.	Construction of 132 KV Grid Station at Industrial Estate Bostan with Allied 132 KV D/C Transmission Line (in & out arrangement) (25 KM).
30.	Integrated Energy Planning (IEP) – Electric Vehicle Analysis Policy Papers.

Table 4.4: WAPDA Inquiries completed

Sr. No.	Name of Inquiry
1.	Para No.4.4.2-Irregular Reliability Test Run (RTR) of Units No.1,2,3&4-Jabban Hydroelectric Power Station.
2.	Para No.4.6.3-Non Supply of Mandatory Spare Parts by the Contractor Valuing US\$ 0.103 Million Jabban Hydroelectric Power Station.
3.	Para No.4.3.4-Delay in completion due to Non-Inclusion of Additional Scope of Work at the Time of Preparation of Bidding Documents Jabban Hydroelectric Power Station.
4.	Para No.4.3.6-Loss due to delay in award of the main contract M/S HRL-CCPG JV for Rehabilitation of JABBAN Hydroelectric Power Station Rs.1,252.269 Million Jabban.
5.	Para No.4.3.9- Irregular Payment due to procurement without factory acceptance tests at manufacture premises US\$ 0.258 Million equivalent to Pak Rs.26565 Million Jabban.
6.	Para No.4.2.6-Loss due to non-recovery of liquidated damages charges Rs 132.925 Million Jabban Hydroelectric Power Station.
7.	Inquiry/Fact Finding in PDP NO.491 of AR-2019-20 of WAPDA (Loss due to delay in procurement-Rs.222.39M) under Directives of DAC meeting relating to CE/GM(P) Tarbela.
8.	Enquiries/Fact Finding in PDP No. 16 of AR-2017-18 of WAPDA under Directives of DAC meeting relating to GM(P) Tarbela.



ADMINISTRATION AND ACCOUNTS WING



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

SECTION – 5: ADMINISTRATION AND 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 Power Wing.

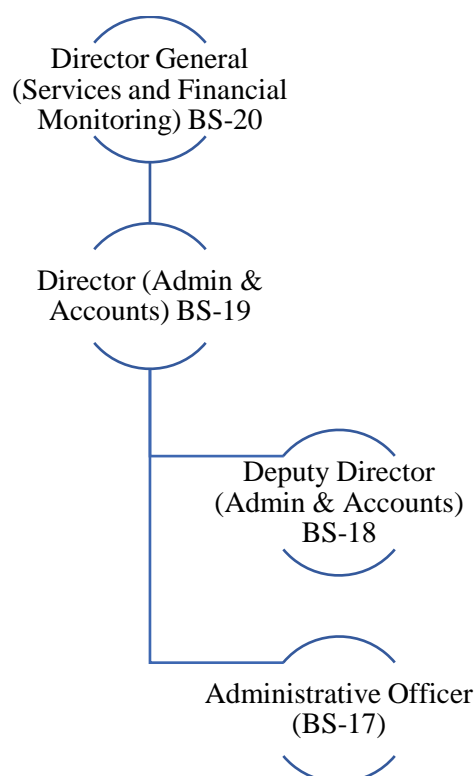


Figure 5.1: Organogram of Admin & Accounts Wing

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 2020

- Appointment of three (03) officials under the “Prime Minister’s Assistance Package for Families of Government Employees who die in Service”.
- Appointment of one (01) official under the “Prime Minister’s Assistance Package for the Civil Servants who become Permanently Disable during the Service”.
- Completion of five (05) tasks under composite tasking document pertaining to service and miscellaneous matters assigned through the PMDU’s Task Management System i.e. (i) Requisition to FPSC: Two (02) posts were forwarded to FPSC through Ministry of Water Resources for initial appointment which are in process of recruitment after being advertised (one Post of Accounts Officer (BS-17) and one post of APS (BS-16) (ii) Revision of Recruitment Rules: The revision in Recruitment Rules of certain technical posts were taken up with the Establishment Division out of which the rules for 12 posts were got revised. (iii) Promotion during the year of 2020: Three (03) posts of officers and seven (07) of officials have been filled through process of Promotion during the year 2020. (iv) Auction of Vehicles: Four (04) obsolete vehicles of this office were in first instance got condemned and thereafter disposed off through auction (v) Recruitment Process Ten (10) posts of officials were filled through initial appointment after obtaining NOC from Establishment Division.
- Clearance of the pending claims from Office of the AGPR, Islamabad.
- Clearance of the pension/family pension cases in respect of four (04) retired/deceased employees.
- Enhancement of 71.150% in the budget allocation i.e. from Rs. 84.000 million (Financial Year 2019-20) to Rs. 143.766 million (Financial Year 2020-21).
- Release of the entire allocated funds for the Normal/Emergent Flood Programme during the financial year 2019-20 i.e. Rs. 500.000 million to the Provinces and Federal Line Agencies for the completion of the approved flood protection schemes.
- Carried out the financial monitoring of the flood protection schemes against the released funds under the Normal/Emergent Flood Programme.
- Completion of the all routine tasks/assignments without any pendency.

5.4 Budgetary Challenges Being Faced by Office of the CEA/CFFC

The biggest administrative challenge being faced by Office of the CEA/CFFC is of inadequate recurrent budget to meet the requirements especially related to the employees' related expenses, hiring and medical claims etc. for which the Finance Division had been approached to grant the Supplementary Grants in this regard. The budget position of the past financial years is tabulated below:

Table 5.1: Budget Position of the Past Financial Years

(Amount in Rupees)

Financial Year	Budget Demand	Budget Allocation
2014-15	103,754,000	59,218,000 (57%)
2015-16	130,185,000	63,969,000 (49%)
2016-17	136,770,000	66,913,000 (48.8%)
2017-18	146,892,000	66,913,000 (45.5%)
2018-19	164,106,000	66,913,000 (41%)
2019-20	178,231,000	84,000,000 (47%)

The recurrent budget being provided to Office of the CEA/CFFC must be enhanced as per its demand in order to cater not only its mandatory needs relating to the employees' related expenses but also to cater its other expenses especially hiring claims.

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INSTITUTIONAL STRENGTHENING AND CAPACITY BUILDING



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

SECTION – 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, Gilgit-Baltistan and AJ&K for Engineers working in Provincial Departments besides by the IRSA and 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.
- (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, Khyber Pakhtunkhawa, Gilgit Baltistan and AJ&K 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 versus 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 (2020-21)
- II. Major Rivers Flow Data of Monsoon Season 2020
- III. Major Rivers Hydrographs of Monsoon Season 2020
- IV. Monthly Rainfall Data (July-September 2020) (Source: PMD)
- V. Escapages below Kotri Barrage (Source: IRSA)

Appendix-I

**SCHEMES TO BE EXECUTED
UNDER NORMAL/ EMERGENT
FLOOD PROGRAMME**

F.Y (2020-21)

**List of Schemes to be Executed Under Normal/ Emergent Flood Programme During
Financial Years (2020-21)**

(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 Indus (left side) along 1-AR Minor in the area of LundiPitafi, District Muzaffargarh (D.G Khan Zone)	386.00	Un- Approved
2.	Checking erosive action of River Chenab at RD 31+000 of Massan Flood Bund and at RD 6+300 of J-Head Spur No. 1, District Jhang – Sargodha Zone	125.00	Un- Approved
3.	Protection from erosive action of River Jhelum on left side near village MeghaKadi Tehsil Shahpur, District Sargodha, diversion structure near Gaga village, Tehsil Bhera and to save the land/ abadies near Chak Mubarak, District Sargodha, (Sargodha Zone)	164.00	Un-Approved
Sub-Total (Punjab)		675.00	
II	<u>Sindh</u>		
1.	Constructing 5 No. stone studs at mile 12/3 + 350 to 12/7 along S.M Bund in Rohri Division Kandiaro	177.349	Un-Approved
2.	Construction of stone pitching of S.M bund from mile 123 to 172	350.000	Un-Approved
Sub-Total (Sindh)		527.349	
III	<u>Khyber Pakhtunkhwa</u>		
1.	Construction of Panyala protection bund District D.I Khan	10.00	Un-Approved
2.	Flood protection scheme for protection of village abadies of Niaz Muhammad Malik Shahi and adjoining agricultural lands located along eroded banks of Khaisar Nullah in reaches District Bannu	20.00	Un-Approved
3.	Flood protection scheme for protection of village abadies of Ajmal Khan PirbaKhel and adjoining agricultural lands in District Bannu	5.00	Un-Approved
4.	Construction of flood protection of Bismillah Khan BakaKhelKorrana and adjoining agricultural lands located along right bank of Tochi River in District Bannu	8.00	Un-Approved
5.	Providing flood protection work along Lora nullah in Barat area in District Bannu	5.00	Un-Approved
6.	Providing flood protection work along left bank of Taudanullah for protection of village abadies & agricultural land in Pk 88 District Bannu	5.00	Un-Approved
7.	Construction of flood protection work for protection of ShamshiKhel village/ agricultural	10.00	Un-Approved

Sr. No.	Name of the Scheme	Estimated Cost (Rs. Million)	Status of Approval
	lands on right side of Kurram River, District Bannu		
8.	Flood protection work for protection of Maqarab Khan Kacha and adjoining lands located along right bank of Gambila River in District Lakki Marwat	4.00	Un-Approved
9.	Construction of flood protection structure for Sangroba area in District Hangu	20.00	Un-Approved
10.	Construction of flood protection structures at critical location in different nullahs of Kohat Irrigation Division Kohat (already approved by Federal DDWP on 8-5-2019, and Administrative Approval issued on 26-5-2019 but due to financial constraints the scheme could not be implemented)	25.00	Un-Approved
11.	Construction of flood protection works along left bank of Swat River near village Manyar for protection of agricultural land and other infrastructure, District Swat	10.00	Un-Approved
12.	Construction of flood protection work along Chitral River at Juti Lasht area, Barenies area and Nagar area District Lower Chitral	10.00	Un-Approved
13.	Construction of flood protection works at Talash Khwar and its tributaries, Jandool Khwar at DoranoQila U/C Munda, Jandool Khwar and its tributaries and Wari area District Dir Lower & Upper	8.00	Un-Approved
14.	Providing flood protection work in Kalpani Nullah D/S of Sangar Baba BabuKhel Bridge District Mardan	8.00	Un-Approved
15.	Providing protection structure for protection of agricultural lands on both sides of escape channel of MachaiBranchat Rd: 75+000	8.00	Un-Approved
16.	Construction of flood protection works for protection of village abadies of village Dagi against flood action in Dagi Drain/ Shagai Nullah District Swabi	9.00	Un-Approved
Sub-Total (Khyber Pakhtunkhwa)		165.00	
IV	<u>Balochistan</u>		
1.	Construction of flood protection bund in Gresha Area, Tehsil Nal, District Khuzdar	20.00	Un- Approved
2.	Construction of flood protection scheme Sari KauranWashaab, District Panjgoor	20.00	Un- Approved
3.	Raising strengthening & stone pitching of flood protection bund Saifabad village, District JhalMagsi	7.500	Un- Approved
4.	Construction of flood protection bund for right	2.00	Un- Approved

Sr. No.	Name of the Scheme	Estimated Cost (Rs. Million)	Status of Approval
	side of Killi Mir Gahwar Khan Khaliq Abad Mangochar		
5.	Construction of flood protection of UmaidabadDurraigi area, District Lasbella	22.50	Un- Approved
6.	Construction of flood protection bund for agriculture land of HonukShahbugKerichi area, District Washuk	2.500	Un- Approved
7.	Construction of flood protection of MirwaniDarakalaWhad Area, District Khuzdar	2.00	Un- Approved
8.	Construction of flood protection of Khalilbadari Shad area, District Khuzdar	2.00	
9.	Construction of flood channel for Graveyard and houses KhanezaiAghbarg area, District Quetta	4.00	Un- Approved
10.	Flood protection scheme TaimarkManda, near Killi Malik Yar, District Pishin	3.00	Un- Approved
11.	Flood protection of KilliMulvi Abdul Rehman Shah near Spin Masjid, District Loralai	3.50	Un- Approved
12.	Construction of flood protection wall for agriculture land at left side of Dhola Nadi PhullanWala area, BastiChoharKhot, District Barakan	10.00	Un- Approved
13.	Construction of flood protection Gabion wall for Killi Amir Hamza in Hanna area, District Quetta	5.00	Un- Approved
14.	Construction of flood protection wall at Ziarat Town Killi Haji Amanullah Khan near Ziarat Football Stadium, District Ziarat	3.50	Un- Approved
15.	Construction of flood protection wall for KilliFaizabadSharan u/c Murgha, District Pishin	2.00	Un- Approved
16.	Construction of flood protection wall for Killi Nadir Abdul Rehmanzai, District Kill Abdullah	2.00	Un- Approved
17.	Construction of flood protection wall for KilliGhuttai, District Killa Saifullah	2.50	Un- Approved
18.	Construction of flood protection for agriculture land KilliMalakUmer Gul Sara kallaKhost area, District Harnai	3.00	Un- Approved
19.	Construction of flood protection wall for KilliSardaranJangalBandatMozaAhmadoon, District Ziarat	3.00	Un- Approved
Sub-Total (Balochistan)		120.00	
V	<u>Gilgit-Baltistan</u>		
1.	Construction of flood protective bund on right side of Silpi Bridge at Gahkuch	15.00	Un- Approved
Sub-Total (Gilgit-Baltistan)		15.00	
VI	<u>Merged Areas</u>		
1.	Construction of flood protection scheme at Kohi	5.00	Un- Approved

Sr. No.	Name of the Scheme	Estimated Cost (Rs. Million)	Status of Approval
	Khwar Tehsil Barang District Bajur.		
2.	Construction of flood protection scheme at GhurbiDand Tehsil Khar District Bajur	5.00	Un- Approved
3.	Construction of flood protection scheme at Nasir Shah KoroonaKhoiBaharaUstrana area Tehsil Sub-Division D.I Khan	3.00	Un- Approved
4.	Construction of flood protection scheme at RohanKachShuzaKhulla Sub-Division Tank	5.00	Un- Approved
5.	Construction of flood protection scheme at Mastora River in Tribal District Orakzai	10.00	Un- Approved
6.	Construction of flood protection scheme at Barshara on Kurram River in Upper Kurram	5.00	Un- Approved
7.	Construction of flood protection scheme at Badama on Khurmana River in Central Kurram	4.00	Un- Approved
8.	Construction of flood protection scheme at Kurram River in Lower Kurram	4.00	Un- Approved
9.	Construction of flood protection scheme at the land of Raza Ullah, Shah Wali, Yar Gul Khel, DazaGhundaiBirmal South Waziristan	4.00	Un- Approved
Sub-Total (Merged Areas)		45.00	
VII	<u>AJ&K</u>		
1.	Construction of flood protection structure/ wall along right and left bank of Paraknullah and spur on right bank of River Jhelum	20.00	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 2020**

DAILY RIVERS FLOW DATA FOR JULY 2020 (IN CUSECS AT 0600 HOUR)

Date	River Indus at Tarbela			Kabul at Nowshera	Indus at Kalabagh		River Indus at Chashma			Indus at Taunsa	
	Reservoir Level (Ft)	Inflow	Outflow		Inflow	Outflow	Reservoir Level (Ft)	Inflow	Outflow	Inflow	Outflow
1-Jul-20	1463.06	152400	160000	65500	217200	210000	639.10	224600	215000	201400	179800
2-Jul-20	1461.99	148200	170000	60600	210000	202800	640.20	229100	215000	216900	188500
3-Jul-20	1461.13	152600	170000	61200	221300	213900	640.90	227300	215000	218800	191200
4-Jul-20	1460.66	160800	170000	61600	226300	218900	642.20	233600	215000	224000	195400
5-Jul-20	1460.87	175000	170000	61600	218600	212200	643.70	237600	215000	220400	193600
6-Jul-20	1461.55	184800	170000	63100	228200	221800	644.40	229900	215000	227600	200000
7-Jul-20	1462.22	174600	160000	66900	228000	221600	645.10	225400	210000	219400	193200
8-Jul-20	1462.02	156400	160000	61400	221100	213900	645.60	223700	210000	218100	191500
9-Jul-20	1461.60	151800	160000	59500	216700	209300	645.80	219400	210000	216400	191000
10-Jul-20	1460.86	160100	175000	58200	209700	202000	645.60	213800	210000	215900	190500
11-Jul-20	1460.80	174300	175000	55500	227300	219600	645.00	218100	220000	213900	188800
12-Jul-20	1460.42	167600	175000	59500	222500	214800	645.30	230800	220000	214400	189100
13-Jul-20	1459.85	168300	175000	58800	234500	226800	645.50	229400	220000	219100	193300
14-Jul-20	1459.15	161500	175000	57000	222500	214800	645.80	230800	220000	225700	197100
15-Jul-20	1458.07	153800	175000	52200	225700	217700	646.20	232800	220000	226000	197400
16-Jul-20	1456.70	148000	175000	51200	229600	221600	646.50	231600	220000	226100	198200
17-Jul-20	1455.39	149200	175000	49200	220600	212600	646.70	229900	220000	229800	202900
18-Jul-20	1455.10	164800	170000	49300	225200	217200	647.00	231600	220000	223900	200500
19-Jul-20	1455.48	168300	160000	53200	219300	211300	647.70	231100	210000	221300	197100
20-Jul-20	1456.11	173500	160000	51900	214600	206600	648.00	222800	210000	215100	190900
21-Jul-20	1457.65	181700	150000	56300	218600	210600	648.00	218700	212100	214600	190900
22-Jul-20	1459.20	181900	150000	49800	211200	203200	648.00	215800	209200	218600	195900
23-Jul-20	1460.16	170200	150000	48900	206300	198300	648.00	215600	209000	215800	190800
24-Jul-20	1459.98	146900	150000	43300	210600	202600	648.30	214200	200000	208800	183100
25-Jul-20	1459.57	142400	150000	41900	197900	189900	648.20	204100	200000	201000	175300
26-Jul-20	1459.24	144000	150000	45500	195500	187500	648.10	204100	200000	198700	175300
27-Jul-20	1459.22	150300	150000	47100	205500	197500	648.00	204100	200000	198700	175300
28-Jul-20	1460.74	166900	135000	46800	202800	194600	648.50	209300	190000	197000	173600
29-Jul-20	1462.58	174200	135000	47200	181600	173400	648.80	208600	194400	191600	167200
30-Jul-20	1465.35	183700	125000	49600	196800	188600	648.00	176200	190000	189000	163300
31-Jul-20	1468.64	193700	125000	49400	182600	174600	647.00	194500	190000	198100	171700

DAILY RIVERS FLOW DATA FOR JULY 2020 (IN CUSECS AT 0600 HOUR)

Date	Indus at Guddu		Indus at Sukkur		Indus at Kotri		Jhelum at Mangla			Jhelum at Rasul	
	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Reservoir Level (Ft)	Inflow	Outflow	Inflow	Outflow
1-Jul-20	157400	119000	110000	53300	43500	2000	1217.00	46300	20000	16100	8000
2-Jul-20	153900	117700	110000	53300	43600	2000	1217.70	44600	20000	16100	8000
3-Jul-20	153900	117700	108400	51600	43600	2000	1218.55	49900	20000	16100	8000
4-Jul-20	160400	121300	108800	52400	43600	2000	1219.25	44600	20000	16100	8000
5-Jul-20	165800	126600	112500	55900	44600	2700	1220.05	48200	20000	19300	11900
6-Jul-20	180500	142600	119400	66300	44600	13100	1220.75	46000	20000	12700	5300
7-Jul-20	186000	151100	132100	78900	45900	20900	1221.30	40400	20000	15700	8000
8-Jul-20	185300	149600	136700	81600	46200	12100	1222.05	42900	15000	15800	8000
9-Jul-20	183700	147300	137000	81000	47100	6900	1222.75	41000	15000	7300	NR
10-Jul-20	166600	128500	133800	77500	49200	6900	1223.50	42900	15000	13200	5300
11-Jul-20	164100	124600	119000	62400	53700	11300	1224.10	45700	23400	7800	NR
12-Jul-20	164100	124600	112700	56200	58600	16200	1224.60	43600	25000	22900	15800
13-Jul-20	164300	126200	114500	57700	68800	26200	1224.95	38000	25000	18600	11900
14-Jul-20	167800	132600	116800	59500	73100	30600	1225.25	36100	25000	23000	15800
15-Jul-20	168500	135200	122200	64600	71100	28400	1225.45	32400	25000	13000	3300
16-Jul-20	173600	137100	124000	66400	68900	26200	1225.65	32400	25000	19500	11900
17-Jul-20	174700	140700	125200	67600	61600	22000	1225.95	36100	25000	19800	11900
18-Jul-20	182200	149900	128000	70400	50700	17800	1226.20	34300	25000	19900	11900
19-Jul-20	179000	143000	131000	74100	55300	17800	1226.40	32400	25000	19900	11900
20-Jul-20	176700	139000	128600	71200	57000	16200	1226.70	36100	25000	13100	5300
21-Jul-20	180400	141600	124800	67300	61500	19300	1227.00	31100	25000	14100	8000
22-Jul-20	185600	150600	129300	71100	61600	19300	1227.85	46600	15000	22800	15800
23-Jul-20	185900	154900	139700	81800	61800	19300	1228.35	33600	15000	7900	NR
24-Jul-20	177100	141300	140100	81800	68900	26500	1228.70	28000	15000	8000	NR
25-Jul-20	176700	138300	128300	70100	72200	29700	1229.00	34700	23600	15900	8000
26-Jul-20	169700	130000	123900	66500	70900	29700	1228.90	31300	35000	19800	11900
27-Jul-20	167300	128400	117300	61800	65500	31500	1228.80	31300	35000	23700	15800
28-Jul-20	158800	121300	115800	59700	67500	33100	1228.90	28700	25000	23700	15800
29-Jul-20	157600	120000	110300	53400	74400	38700	1229.10	32400	25000	19800	11900
30-Jul-20	157900	120000	109600	52600	76700	38700	1229.30	27400	20000	19400	11900
31-Jul-20	157900	120000	109700	52600	70000	30300	1229.80	33600	15000	7500	

DAILY RIVERS FLOW DATA FOR JULY 2020 (IN CUSECS AT 0600 HOUR)

Date	Chenab at Marala		Chenab at Khanki		Chenab at Qadirabad		Chenab at Trimmu		Ravi at Panjnad		Ravi at Balloki	
	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow
1-Jul-20	62300	29600	36700	28800	44200	22200	31000	16000	19800	4100	40800	9300
2-Jul-20	67900	35000	29000	21200	28700	6700	25400	10300	21800	6100	43100	11600
3-Jul-20	68200	35000	32700	25000	35200	13200	22000	6900	21900	6100	43600	11600
4-Jul-20	73500	40300	36500	28800	37800	15800	29200	14100	23400	7600	41900	10500
5-Jul-20	72500	40300	41200	34200	41600	19600	24500	9600	25700	9700	43300	12800
6-Jul-20	67700	35000	39700	32500	41600	19600	19200	4300	24100	8100	44400	13900
7-Jul-20	62300	29600	39700	32500	39000	17000	21800	6900	19100	3100	45000	13900
8-Jul-20	62500	29600	30700	23000	32600	10600	21800	6900	24500	8500	42800	11600
9-Jul-20	73300	40300	36500	28800	27400	5400	28000	13100	16000	Nil	40800	9300
10-Jul-20	68000	35000	44300	36600	41600	19600	26900	12000	16000	Nil	43200	11600
11-Jul-20	68000	35000	34800	27000	41600	19600	23000	8100	15100	Nil	47900	16200
12-Jul-20	67800	35000	34700	27000	35200	13200	14900	NR	14800	Nil	49500	18500
13-Jul-20	68100	35000	30700	23000	34000	12000	14900	NR	15300	Nil	45900	17400
14-Jul-20	52100	18900	28900	21200	34000	12000	21300	6400	18100	2100	43000	13900
15-Jul-20	62800	29600	21400	13600	22000	NR	25800	10800	16000	Nil	46500	16200
16-Jul-20	62800	29600	27000	19200	28700	6700	25800	10800	13200	Nil	44400	12800
17-Jul-20	62800	29600	32800	25000	28700	6700	25900	10700	15500	Nil	45600	13900
18-Jul-20	62800	29600	22600	14800	30000	8000	23400	8200	21900	5900	46800	15100
19-Jul-20	57500	24200	27000	19200	24700	2700	18100	2900	25100	9200	45700	16200
20-Jul-20	67200	35000	32800	25000	30000	8000	18000	2900	25200	9200	50500	24300
21-Jul-20	59700	29600	43200	35800	41600	19600	23500	8400	20400	4300	49200	26700
22-Jul-20	65100	35000	35000	32100	25000	13200	23000	8400	15400	Nil	46100	21000
23-Jul-20	59700	29600	29600	44500	37400	19600	23000	8400	15400	Nil	46100	21000
24-Jul-20	49000	18900	18900	22100	14800	4100	23000	8300	15500	Nil	42300	14100
25-Jul-20	54400	24200	24200	17500	10200	NR	26600	12000	22300	6700	40300	11100
26-Jul-20	65200	35000	35000	26600	19200	NR	23000	8400	28700	13100	37400	8100
27-Jul-20	60300	29600	29600	30300	23000	13200	20300	5700	31900	17400	37900	8100
28-Jul-20	60800	29600	29600	26600	19200	10600	14200	NR	32400	16900	41700	11600
29-Jul-20	67200	35000	26600	19200	28700	6700	13900	NR	32400	16900	42800	12800
30-Jul-20	72500	40300	34400	27000	35200	13200	23500	8400	32600	17000	43800	12800
31-Jul-20	60800	29600	39900	32500	39000	17000	30400	15500	32700	17000	45000	14000

DAILY RIVERS FLOW DATA FOR JULY 2020 (IN CUSECS AT 0600 HOURS)

Date	Sutlej at Sidhnai		Sutlej at Sulemanki		Sutlej at Islam		Link Canals				Skardu Temperature °C	
	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	C.J.	CRBC	Q.B.	T.P	Max.	Min.
1-Jul-20	19200	4600	19800	7400	3100	1500	2000	4600	22000	11600	31.9	14.2
2-Jul-20	17700	2600	18000	5500	3600	2300	2000	4600	22000	10200	30.9	13.3
3-Jul-20	17900	2600	14800	2300	3600	2300	2000	4600	22000	11500	30.9	13.4
4-Jul-20	18400	3000	14100	1700	2700	1300	2000	4600	22000	11300	33.1	15.2
5-Jul-20	19000	3600	14200	1700	2700	2700	1300	4600	22000	11500	27.3	16.2
6-Jul-20	19000	3600	13400	1000	1500	1500	Nil	4600	22000	11300	24.8	13.4
7-Jul-20	19300	4000	15700	3300	1500	1500	Nil	4600	22000	10000	26.1	11.2
8-Jul-20	19300	4000	15800	3300	1500	1500	Nil	4600	22000	9600	30.9	19.3
9-Jul-20	20000	4600	15800	3300	2300	2300	Nil	4600	22000	8700	30.9	16.4
10-Jul-20	20300	5000	15800	3300	2300	2300	800	4600	22000	8600	29.6	14.2
11-Jul-20	18700	3300	18000	5500	2300	2300	800	4600	22000	8200	29.3	12.2
12-Jul-20	18100	2600	17600	5000	2800	2800	1300	4600	22000	8600	30.8	17.4
13-Jul-20	16900	1300	17400	5000	2800	2800	1300	4600	22000	12000	26.6	13.1
14-Jul-20	21500	5900	18800	6400	3900	3900	2400	4600	22000	12000	27.3	11.3
15-Jul-20	23400	7900	20200	7600	4400	4400	2800	4600	22000	12000	28.8	12.3
16-Jul-20	23800	8600	22600	10000	6600	660	5000	4600	22000	12000	30.1	17.3
17-Jul-20	22800	7600	21400	8700	6600	6600	5000	4600	22000	12000	27.7	15.3
18-Jul-20	20600	5300	20000	7300	7800	7800	6300	4600	22000	8000	28.8	17.3
19-Jul-20	19800	4600	17500	4800	7900	7900	6300	4600	22000	8000	26.4	14.3
20-Jul-20	19800	4600	17500	4800	6300	6300	4700	4600	22000	8000	27.3	12.3
21-Jul-20	24200	14100	18400	9100	5000	5000	5000	4600	22000	8000	30	13.0
22-Jul-20	24700	14100	21800	11500	6100	6100	3900	4600	22000	8000	20.4	11.2
23-Jul-20	24700	14100	21800	11500	6100	3900	2000	4600	22000	10000	25.6	13.2
24-Jul-20	25800	14100	23200	10000	6000	5000	2000	4600	22000	10000	31.7	12.4
25-Jul-20	28300	16600	22000	10000	6000	5000	2000	4600	22000	10000	32.3	12.3
26-Jul-20	29200	21100	21500	9200	7800	6300	2000	4600	22000	7000	34.2	17.2
27-Jul-20	23400	12900	18000	5200	8800	6300	2000	4600	22000	7000	32.6	17.4
28-Jul-20	19300	7200	15600	2600	7500	5000	2000	4600	22000	7000	28.8	14.2
29-Jul-20	14700	2000	15800	2600	7200	4700	2000	4600	22000	8000	33.4	17.3
30-Jul-20	17900	4600	13700	400	3100	800	2000	4600	22000	9300	34.8	16.7
31-Jul-20	18800	5300	14500	1300	2300	1300	2000	4600	22000	11900	35.1	17.8

DAILY RIVERS FLOW DATA FOR AUGUST 2020 (IN CUSECS AT 0600 HOUR)

Date	River Indus at Tarbela			Kabul at Nowshera	Indus at Kalabagh		River Indus at Chashma			Indus at Taunsa	
	Reservoir Level (Ft)	Inflow	Outflow		Inflow	Outflow	Reservoir Level (Ft)	Inflow	Outflow	Inflow	Outflow
1-Aug-20	1472.30	204000	125000	49700	181600	173600	647.30	184200	190000	187200	164800
2-Aug-20	1476.33	212300	125000	53600	190900	182900	646.60	183700	190000	187200	164800
3-Aug-20	1479.55	209900	140000	51800	190000	182000	646.30	191600	190000	188200	164800
4-Aug-20	1482.48	205500	140000	53100	202400	194400	645.70	191400	194000	186700	162800
5-Aug-20	1485.14	199900	140000	52000	202800	194800	645.90	203400	194000	185900	161500
6-Aug-20	1487.67	197000	140000	52000	191200	183000	645.50	194900	194000	190700	166300
7-Aug-20	1490.44	192700	130000	45400	183700	175500	645.40	195200	190000	190200	166300
8-Aug-20	1493.38	188900	120000	42600	182800	174600	645.10	177400	175000	193400	170000
9-Aug-20	1496.85	201200	120000	39100	123500	115300	644.10	164000	170000	185300	162300
10-Aug-20	1500.80	223400	130000	41600	177200	169000	640.50	140800	170000	179600	155600
11-Aug-20	1505.37	242700	130000	49000	179100	170900	640.10	173100	170000	177100	150800
12-Aug-20	1510.20	249200	130000	50600	204000	195800	640.50	179400	170000	171700	146100
13-Aug-20	1514.60	242500	130000	45800	171300	163100	641.50	185200	170000	171700	146100
14-Aug-20	1518.54	230800	130000	44600	175400	167200	640.20	170400	170000	173700	147800
15-Aug-20	1522.46	232900	130000	44800	190000	181800	641.60	178700	165000	177100	150800
16-Aug-20	1526.66	241900	130000	45000	196200	188000	643.50	191000	165000	179300	150600
17-Aug-20	1530.93	244400	130100	45200	168800	160600	644.70	185900	165000	174000	148100
18-Aug-20	1532.93	243100	187500	43900	194000	185800	644.70	171600	165000	170900	145400
19-Aug-20	1534.93	250000	194300	43100	207400	199400	646.80	202800	165000	171200	146300
20-Aug-20	1536.93	262400	206700	45000	282200	274200	646.70	217500	212500	167500	142500
21-Aug-20	1538.93	235500	179800	48500	229700	222200	646.60	258300	253600	174600	149200
22-Aug-20	1540.93	222600	165800	46600	217000	209500	648.50	266200	220000	227800	201400
23-Aug-20	1542.93	208100	150000	45000	216000	208500	648.50	236200	230200	259000	235600
24-Aug-20	1544.93	195000	137300	38800	188400	180600	648.50	221700	215400	248600	224700
25-Aug-20	1548.00	180300	134600	36400	172800	165000	647.50	178400	196900	233000	209100
26-Aug-20	1549.00	183200	139500	37300	171200	163700	646.50	179500	191500	209100	186200
27-Aug-20	1550.00	212300	183100	48000	204000	196500	645.50	188100	197200	221500	207600
28-Aug-20	1550.00	233600	204000	52600	240300	233300	643.50	216100	235500	207600	193100
29-Aug-20	1550.00	265200	264800	88000	323500	316500	640.70	226800	288500	223500	212300
30-Aug-20	1550.00	223300	222700	50400	315500	308500	639.00	316100	323300	257900	246700
31-Aug-20	1550.00	184000	183400	41400	228700	221100	639.00	322900	317500	322000	310700

DAILY RIVERS FLOW DATA FOR AUGUST 2020 (IN CUSECS AT 0600 HOUR)

Date	Indus at Guddu		Indus at Sukkur		Indus at Kotri		Jhelum at Mangla			Jhelum at Rasul	
	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Reservoir Level (Ft)	Inflow	Outflow	Inflow	Outflow
1-Aug-20	156400	124200	108300	51400	63800	26400	1230.30	34200	15000	12800	5300
2-Aug-20	156200	128800	111500	54300	60700	20700	1230.70	30600	15000	7000	NR
3-Aug-20	150000	119500	117000	59700	58000	17000	1231.05	28700	15000	12300	5300
4-Aug-20	143800	108500	111600	54300	51900	9900	1231.35	26700	15000	7900	Nil
5-Aug-20	143900	106000	101300	101300	49700	8400	1231.65	26700	15000	7900	Nil
6-Aug-20	142900	110300	98400	98400	49500	11300	1231.85	22800	15000	8000	Nil
7-Aug-20	144500	119800	104100	104100	50900	35100	1232.10	24800	15000	8000	Nil
8-Aug-20	147100	146100	114300	114300	52400	37300	1232.40	26700	15000	10800	8000
9-Aug-20	148700	155600	138600	138600	57400	37300	1232.80	30600	15000	14700	11900
10-Aug-20	148000	146000	146800	146800	51200	25900	1233.35	31500	10000	8100	5300
11-Aug-20	151400	133100	137400	137400	45600	17800	1233.85	29500	10000	3200	Nil
12-Aug-20	144500	115500	125200	80400	45300	15000	1234.25	25600	10000	3000	Nil
13-Aug-20	134100	103600	108400	63500	53900	23400	1234.60	23700	10000	8300	5300
14-Aug-20	129700	97000	96100	49800	78400	43300	1234.90	21700	10000	3000	Nil
15-Aug-20	128700	97200	91100	44700	90700	55600	1235.30	25600	10000	3400	Nil
16-Aug-20	132700	100000	89000	42600	87600	51100	1235.60	21700	10000	2800	Nil
17-Aug-20	132900	100000	89200	39500	83100	43800	1235.95	23700	10000	3000	Nil
18-Aug-20	135100	102000	89600	39500	69000	32000	1236.40	27600	10000	2900	Nil
19-Aug-20	133700	100000	90500	39500	61400	23200	1236.80	25600	10000	7900	5300
20-Aug-20	127000	95500	89100	39500	47900	8400	1237.35	31500	10000	21400	19700
21-Aug-20	125400	99900	87900	38300	42800	4000	1237.75	25600	10000	12700	11900
22-Aug-20	130500	108200	90300	50200	41300	26200	138.05	21700	10000	8500	8000
23-Aug-20	134200	108200	97900	55400	37500	22600	1238.35	21700	10000	8900	8000
24-Aug-20	148100	116300	100100	61000	37400	24300	1238.60	19800	10000	900	Nil
25-Aug-20	216700	193600	107300	72100	37900	29400	1238.90	21700	10000	5300	5300
26-Aug-20	237500	230500	181600	173900	38000	37200	1239.45	31500	10000	5300	5300
27-Aug-20	235300	228300	214300	209000	35100	34300	1239.75	81500	69700	78600	7600
28-Aug-20	226400	217900	214100	211400	46600	45800	1242.00	149400	57600	76200	76200
29-Aug-20	226300	216300	205200	200500	60400	60500	1242.00	71100	71100	112600	112600
30-Aug-20	221900	217900	205200	200500	69100	68800	1241.45	50900	73500	70500	70500
31-Aug-20	234300	229300	207700	205000	86600	85900	1241.15	33400	45700	38400	37900

DAILY RIVERS FLOW DATA FOR AUGUST 2020 (IN CUSECS AT 0600 HOUR)

Date	Chenab at Marala		Chenab at Khanki		Chenab at Qadirabad		Chenab at Trimmu		Ravi at Panjnad		Ravi at Balloki	
	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow
1-Aug-20	60800	29600	38300	28800	36500	14500	21800	6900	16700	800	48400	17500
2-Aug-20	71500	40300	39900	32500	39000	17000	21800	8100	16700	6900	52500	21600
3-Aug-20	55400	24200	43100	35800	41600	19600	21900	7000	15800	Nil	51300	20500
4-Aug-20	66200	35000	26600	19200	30000	8000	20600	5700	15800	Nil	50400	19300
5-Aug-20	66200	35000	32600	25000	32600	10600	19200	4300	20900	5100	48300	17000
6-Aug-20	66300	35000	30800	23000	35200	13200	21800	7000	15800	Nil	46000	14700
7-Aug-20	60900	29600	30800	23000	32600	10600	16400	1500	15800	Nil	44800	13500
8-Aug-20	62900	31600	30800	23000	35200	13200	13600	Nil	15000	Nil	43700	12300
9-Aug-20	77000	45700	40400	32500	29000	12000	13200	Nil	18700	6100	42500	11100
10-Aug-20	87700	56400	45400	37400	37900	20900	13900	Nil	19100	5100	39500	8100
11-Aug-20	77000	45700	61900	53900	57900	40900	13300	Nil	19300	4100	40700	9300
12-Aug-20	76700	45700	40400	32500	39200	22200	14100	Nil	15000	Nil	44200	12800
13-Aug-20	76700	45700	38700	30700	36600	19600	4400	Nil	12400	Nil	45300	13900
14-Aug-20	92700	61700	50000	42100	37900	20900	32300	17500	11900	Nil	47700	16200
15-Aug-20	72600	45700	46900	38900	46700	29700	27200	12400	11700	Nil	45300	12800
16-Aug-20	87200	56400	45400	37400	39200	22200	21100	6300	11700	Nil	47600	15100
17-Aug-20	92600	61700	50000	42100	46100	32100	22500	7700	11700	Nil	46500	13900
18-Aug-20	92600	61700	65300	57300	57400	47400	30600	15800	12300	Nil	37300	4700
19-Aug-20	96600	67100	70700	62700	62300	48100	27100	12300	15600	Nil	34500	1800
20-Aug-20	88400	61700	65100	57300	66100	48100	29400	14700	15800	Nil	41200	10400
21-Aug-20	81600	56400	50800	43700	50600	32600	50100	35900	14700	Nil	53700	25500
22-Aug-20	99800	75700	67000	60100	61800	43800	57000	42100	15900	Nil	50600	22000
23-Aug-20	78400	54300	95500	88500	96400	78400	58000	43500	18900	3100	48600	18500
24-Aug-20	78400	54300	50800	43700	54300	36300	51300	36800	19000	3100	45600	18500
25-Aug-20	73300	49000	41500	34200	38900	20900	61000	46500	23600	7600	45600	15100
26-Aug-20	98900	74200	90100	82800	67300	49300	65200	50700	34500	18500	39800	9300
27-Aug-20	139600	120300	156200	149500	92100	74100	44300	30000	42400	26700	39300	10400
28-Aug-20	255400	250400	248900	23100	207500	186300	37000	23200	40900	26700	49200	23200
29-Aug-20	126900	121200	149400	143600	218400	208500	96400	84300	52700	37700	63300	37300
30-Aug-20	83400	77700	96500	91600	111200	98200	150500	138100	60900	45900	57500	31500
31-Aug-20	66400	60700	76500	70600	78500	60200	178700	166200	54000	38900	44100	18100

DAILY RIVERS FLOW DATA FOR AUGUST 2020 (IN CUSECS AT 0600 HOUR)

Date	Sutlej at Sidhnai		Sutlej at Sulemanki		Sutlej at Islam		Link Canals				Skardu Temperature °C	
	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	C.J.	CRBC	Q.B.	T.P	Max.	Min.
1-Aug-20	20900	7000	14400	1300	1600	Nil	2000	4600	22000	8000	33.4	17.3
2-Aug-20	20500	.6500	14400	1300	1900	Nil	2000	4600	22000	8000	30	16.7
3-Aug-20	20700	6500	15800	2300	2100	Nil	2000	4600	22000	8000	34.4	14.4
4-Aug-20	22200	7200	16000	2300	1500	Nil	2000	4600	22000	8000	30.6	17.3
5-Aug-20	24200	9100	18100	4300	1500	Nil	2000	4600	22000	8000	33.8	17.5
6-Aug-20	25700	11100	18200	4300	2100	800	2000	4600	22000	8000	30.4	17.4
7-Aug-20	26800	12600	16600	2700	2100	800	2000	4600	22000	8000	32.7	15.5
8-Aug-20	24600	10400	16000	2000	2500	1300	2000	4600	22000	8000	35.8	20.4
9-Aug-20	21200	6600	16100	2000	2500	1300	2000	4600	17000	8000	36.2	18.5
10-Aug-20	19400	4000	15000	1000	2500	1300	2000	4600	17000	8000	29.7	16.3
11-Aug-20	18900	4000	14800	1300	1700	400	2000	4600	17000	9700	25.3	14.5
12-Aug-20	17700	2900	15100	1300	1200	Nil	2000	4600	17000	10200	31.2	15.5
13-Aug-20	19700	4100	15400	1300	500	Nil	2000	4600	17000	10900	35.6	16.5
14-Aug-20	19100	3300	15200	1000	300	Nil	2000	4600	17000	10500	34	18.0
15-Aug-20	20700	4900	15200	1000	300	Nil	2000	4600	17000	10500	35.6	20.4
16-Aug-20	20900	4900	16100	2000	700	Nil	2000	4600	17000	11000	31.8	16.2
17-Aug-20	20800	4900	16800	2600	700	Nil	2000	4600	14000	1000	36.1	13.3
18-Aug-20	21500	5600	19500	5500	700	Nil	2000	4600	18000	9100	38.2	19.3
19-Aug-20	22100	6900	18700	5500	1200	Nil	2000	4600	18000	9400	35.7	21.3
20-Aug-20	22600	7200	17400	4000	1200	Nil	2000	4600	18000	9100	31.8	19.0
21-Aug-20	17700	2900	18600	5900	2100	Nil	2000	4600	18000	1100	26.1	15.0
22-Aug-20	16400	700	19500	5900	2800	Nil	2000	4600	18000	12000	28.4	16.4
23-Aug-20	24200	8500	21600	7800	2800	Nil	2000	4600	18000	8000	28.7	11.2
24-Aug-20	27400	11800	21400	7800	3600	2400	2000	4600	18000	8000	33.6	12.8
25-Aug-20	30300	14800	24700	11100	4800	3600	2000	4600	22000	8000	35.4	14.2
26-Aug-20	32200	16700	17900	4200	6500	5000	2000	4600	20000	8000	36.1	15.3
27-Aug-20	31600	16300	16400	2700	8400	6600	2000	4600	19300	8000	24.4	15.4
28-Aug-20	29200	13600	15800	2700	8400	6600	2000	3700	22000	8000	19	9.3
29-Aug-20	25100	9400	19000	5600	6500	4700	2000	3700	22000	4000	19.6	12.4
30-Aug-20	25100	9000	19200	5600	1300	1300	2000	3600	22000	4000	25	12.1
31-Aug-20	29000	13000	19200	5600	3100	1200	2000	3400	22000	4000	28.2	13.2

DAILY RIVERS FLOW DATA FOR SEPTEMBER 2020 (IN CUSECS AT 0600 HOUR)

Date	River Indus at Tarbela			Kabul at Nowshera	Indus at Kalabagh		River Indus at Chashma			Indus at Taunsa	
	Reservoir Level (Ft)	Inflow	Outflow		Inflow	Outflow	Reservoir Level (Ft)	Inflow	Outflow	Inflow	Outflow
1-Sep-20	1550.00	166500	165900	39500	247100	240500	638.15	272600	273100	379400	379400
2-Sep-20	1550.00	300500	300500	106900	404700	400300	638.15	314200	311500	354900	354900
3-Sep-20	1550.00	276900	276900	118800	456200	453200	639.00	413400	405800	342000	342000
4-Sep-20	1550.00	239500	239500	93000	428900	426600	640.00	458000	449100	364900	364900
5-Sep-20	1550.00	210600	210600	70500	395300	393900	640.00	467700	465000	446400	446400
6-Sep-20	1550.00	199300	199300	55500	298600	297400	640.50	418700	412200	465600	464600
7-Sep-20	1550.00	183500	183500	49200	230000	227000	641.50	320800	308700	455900	455900
8-Sep-20	1550.00	169700	169700	46600	213700	209700	643.90	266300	231300	398900	398900
9-Sep-20	1550.00	148300	148300	36400	211100	206100	646.30	229200	183600	259700	252800
10-Sep-20	1550.00	134500	134000	32000	187900	182900	647.50	212500	177500	195300	185500
11-Sep-20	1550.00	119000	118700	28000	144800	139300	648.50	189000	152900	193500	185800
12-Sep-20	1550.00	112000	111500	25100	155000	149500	648.90	153200	130000	150800	140400
13-Sep-20	1550.00	106400	105900	21300	142500	139800	649.00	158000	142500	142500	130800
14-Sep-20	1550.00	110500	109800	20300	122800	116800	648.80	137900	130000	138700	126200
15-Sep-20	1550.00	98200	97500	19000	138900	132900	648.40	130600	130000	134200	120100
16-Sep-20	1550.00	104200	103600	18000	115400	109200	648.80	138400	122000	129700	115100
17-Sep-20	1550.00	94300	93700	17700	118600	112000	648.40	117100	122000	126300	111200
18-Sep-20	1550.00	96700	96100	15900	109300	102700	648.40	127500	122000	122700	101000
19-Sep-20	1550.00	93900	93300	15000	109200	101900	647.90	115300	122000	119600	98300
20-Sep-20	1550.00	85100	84500	13200	122200	114900	647.40	117400	122000	118600	98300
21-Sep-20	1550.00	81400	80800	12200	88800	81300	647.30	113600	110000	119800	98900
22-Sep-20	1550.00	81300	80700	10800	102500	95000	646.30	95800	108000	121100	100300
23-Sep-20	1549.44	84500	100000	9600	93700	86200	645.70	101600	105000	113300	93800
24-Sep-20	1548.79	81900	100000	10200	135100	128000	645.40	106700	105000	107700	87700
25-Sep-20	1548.65	81600	85000	9500	102900	95400	646.30	124400	105000	103100	83700
26-Sep-20	1548.57	83300	85000	9800	93500	86000	646.60	105600	98000	102100	82900
27-Sep-20	1548.40	80700	85000	10100	114400	106900	645.90	95800	98000	104000	84500
28-Sep-20	1548.19	79300	85000	10000	98100	90600	645.80	102500	98000	100900	82900
29-Sep-20	1547.80	74600	85000	9500	97500	90000	645.70	102500	98000	95900	77000
30-Sep-20	1547.14	66800	85000	9800	103200	95700	645.70	103900	98000	97200	78400

DAILY RIVERS FLOW DATA FOR SEPTEMBER 2020 (CUSECS AT 0600 HOUR)

Date	Indus at Guddu		Indus at Sukkur		Indus at Kotri		Jhelum at Mangla			Jhelum at Rasul	
	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Reservoir Level (Ft)	Inflow	Outflow	Inflow	Outflow
1-Sep-20	267700	281700	217800	215100	148600	147800	1242.00	59300	24400	37500	37500
2-Sep-20	308300	305300	261900	254500	153300	153200	1242.00	57000	57000	52900	52900
3-Sep-20	346400	338700	284700	273100	168700	168300	1242.00	70400	70400	68000	68000
4-Sep-20	400300	394100	307000	291100	176400	176100	1242.00	48900	48900	52900	52900
5-Sep-20	458200	451500	359900	339300	176900	176100	1242.00	66600	66600	64300	64300
6-Sep-20	466200	453500	397800	373300	177600	176100	1242.00	38500	38500	49200	49200
7-Sep-20	500500	477000	420100	386600	188900	185800	1242.00	56300	56300	50400	49200
8-Sep-20	548100	520100	440200	401900	201100	197700	1242.00	52700	52700	57100	56700
9-Sep-20	570700	540700	460300	418600	202100	197700	1242.00	38300	38300	49200	49200
10-Sep-20	569600	540700	489200	446500	212600	206500	1242.00	38300	38300	31300	30300
11-Sep-20	475200	444200	495000	452300	213200	206500	1242.00	33900	33900	43400	34100
12-Sep-20	383700	351300	483400	440400	229700	219800	1242.00	29000	29000	30300	15300
13-Sep-20	292800	260900	410900	367800	254200	244400	1242.00	29000	29000	31600	15300
14-Sep-20	229700	201200	335400	292300	255100	244400	1242.00	29000	29000	25700	7700
15-Sep-20	182000	158700	226700	189100	264200	252800	1242.00	29000	29000	27700	7700
16-Sep-20	172600	152700	163300	125400	267900	255400	1241.30	26300	55000	57900	37900
17-Sep-20	168300	147300	145900	124500	275900	260100	1240.50	22200	55000	58000	37900
18-Sep-20	146900	122800	144300	134300	281900	264000	1239.70	22800	55000	57800	37900
19-Sep-20	129400	103300	134000	116600	300400	283900	1238.90	23700	55000	57900	37900
20-Sep-20	115100	84000	99000	69400	300600	283900	1238.05	21800	55000	54000	34100
21-Sep-20	101500	70900	79300	36200	291600	274300	1237.30	20700	50000	46900	26600
22-Sep-20	101500	70900	72000	26500	263600	246200	1236.50	18700	50000	43200	22800
23-Sep-20	101200	70900	68400	22900	199200	181800	1235.70	18700	50000	47400	26600
24-Sep-20	101200	70900	67400	22200	127500	115300	1234.90	18700	50000	39800	19000
25-Sep-20	100900	70900	66900	21700	76100	61900	1234.20	17600	45000	47300	26600
26-Sep-20	94700	67800	66900	21700	65900	63700	1233.45	15700	45000	39700	19000
27-Sep-20	90100	68500	64400	19300	59700	57600	1232.65	13700	45000	36200	15300
28-Sep-20	89400	68500	64400	19300	56600	41300	1231.95	12600	45000	4000	19000
29-Sep-20	88400	67900	64400	19300	49400	29000	1231.25	12600	45000	36300	15300
30-Sep-20	85700	67200	63600	18600	35400	13500	1230.55	12600	40000	36600	15300

DAILY RIVERS FLOW DATA FOR SEPTEMBER 2020 (IN CUSECS AT 0600 HOUR)

Date	Chenab at Marala		Chenab at Khanki		Chenab at Qadirabad		Chenab at Trimmu		Ravi at Panjnad		Ravi at Balloki	
	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow
1-Sep-20	82400	76700	91900	86000	78500	56500	206100	196100	55400	48600	42500	17500
2-Sep-20	75200	64600	70900	65000	78500	56500	163600	154600	95600	86100	40200	15200
3-Sep-20	71800	58500	57400	51500	60200	38200	151900	143900	116200	102700	40200	15200
4-Sep-20	71800	58500	60400	54500	56500	34500	153200	146200	143800	130200	40200	15200
5-Sep-20	60400	54500	60400	54500	52300	30300	111100	105100	147300	133600	43500	2050
6-Sep-20	57700	46400	49400	43400	53100	31100	118300	112300	129700	116400	43500	20500
7-Sep-20	57800	46400	46800	40700	48200	24200	118300	112300	113600	100200	42300	15800
8-Sep-20	58400	40400	59900	53300	48200	26200	117500	110500	112200	98500	37300	9300
9-Sep-20	46200	22200	42000	35100	38400	16400	114200	106200	109600	95100	36100	7600
10-Sep-20	49400	22200	24600	17400	19000	Nil	105600	92900	103100	88600	34700	4700
11-Sep-20	44500	16900	20400	12900	20800	Nil	96900	83000	100900	86100	36200	5800
12-Sep-20	46500	16900	20500	12900	22000	Nil	93100	79000	109200	94200	37500	7000
13-Sep-20	44200	11500	13100	5600	30800	8800	87400	73100	97400	82400	39300	8800
14-Sep-20	44700	11500	15000	7500	24300	2300	79300	65000	81000	66000	39800	8200
15-Sep-20	44800	11500	13100	5600	25900	3900	55400	40900	80000	65000	41200	9400
16-Sep-20	44800	11500	13100	5600	26900	4900	40600	26100	69700	54700	40500	8200
17-Sep-20	41000	7700	11200	3700	26900	4900	36100	21600	61200	46200	40800	8200
18-Sep-20	40300	7000	10500	2800	22000	Nil	29500	15000	57600	42300	40800	8200
19-Sep-20	36800	7000	9700	1900	22000	Nil	35000	20500	37400	21900	40800	8200
20-Sep-20	35700	7000	9700	1900	21000	Nil	42500	28000	37500	21900	40800	8200
21-Sep-20	35900	7000	10700	2800	21000	Nil	46300	31800	32700	16900	37300	4800
22-Sep-20	36100	7000	10700	2800	21000	Nil	46300	31800	28900	13000	37300	4800
23-Sep-20	31500	7000	8800	1000	21500	Nil	46300	31800	29100	13000	36700	4200
24-Sep-20	31800	7000	13500	5600	24300	2300	43200	28700	31800	15200	36700	4200
25-Sep-20	32800	7000	12600	4700	23200	1200	37000	22500	32900	16700	36700	4200
26-Sep-20	30800	7000	9700	1900	22000	Nil	36900	22400	32900	16700	36700	4200
27-Sep-20	30900	7000	9600	1900	21900	Nil	32400	17300	32900	16700	36700	4200
28-Sep-20	29100	7000	10600	2800	22000	Nil	35600	20500	26300	10000	34900	2400
29-Sep-20	25600	7000	9700	1900	22000	Nil	29100	14000	26300	10000	33500	9000
30-Sep-20	17500	5000	9700	1900	22000	Nil	29100	14000	26300	10000	30600	NR

DAILY RIVERS FLOW DATA FOR SEPTEMBER 2020 (IN CUSECS AT 0600 HOUR)

Date	Sutlej at Sidhnai		Sutlej at Sulemanki		Sutlej at Islam		Link Canals				Skardu Temperature °C	
	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	C.J.	CRBC	Q.B.	T.P	Max.	Min.
1-Sep-20	32900	28800	20800	8400	2700	2300	2000	2600	22000		22.3	11.2
2-Sep-20	33200	28800	18700	6200	5400	4500	2000	700	22000		27.1	13.3
3-Sep-20	30300	25200	18100	6400	5500	4500	2000	500	22000		25.2	14.2
4-Sep-20	26400	20600	17400	8800	6200	5000	2000	500	22000		29.2	17.3
5-Sep-20	22300	13700	18000	9700	6200	5000	2000	500	22000		23.6	13.4
6-Sep-20	21500	10700	16600	6400	6300	500	2000	500	22000		25	13.3
7-Sep-20	20900	7600	19000	7400	6300	5000	2000	900	22000		25.2	13.4
8-Sep-20	21500	8000	19700	7400	6300	5000	2000	2000	22000		20.4	7.2
9-Sep-20	23800	8300	21300	8400	6200	5000	2000	2900	22000		21.1	18.9
10-Sep-20	23000	7000	19200	5800	7800	6600	2000	3000	19000		24.4	15.6
11-Sep-20	21400	4900	17900	4400	7800	6600	2000	3000	20800		28.6	11.7
12-Sep-20	21800	4900	16700	3200	8100	6600	2000	3000	22000		27.2	11.7
13-Sep-20	20400	3900	15900	2300	6800	500	2000	3000	22000		30.2	9.4
14-Sep-20	19500	2600	15700	2000	3000	1300	2000	3000	22000		29.2	11.2
15-Sep-20	21900	4900	15800	2000	1700	Nil	2000	3000	22000		25.7	10.3
16-Sep-20	21900	4900	15500	1700	1700	Nil	2000	3300	22000		27.2	9.5
17-Sep-20	23200	6200	15100	1100	1700	Nil	2000	3500	22000		28.4	9.3
18-Sep-20	22100	4900	16000	2000	1700	Nil	2000	3500	22000	6000	28.2	9.3
19-Sep-20	22200	4900	16000	2000	1200	Nil	2000	3700	22000	6000	28.9	9.4
20-Sep-20	22500	4900	16100	2000	1200	Nil	2000	3700	21000	6000	27	7.4
21-Sep-20	22500	4900	16100	2000	1200	Nil	2000	3700	21000	6000	29.1	10.2
22-Sep-20	21000	3300	15700	1700	1200	Nil	2000	3800	21000	5500	28.8	6.4
23-Sep-20	21300	3600	15800	1700	1200	Nil	2000	3900	21000	4300	28.8	7.3
24-Sep-20	19300	1300	16100	2000	1200	Nil	2000	3900	21000	4700	29.2	7.1
25-Sep-20	18700	700	16100	2000	1200	Nil	2000	3900	2200	4200	28.7	6.4
26-Sep-20	18300	300	16100	2000	1200	Nil	2000	3900	22000	4500	26.4	14.2
27-Sep-20	17800	Nil	16100	2000	1200	Nil	2000	3900	21900	4500	24.6	9.3
28-Sep-20	18200	Nil	16000	1900	1200	Nil	2000	3900	22000	2400	20.3	8.1
29-Sep-20	17800	Nil	15900	1900	1200	Nil	2000	3900	22000	4200	22.3	5.3
30-Sep-20	17800	Nil	15900	2100	1200	Nil	2000	3900	22000	4000	22.2	5.3

DAILY RIVERS FLOW DATA FOR OCTOBER 2020 (IN CUSECS AT 0600 HOUR)

Date	River Indus at Tarbela			Kabul at Nowshera	Indus at Kalabagh		River Indus at Chashma			Indus at Taunsa	
	Reservoir Level (Ft)	Inflow	Outflow		Inflow	Outflow	Reservoir Level (Ft)	Inflow	Outflow	Inflow	Outflow
1-Oct-20	1546.23	59600	85000	10200	99500	91800	645.00	99900	104000	95600	77200
2-Oct-20	1544.69	56400	100000	10700	108100	100400	644.00	101200	108000	95600	77600
3-Oct-20	1543.05	53500	100000	10800	119900	112200	642.90	101100	108000	101100	82900
4-Oct-20	1541.29	50000	100000	10400	11000	102300	643.40	118800	108000	102400	84200
5-Oct-20	1540.09	48200	82000	10300	108100	100400	643.20	111100	108000	106200	84100
6-Oct-20	1538.82	47600	82000	9900	93700	86000	643.80	105000	93000	107000	84800
7-Oct-20	1537.45	45500	82000	10000	102000	94300	643.40	93800	93000	107300	85000
8-Oct-20	1536.13	45800	82000	10200	100400	92700	642.90	92800	93000	94200	74500
9-Oct-20	1534.77	45200	82000	8300	104200	96500	642.10	90200	93000	90700	68800
10-Oct-20	1533.79	43700	70000	8500	81300	73400	641.90	96400	74000	91800	69700
11-Oct-20	1532.79	43200	70000	8700	101200	94200	641.70	77500	74000	91800	69700
12-Oct-20	1532.20	42400	58000	8700	91700	84700	641.50	77500	74000	91600	69500
13-Oct-20	1531.59	41800	58000	8500	68600	61600	641.30	77500	60000	77800	62700
14-Oct-20	1531.00	42400	58000	8500	81500	74600	641.20	64400	60000	77800	62700
15-Oct-20	1530.36	41000	58000	8500	76100	69000	640.90	62800	50000	73500	59200
16-Oct-20	1529.68	40300	58000	8700	70300	64300	642.60	71100	50000	67600	67100
17-Oct-20	1528.95	39400	58000	8200	79600	73600	643.90	67800	50000	60100	59600
18-Oct-20	1528.17	38100	58000	7200	77900	71900	644.60	62300	50000	56200	55700
19-Oct-20	1527.45	39600	58000	6800	91000	85000	645.40	64400	50000	53600	53100
20-Oct-20	1526.61	36500	58000	5900	90200	83300	646.00	62400	45000	52400	51900
21-Oct-20	1526.19	35600	46000	6000	81300	73800	646.70	60600	45000	52400	51900
22-Oct-20	1526.00	35700	40000	5900	47700	40200	647.20	58100	40000	51100	50600
23-Oct-20	1526.22	36500	30000	4800	52900	45500	647.20	44000	40000	51100	50600
24-Oct-20	1526.39	35200	30000	5000	46200	39600	647.20	44000	40000	47200	46700
25-Oct-20	1526.52	34100	30000	5200	40800	33300	646.50	31500	40000	44700	44200
26-Oct-20	1526.65	34100	30000	5600	41600	34100	646.00	35700	40000	40800	40300
27-Oct-20	1526.72	32600	30000	5500	52400	44900	645.40	35500	40000	40800	40300
28-Oct-20	1526.51	33100	380000	5200	50300	42800	645.00	38300	40000	39500	39000
29-Oct-20	1526.23	31300	38000	4800	20200	42700	644.60	34000	40000	39500	39000
30-Oct-20	1525.98	32100	38000	4500	52100	44600	644.70	45200	40000	39500	39000
31-Oct-20	1525.66	30200	38000	4600	65600	58100	644.40	40100	40000	39500	39000

DAILY RIVERS FLOW DATA FOR OCTOBER 2020 (IN CUSECS AT 0600 HOUR)

Date	Indus at Guddu		Indus at Sukkur		Indus at Kotri		Jhelum at Mangla			Jhelum at Rasul	
	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Reservoir Level (Ft)	Inflow	Outflow	Inflow	Outflow
1-Oct-20	80800	65800	62500	17800	29700	7200	1229.85	12900	40000	36700	15300
2-Oct-20	79100	64100	61300	17200	27500	5700	1229.10	12100	40000	36700	15300
3-Oct-20	78100	64100	59800	16700	25000	5700	1228.35	12100	40000	36700	15300
4-Oct-20	77000	62000	59100	16700	23300	5700	1227.60	12100	40000	36700	15300
5-Oct-20	73200	57700	57700	16300	23300	5700	1226.85	12100	40000	37200	15300
6-Oct-20	72800	57800	55900	15000	23300	5700	1226.05	10300	40000	37800	15800
7-Oct-20	76100	62100	55900	15000	23300	5700	1225.25	10300	40000	30000	8000
8-Oct-20	75400	62400	55200	15600	21600	4000	1224.45	10300	40000	37800	15800
9-Oct-20	74700	61700	58900	23700	21600	4000	1223.65	10300	40000	37900	15800
10-Oct-20	74700	61700	58000	26100	21600	4000	1222.80	8400	40000	37900	15800
11-Oct-20	69500	58500	58000	26100	17700	3200	1222.10	9000	35000	30100	8000
12-Oct-20	68600	57600	55400	22500	17700	3200	1221.40	9000	35000	27500	5300
13-Oct-20	68600	57600	54400	22500	17700	3200	1220.75	10900	35000	27500	5300
14-Oct-20	68600	57600	54000	22500	17700	3200	1220.05	9000	35000	27500	5300
15-Oct-20	68200	57200	52900	22500	19700	5200	1219.15	8300	40000	27500	5300
16-Oct-20	65900	54300	52900	22500	19700	5200	1218.20	6600	40000	36700	15800
17-Oct-20	63300	51800	50000	26000	19700	5200	1217.45	8700	35000	36700	15800
18-Oct-20	63300	51800	48700	24600	19700	5200	1216.70	8700	35000	26200	5300
19-Oct-20	61600	50100	48300	23200	19700	5200	1215.95	8700	35000	32800	11900
20-Oct-20	61600	50100	47400	16500	19700	5200	1215.25	7400	32000	28800	11900
21-Oct-20	54700	47200	46800	15100	19600	8300	1214.46	5400	30000	28600	11900
22-Oct-20	53800	46200	44200	12800	19600	8300	1213.95	5900	27000	27500	15800
23-Oct-20	52900	45400	43100	12800	20900	9700	1213.35	5900	27000	23600	11900
24-Oct-20	52900	45400	42100	12800	19600	8300	1212.80	5700	25000	21600	11900
25-Oct-20	55400	47800	42000	13900	17900	6700	1212.30	7400	25000	21600	11900
26-Oct-20	55400	47800	42000	13900	14600	3400	1211.85	6200	22000	13000	5300
27-Oct-20	52200	44600	41900	13900	13900	2700	1211.50	9700	22000	19600	11900
28-Oct-20	49300	41800	40200	13000	12800	1600	1211.05	6200	22000	13000	5300
29-Oct-20	47900	40400	38400	11700	12800	1600	1210.60	6200	22000	19600	11900
30-Oct-20	44700	37100	38400	11700	12800	1600	1210.00	7100	28200	24200	11700
31-Oct-20	44700	37100	35800	9100	12800	1600	1209.25	5200	30000	27000	11700

DAILY RIVERS FLOW DATA FOR OCTOBER 2020 (IN CUSECS AT 0600 HOUR)

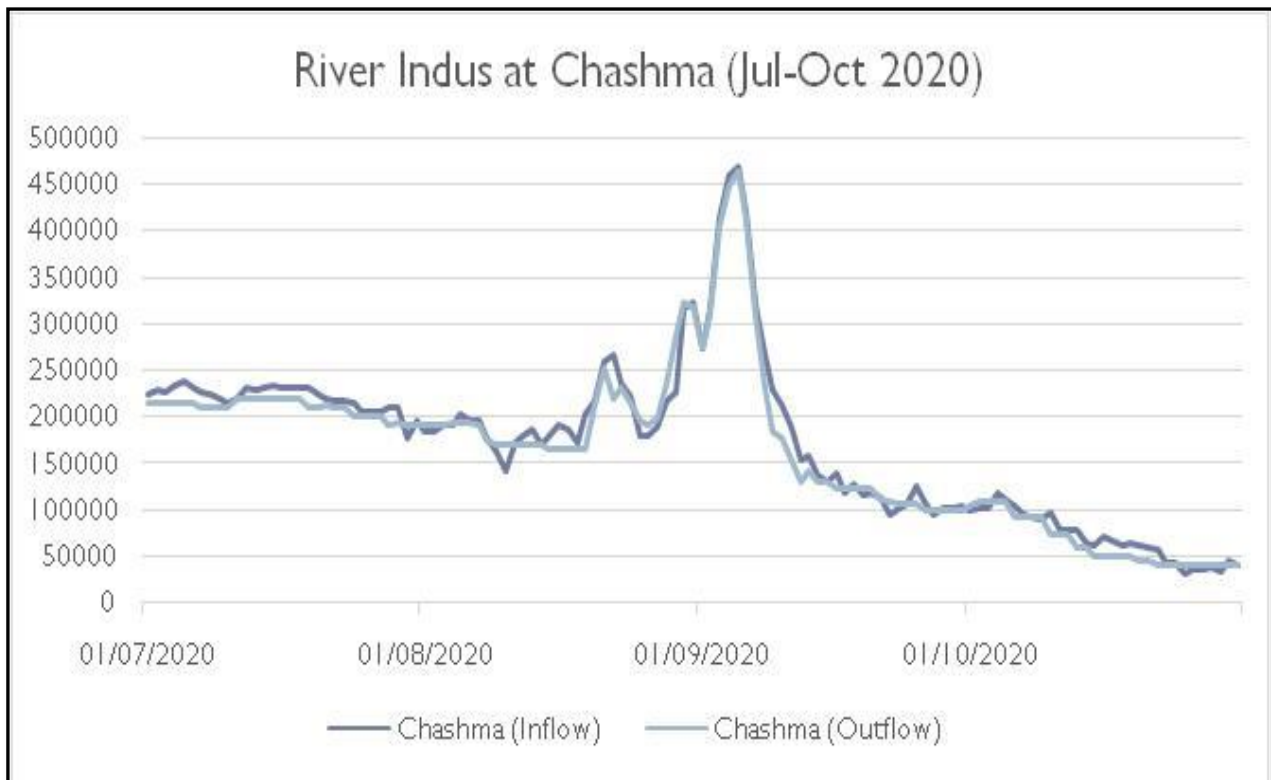
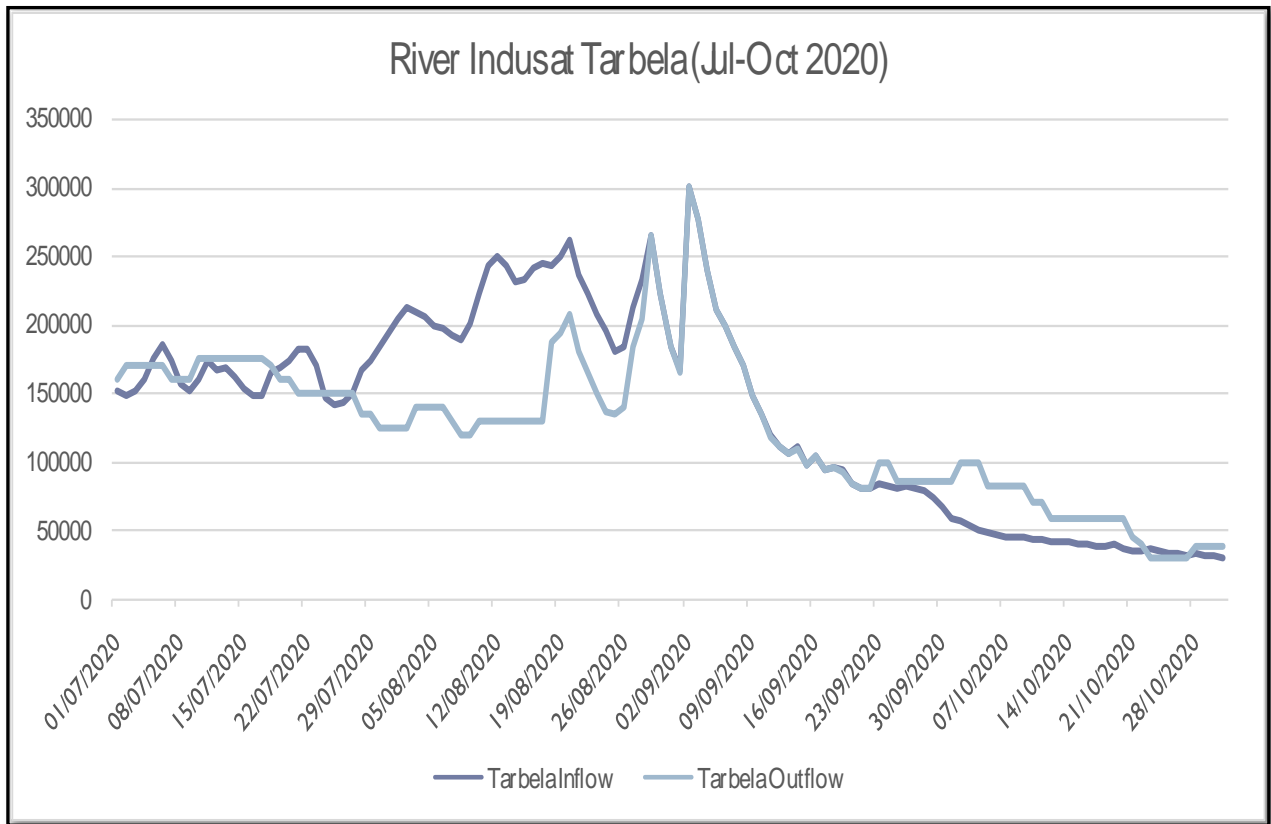
Date	Chenab at Marala		Chenab at Khanki		Chenab at Qadirabad		Chenab at Trimmu		Ravi at Panjnad		Ravi at Balloki	
	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow
1-Oct-20	21300	5000	7800	Nil	20000	Nil	29100	14000	23300	7100	26600	NIL
2-Oct-20	18200	5000	8700	1000	20100	Nil	26500	11400	21400	5100	24000	Nil
3-Oct-20	18200	5000	8700	Nil	19000	Nil	22900	7800	19400	3100	23000	Nil
4-Oct-20	17300	5000	7000	Nil	20000	Nil	22900	7800	16000	Nil	20000	Nil
5-Oct-20	17300	5000	10500	Nil	21000	Nil	19000	3400	15400	Nil	20000	Nil
6-Oct-20	17300	5000	9500	2800	20000	Nil	19800	4200	14000	Nil	20000	Nil
7-Oct-20	16900	5000	8500	1900	20000	Nil	23300	7600	14500	Nil	20000	Nil
8-Oct-20	17000	5000	8600	1000	20500	Nil	19800	4200	14500	Nil	21000	Nil
9-Oct-20	16000	4000	8600	1000	20500	Nil	19800	4200	14500	Nil	20000	Nil
10-Oct-20	15900	4000	9400	1000	20200	Nil	19800	4200	13800	Nil	20000	Nil
11-Oct-20	15700	4000	8800	1900	20000	Nil	19100	3500	12600	Nil	20000	Nil
12-Oct-20	15700	4000	8500	1000	20500	Nil	19100	3500	13200	Nil	20000	Nil
13-Oct-20	15700	4000	8500	1000	19000	Nil	17700	2100	13200	Nil	19000	Nil
14-Oct-20	15700	4000	7500	1000	20000	Nil	17700	2100	12700	Nil	19000	Nil
15-Oct-20	15000	4000	7200	Nil	19000	Nil	15600	Nil	12200	Nil	23000	Nil
16-Oct-20	14400	5000	7200	Nil	19000	Nil	15900	8000	5500	Nil	22000	Nil
17-Oct-20	15600	7700	7200	Nil	20500	Nil	15600	8000	5500	Nil	22000	Nil
18-Oct-20	15600	7700	10000	2800	22000	Nil	18000	10400	7600	2000	22000	Nil
19-Oct-20	13600	5700	10900	3700	24700	Nil	22500	14900	5500	Nil	19500	Nil
20-Oct-20	13300	5400	8100	4200	24700	2700	19900	14900	5400	Nil	22500	Nil
21-Oct-20	14900	7000	9700	9700	24700	2700	16600	12600	7500	2100	22500	Nil
22-Oct-20	14900	7000	9700	9700	21000	2700	16600	9300	12500	7100	20500	Nil
23-Oct-20	11900	4000	9700	9700	20000	Nil	15400	9300	14500	9100	20500	Nil
24-Oct-20	11900	4000	6100	6100	17000	Nil	15400	8000	14700	9400	19500	Nil
25-Oct-20	11900	4000	7700	7700	17000	Nil	15400	8000	12400	7100	19500	Nil
26-Oct-20	11900	4000	5100	5100	16000	Nil	15400	8000	12300	7100	15000	Nil
27-Oct-20	11900	4000	7100	7100	13900	Nil	15400	8000	12300	7100	1500	Nil
28-Oct-20	11900	4000	7000	7100	13000	Nil	11600	4200	12500	7600	14000	Nil
29-Oct-20	9600	1800	7100	7100	13900	Nil	11600	4200	12500	7600	14000	Nil
30-Oct-20	9600	3000	7100	7100	13900	Nil	11600	4200	12100	7200	15800	Nil
31-Oct-20	8200	3000	4700	2800	14000	Nil	11600	4200	12100	7200	14800	Nil

DAILY RIVERS FLOW DATA FOR OCTOBER 2020 (IN CUSECS AT 0600 HOUR)

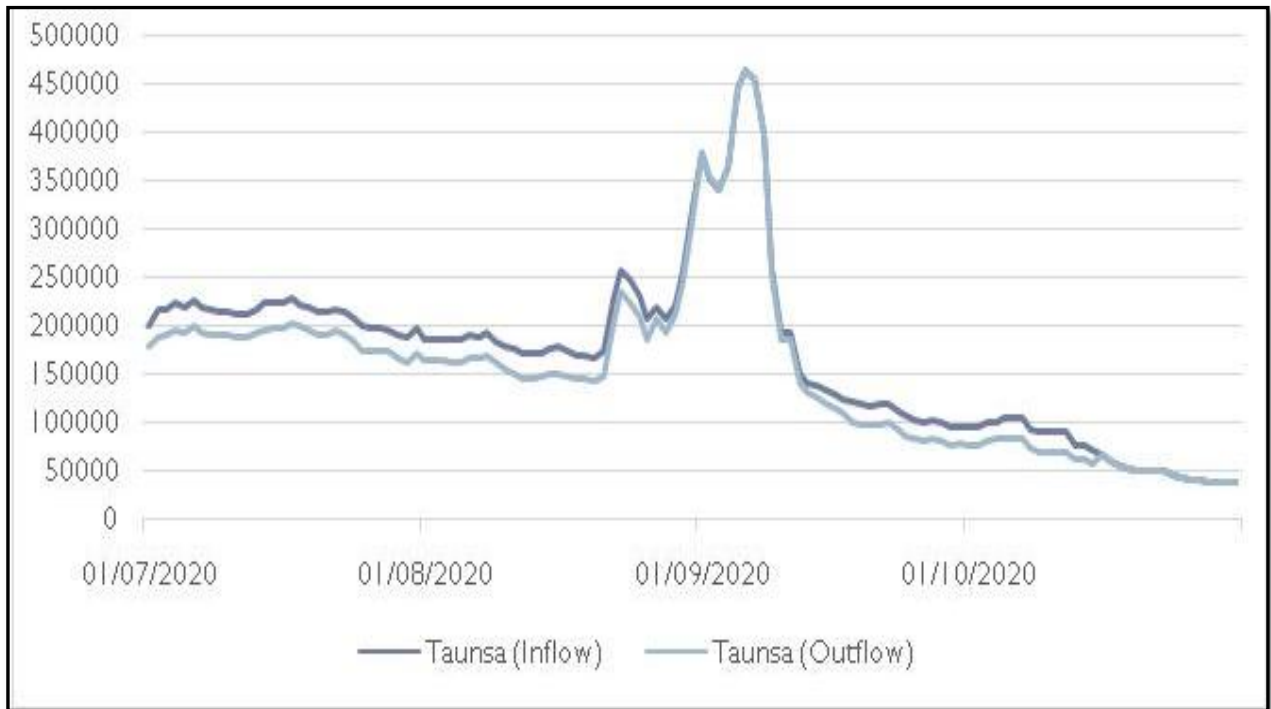
Date	Sutlej at Sidhnai		Sutlej at Sulemanki		Sutlej at Islam		Link Canals				Skardu Temperature °C	
	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	C.J.	CRBC	Q.B.	T.P	Max.	Min.
1-Oct-20	17300	Nil	15000	1100	1200	Nil	2000	3800	20000	3700	22.4	5.4
2-Oct-20	16600	Nil	13700		1200	Nil	2000	3600	20100	3400	24.4	3.3
3-Oct-20	15900	Nil	15000	1500	1200	Nil	2000	3400	18000	3800	24.3	5.3
4-Oct-20	15900	Nil	13500	1500	1200	Nil	2000	3300	19000	8000	25.2	4.4
5-Oct-20	15500	Nil	12500	1500	1200	Nil	2000	3300	20000	8600	25.4	5.3
6-Oct-20	15500	Nil	11300	1500	500	Nil	2000	3300	210000	9300	24.4	4.3
7-Oct-20	15500	Nil	11800	1500	500	Nil	2000	3300	20000	9400	24.1	4.4
8-Oct-20	15000	Nil	12000	1500	500	Nil	2000	3300	20000	9700	24.1	4.2
9-Oct-20	15000	Nil	11600	400	500	Nil	2000	3300	20500	9900	25.8	5.3
10-Oct-20	15000	Nil	11600	400	500	Nil	2000	3300	20500	9900	24.5	3.4
11-Oct-20	15000	Nil	11000	Nil	400	Nil	2000	3300	20200	9800	24.0	2.4
12-Oct-20	14800	Nil	11500	Nil	400	Nil	2000	3300	20000	3200	23.6	4.3
13-Oct-20	14800	Nil	11000	Nil	700	Nil	2000	3300	20500	4400	23.5	6.4
14-Oct-20	14800	Nil	11000	Nil	700	Nil	2000	3300	19000	3600	21.4	8.2
15-Oct-20	14800	Nil	11000	Nil	700	Nil	1500	3400	20000	Nil	21	4.3
16-Oct-20	13100	Nil	12800	3800	700	Nil	Nil	3500	19000	Nil	20.6	5
17-Oct-20	9300	Nil	12300	4300	700	Nil	Nil	3700	19000	Nil	20.0	4.4
18-Oct-20	8600	Nil	13100	4600	400	Nil	Nil	3800	20500	Nil	21.1	4.4
19-Oct-20	8600	Nil	13200	4700	400	Nil	Nil	3800	22000	Nil	20.0	3.9
20-Oct-20	8600	Nil	12400	3700	700	Nil	Nil	3900	22000	Nil	21.1	5
21-Oct-20	8600	Nil	12500	3700	700	Nil	Nil	4000	22000	Nil	21.7	4.4
22-Oct-20	8600	Nil	13300	4300	700	Nil	Nil	4000	22000	Nil	22.2	3.9
23-Oct-20	8600	Nil	13300	4300	3900	2900	Nil	4000	21000	Nil	21.7	4.4
24-Oct-20	8200	300	13100	4600	3900	2900	Nil	4000	20000	Nil	21.1	4.4
25-Oct-20	8100	Nil	13100	4600	3600	3600	Nil	4000	17000	Nil	20.0	7.9
26-Oct-20	8100	Nil	12800	4600	3600	3600	Nil	4000	16000	Nil	18.9	2.2
27-Oct-20	8100	Nil	10600	2400	3600	3600	Nil	4000	13900	Nil	17.8	1.7
28-Oct-20	8000	Nil	10600	2400	3600	3600	Nil	4000	13000	Nil	16.7	1.1
29-Oct-20	8000	Nil	10200	2000	3600	3600	Nil	4000	13900	Nil	17.2	0.6
30-Oct-20	7800	Nil	9600	1400	3600	3600	Nil	400	13900	Nil	16.1	2.8
31-Oct-20	7800	Nil	9600	1400	1800	1800	Nil	3800	14000	Nil	16.7	3.9

Appendix-III

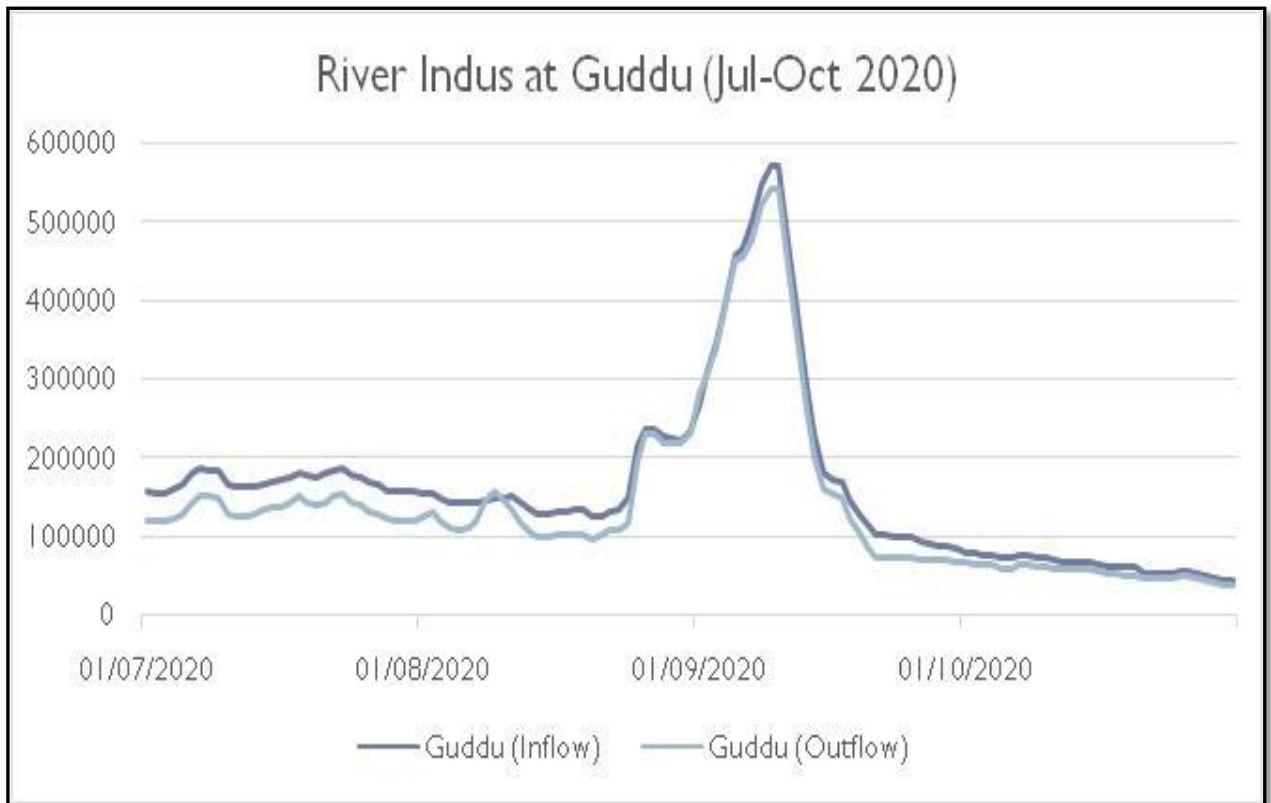
**MAJOR RIVERS FLOW HYDROGRAPH
OF MONSOON SEASON 2020**

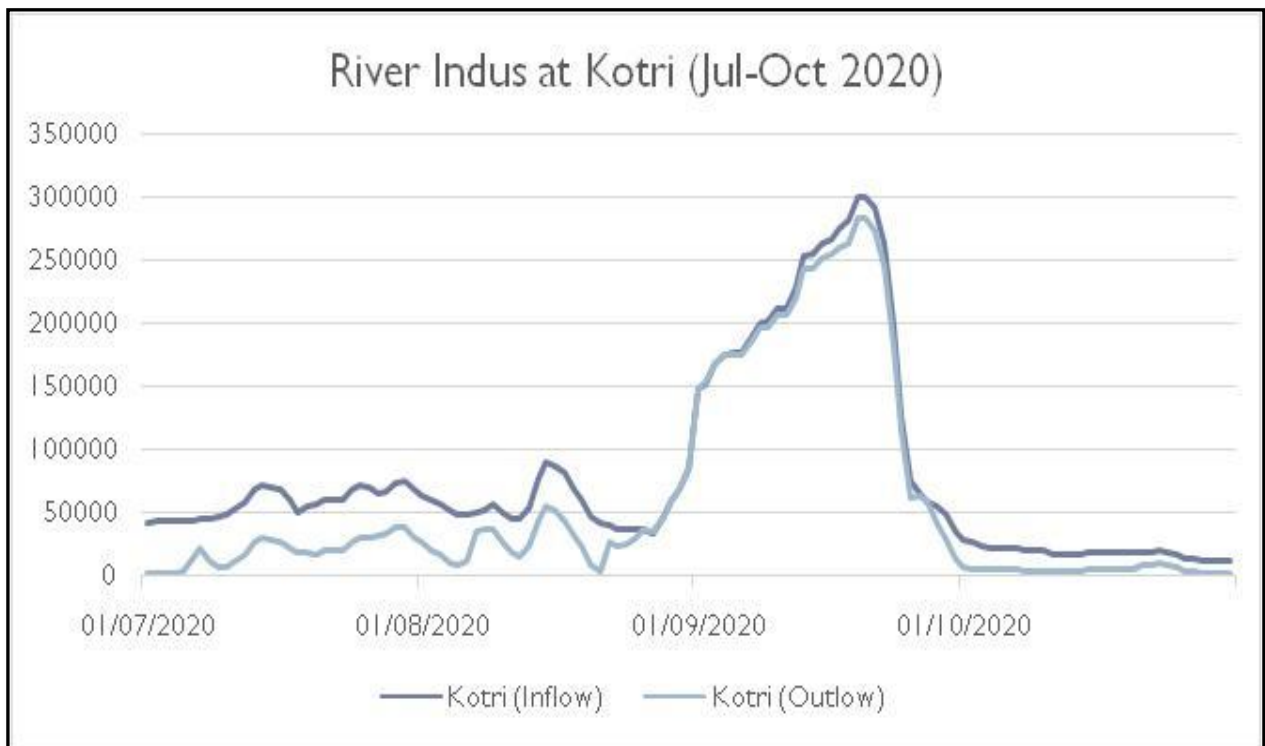
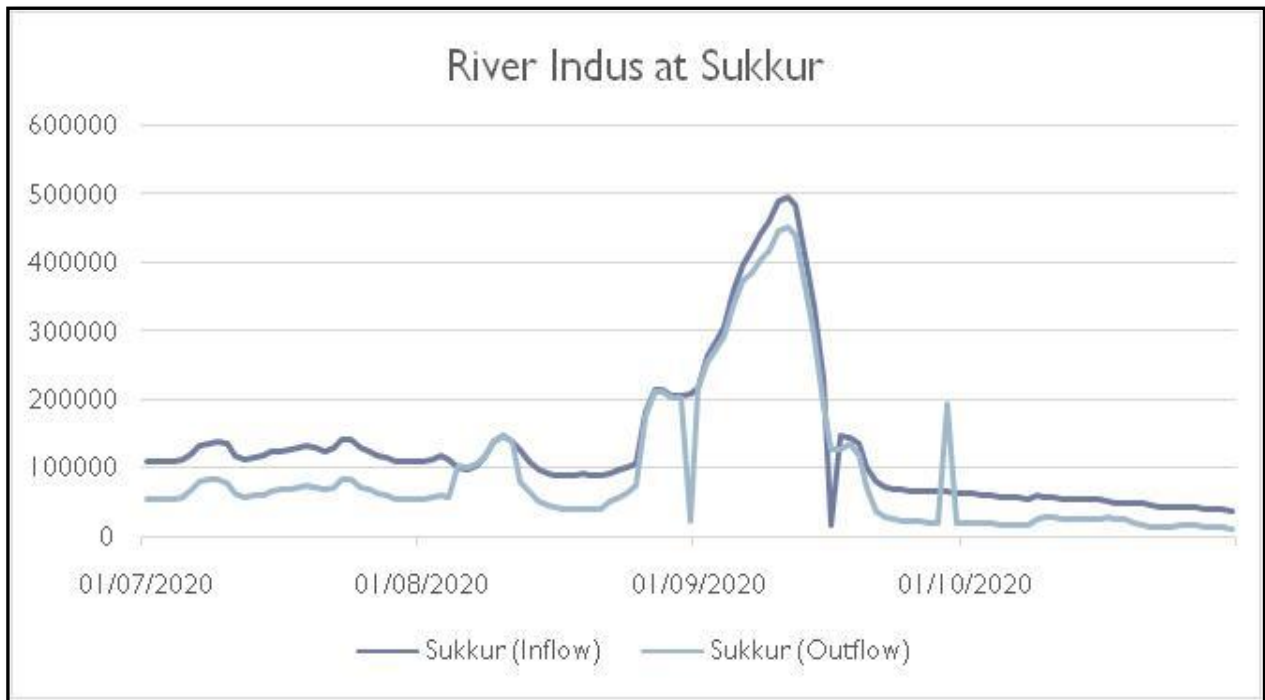


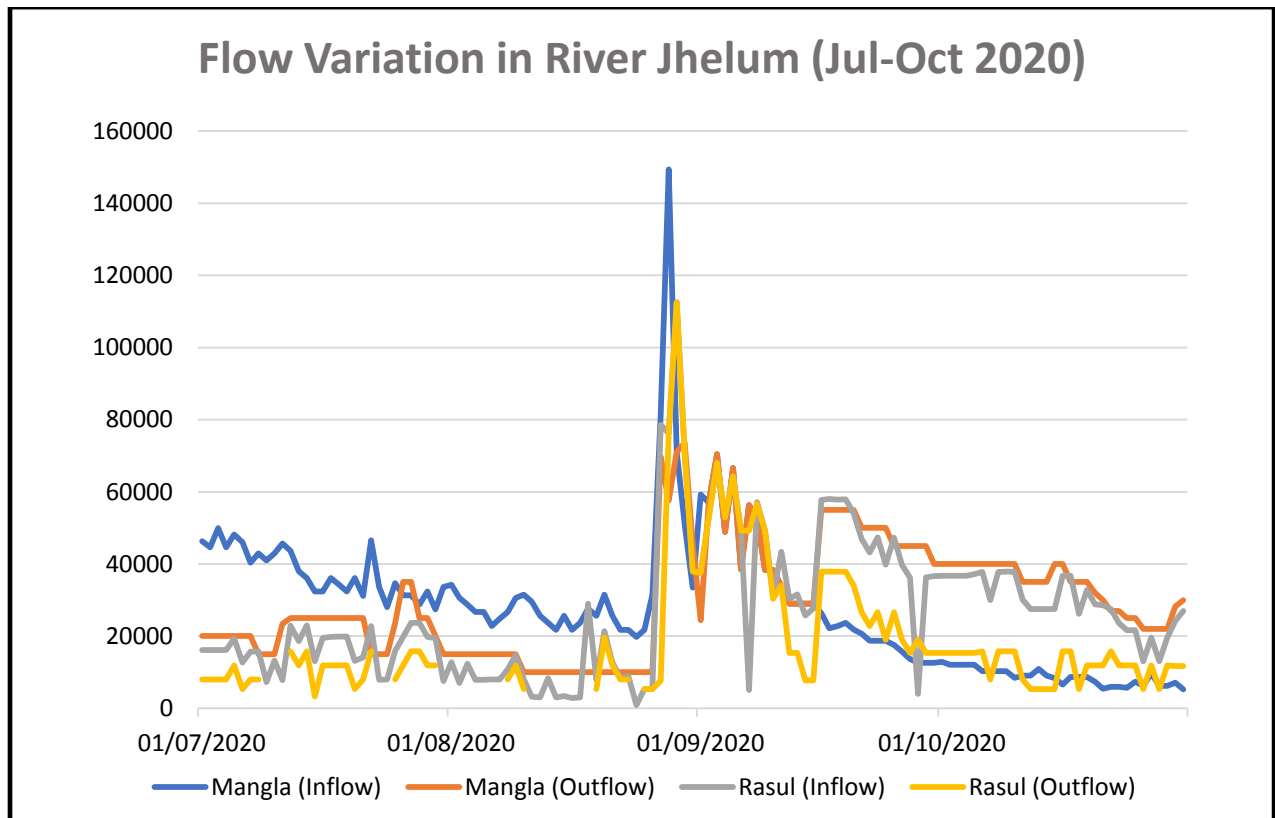
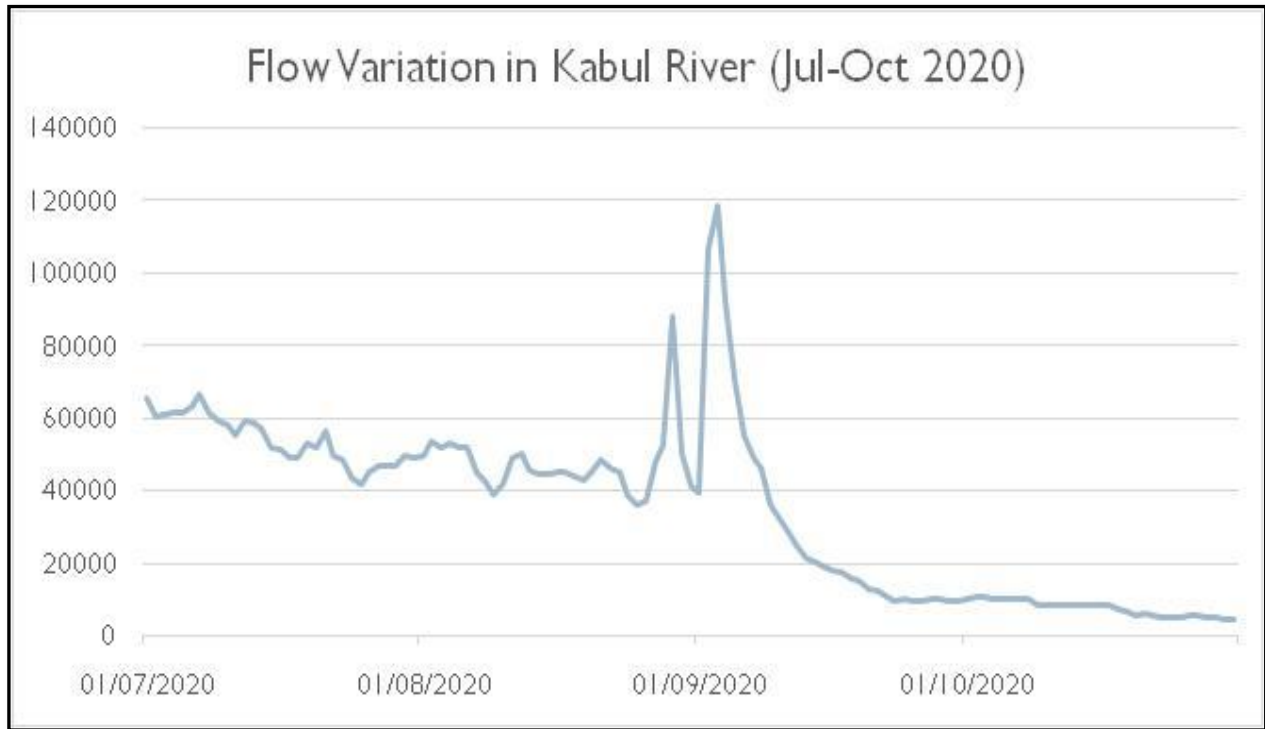
Indus at Taunsa (Jul-Oct 2020)

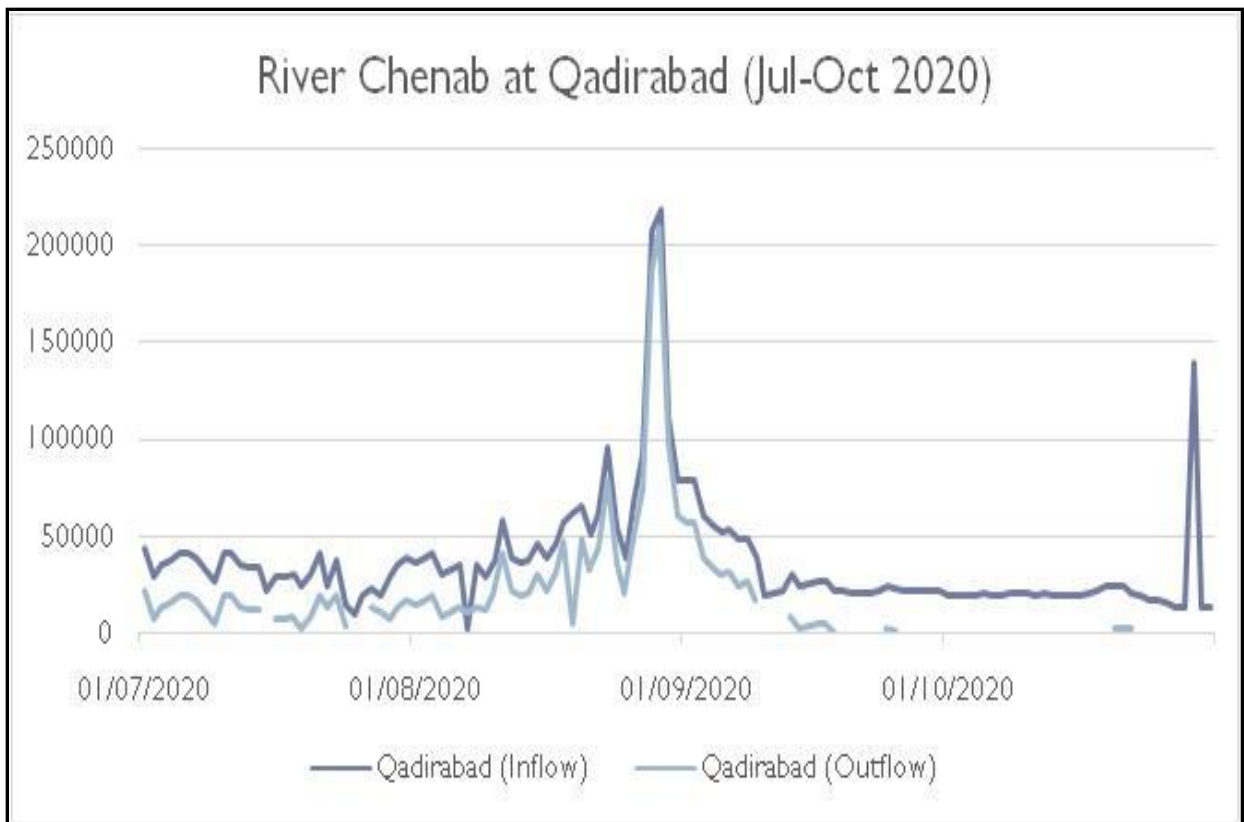
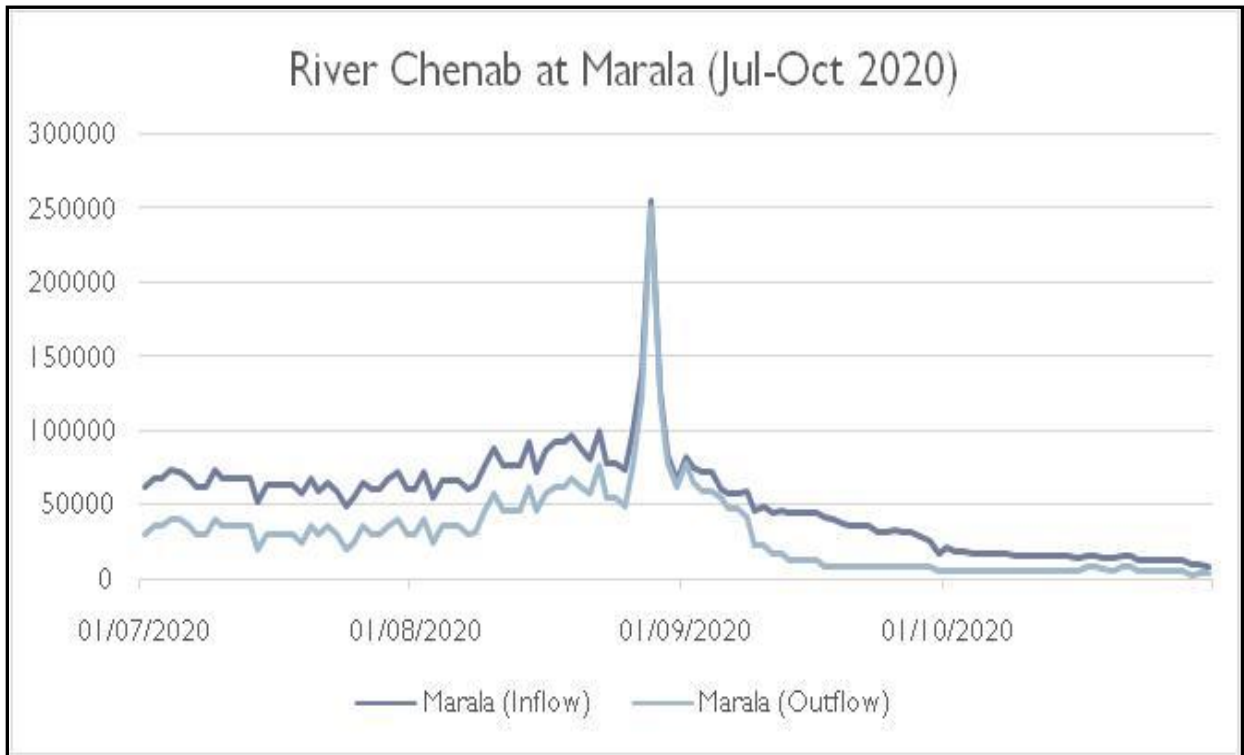


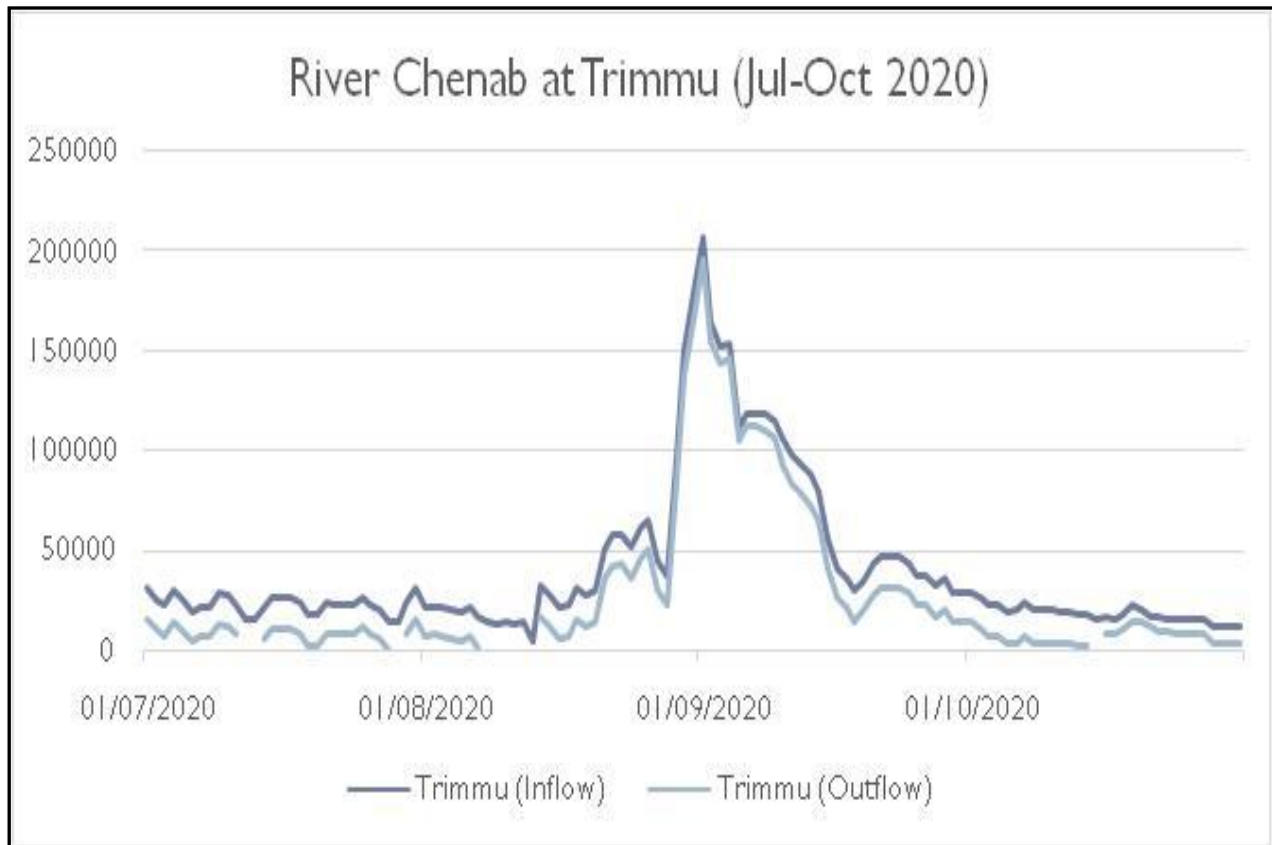
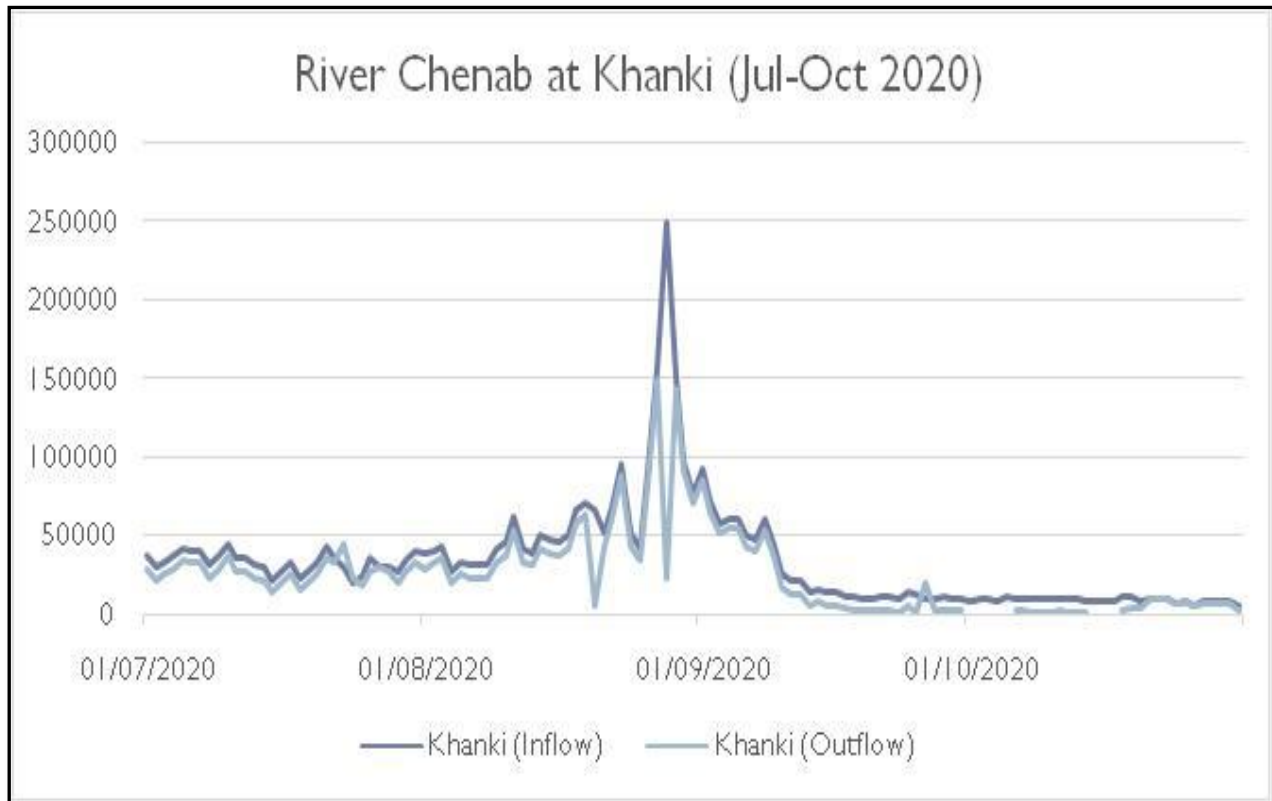
River Indus at Guddu (Jul-Oct 2020)

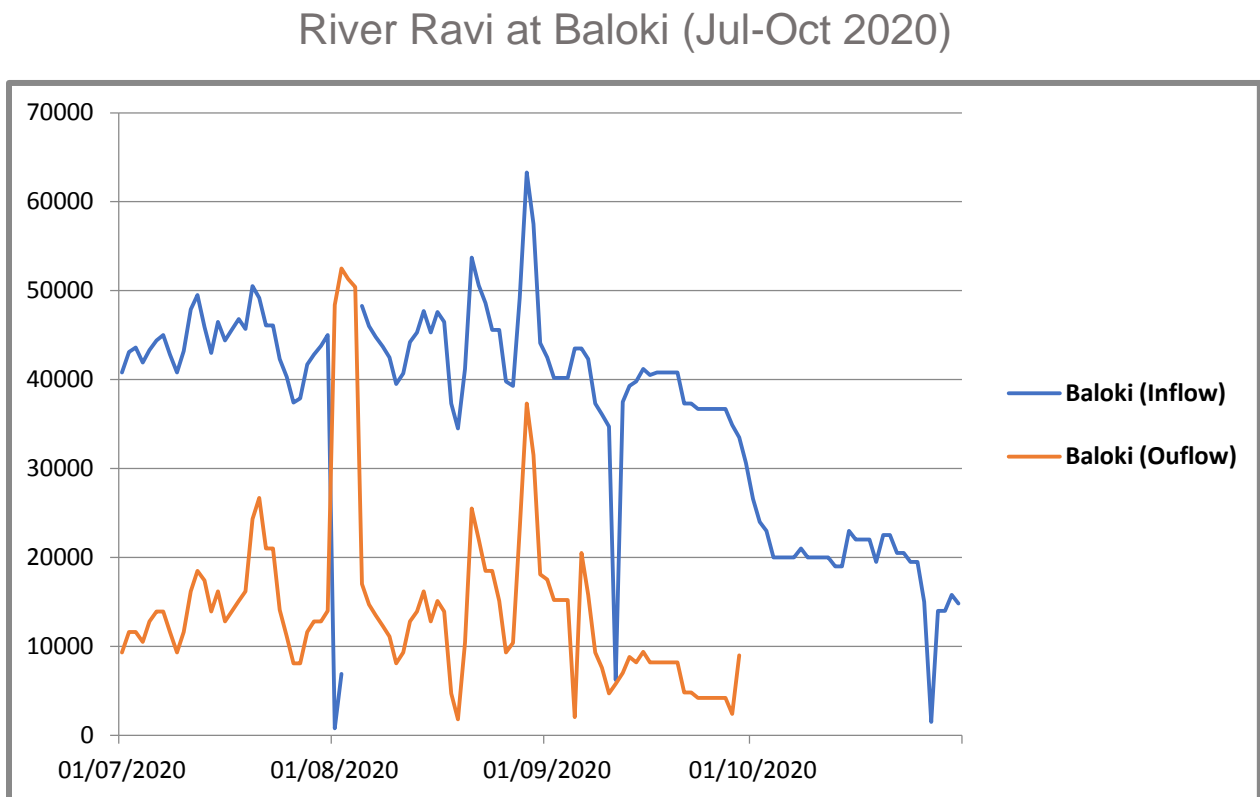
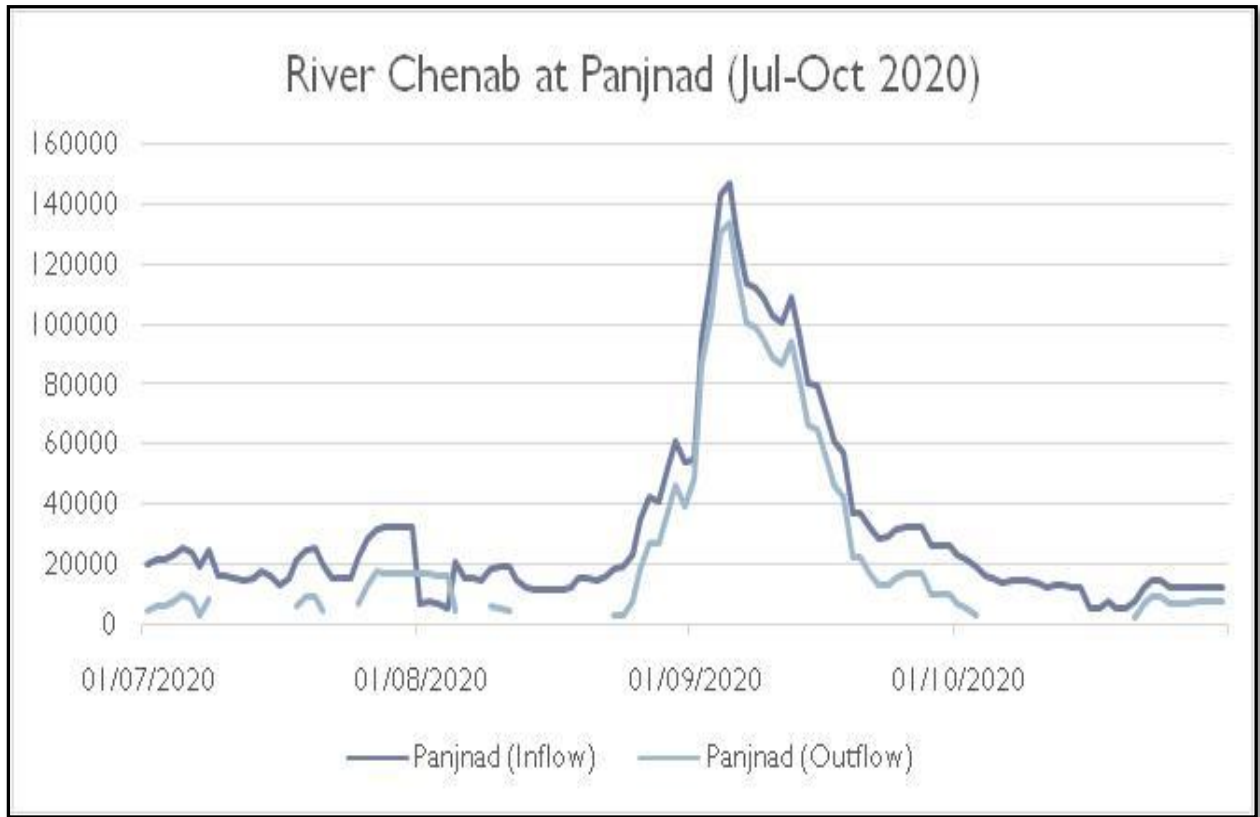




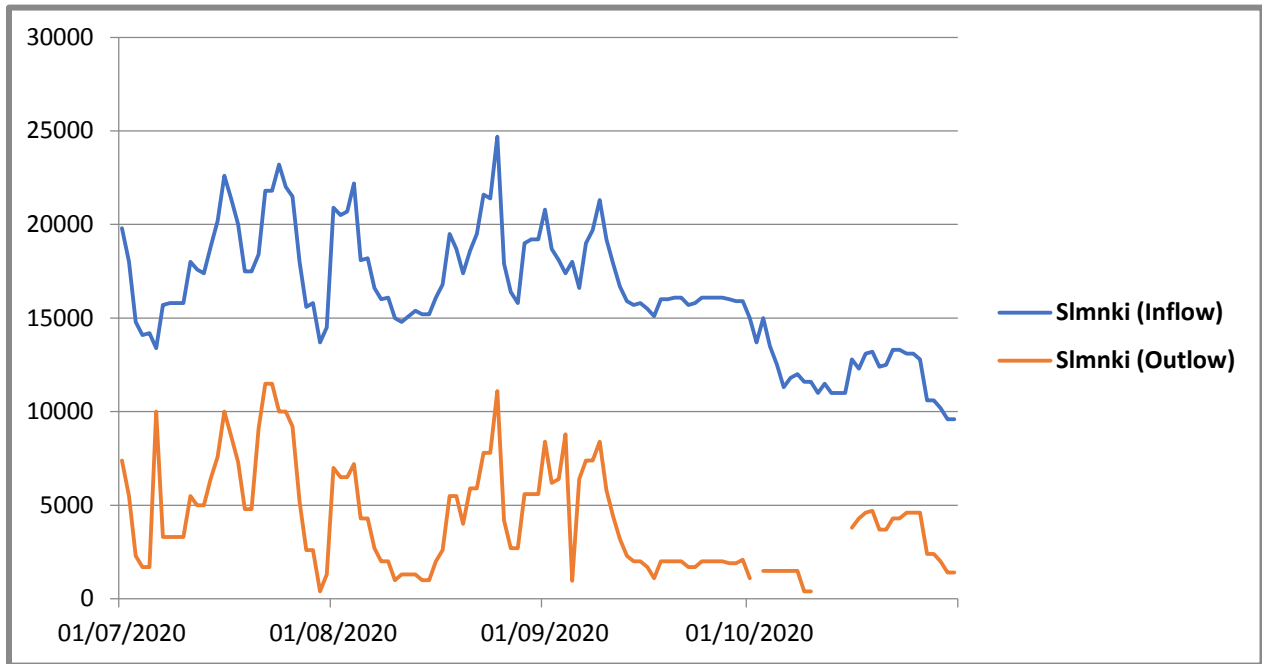




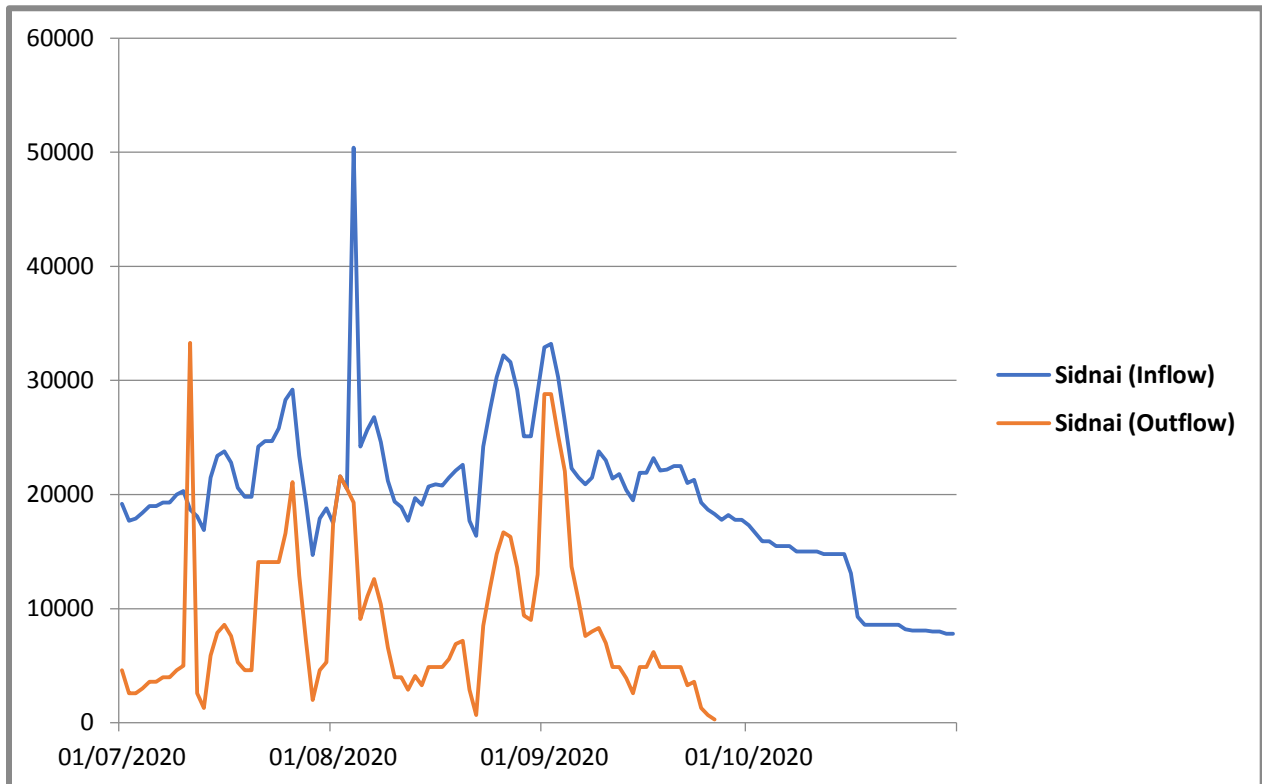




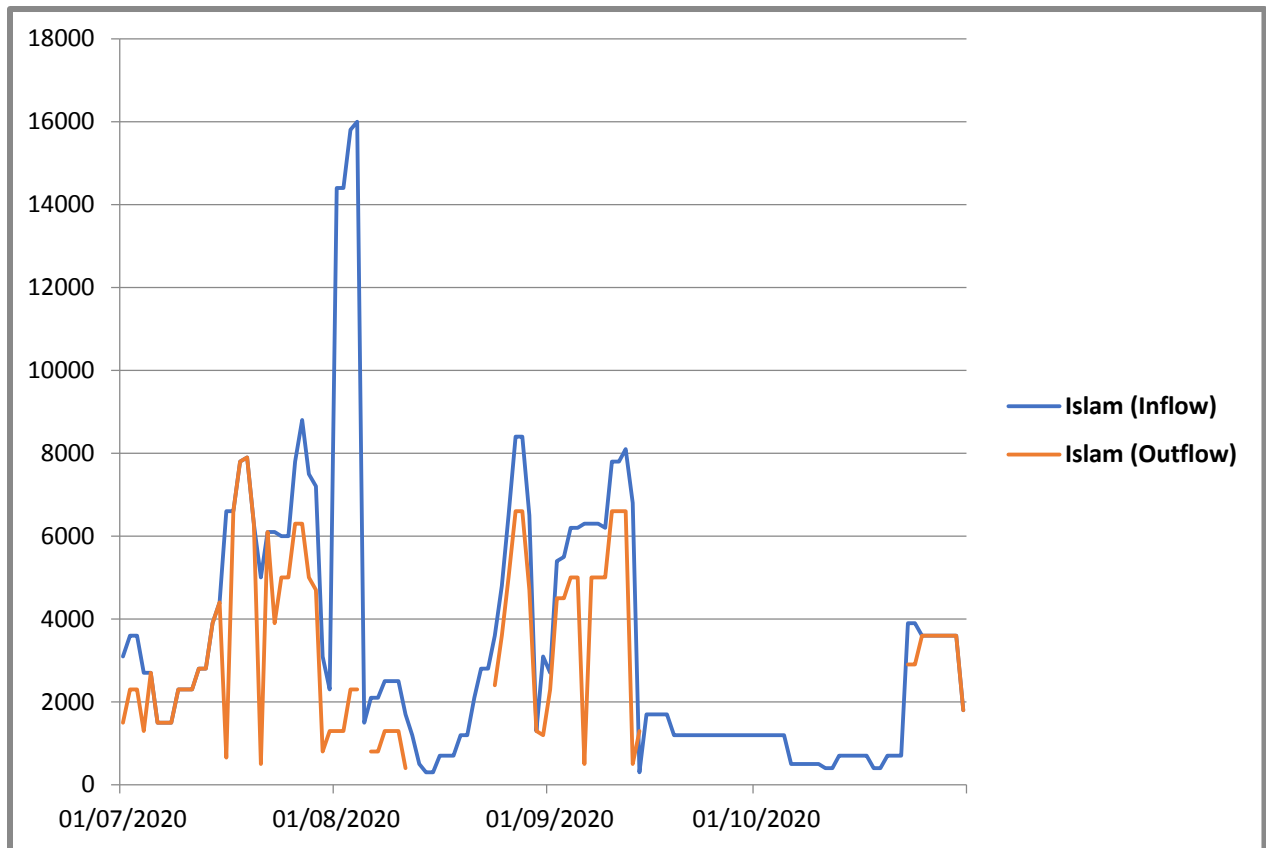
River Ravi at Sulemanki (Jul-Oct 2020)



River Sutlej at Sidnai (Jul-Oct 2020)



River Sutlej at Islam (Jul-Oct 2020)



**MONTHLY RAINFALL DATA
(JULY-SEPTEMBER 2020)
(SOURCE: PMD)**

JULY 2020			AUGUST 2020			SEPTEMBER 2020		
STATIONS	Total	Normal	STATIONS	Total	Normal	STATIONS	Total	Normal
BAHAWALNAGAR	39.02	70.8	BAHAWALNAGAR	17.05	34.2	BAHAWALNAGAR	109	14.9
BAHAWALPUR,CITY	31.42	40.4	BAHAWALPUR,CITY	2.36	39.1	BAHAWALPUR,CITY	74.72	16.5
BAHAWALPUR,AIRPORT	61	**	BAHAWALPUR,AIRPORT	18.04	**	BAHAWALPUR,AIRPORT	69.4	**
BHAKKAR	67.02	**	BHAKKAR	41.04	**	BHAKKAR	112	**
CHAKWAL	88.23	**	CHAKWAL	172.41	**	CHAKWAL	233.31	**
D.G.KHAN	66.03	**	D.G.KHAN	30.02	**	D.G.KHAN	32	**
FAISALABAD	170.63	100.8	FAISALABAD	159.01	87	FAISALABAD	32.22	42.5
CHAKLALA AIRBASE	237.45	307.8	CHAKLALA AIRBASE	235.14	340.3	CHAKLALA AIRBASE	113.03	110.7
ISLAMABAD,ZEROPOINT	219.54	368.6	ISLAMABAD,ZEROPOINT	398.73	334.7	ISLAMABAD,ZEROPOINT	95	123.3
ISLAMABAD, AIRPORT	86.4	**	ISLAMABAD, AIRPORT	276.21	**	ISLAMABAD, AIRPORT	269.7	**
JHANG	69.21	**	JHANG	152.62	**	JHANG	134.2	**
JOHARABAD	97.8	**	JOHARABAD	145.92	**	JOHARABAD	271.9	**
JHELUM	160.42	243.1	JHELUM	372.73	231.6	JHELUM	26.41	65.4
KASUR	222.02	**	KASUR	145.04	**	KASUR	134.52	**
KHANPUR	43.4	33.3	KHANPUR	39.02	33.2	KHANPUR	10.5	12
KOT ADDU	38.8	**	KOT ADDU	91.3	**	KOT ADDU	70	**
KAMRA AIRBASE	37.05	216.5	KAMRA AIRBASE	77.05	276.7	KAMRA AIRBASE	195.52	88.8

JULY 2020			AUGUST 2020			SEPTEMBER 2020		
LAHORE, AIRPORT	174.52	196.8	LAHORE, AIRPORT	368.02	182.9	LAHORE, AIRPORT	131.8	74.6
LAHORE, CITY	151.75	190.9	LAHORE, CITY	316.37	179.4	LAHORE, CITY	107.72	60.4
LAYYAH	58.61	**	LAYYAH	21.91	**	LAYYAH	92.01	**
MANDIBAHAUDDIN	79.02	**	MANDIBAHAUDDIN	203.63	**	MANDIBAHAUDDIN	7.02	**
MIANWALI AIRBASE	53.05	144.6	MIANWALI AIRBASE	121.01	115.9	MIANWALI AIRBASE	131.04	53.1
MULTAN AIRPORT	85.3	49.6	MULTAN AIRPORT	17.02	41.8	MULTAN AIRPORT	52.32	24.6
MULTAN CITY	86.2	**	MULTAN CITY	45.9	**	MULTAN CITY	70.01	**
MANGLA	0	**	MANGLA	0	**	MANGLA	0.02	**
MURREE	126.7	339.5	MURREE	248.62	302.4	MURREE	108.6	130.9
NOORPUR THAL	110.8	**	NOORPUR THAL	56	**	NOORPUR THAL	305	**
OKARA	80.01	**	OKARA	116.42	**	OKARA	63.04	**
RAHIM YAR KHAN	25.2	**	RAHIM YAR KHAN	56.82	**	RAHIM YAR KHAN	45.02	**
GUJRANWALA	87.4	**	GUJRANWALA	333.01	**	GUJRANWALA	24	**
GUJRAT	22.51	**	GUJRAT	175.8	**	GUJRAT	7.4	**
SAHIWAL	103.02	**	SAHIWAL	67.01	**	SAHIWAL	27	**
SHORKOT AIRBASE	32.01	95	SHORKOT AIRBASE	51.51	57.4	SHORKOT AIRBASE	98.11	37
SARGODHA AIRBASE	155.03	120.8	SARGODHA AIRBASE	135.04	109.2	SARGODHA AIRBASE	143	**
SARGODHA CITY	0	**	SARGODHA CITY	0	**	SARGODHA CITY	0	24.1

JULY 2020			AUGUST 2020			SEPTEMBER 2020		
SAHIWAL	103.02	**	SAHIWAL	67.01	**	SAHIWAL	27	**
SHORKOT AIRBASE	32.01	95	SHORKOT AIRBASE	51.51	57.4	SHORKOT AIRBASE	98.11	37
SARGODHA AIRBASE	155.03	120.8	SARGODHA AIRBASE	135.04	109.2	SARGODHA AIRBASE	143	**
SARGODHA CITY	0	**	SARGODHA CITY	0	**	SARGODHA CITY	0	24.1
SIALKOT CANTT	138.74	312.6	SIALKOT CANTT	547.46	277.3	SIALKOT CANTT	25	89
SIALKOT AIRPORT	50.24	**	SIALKOT AIRPORT	286.43	**	SIALKOT AIRPORT	0.3	**
T.T. SINGH	48.53	**	T.T. SINGH	97.6	**	T.T. SINGH	26.11	**
HAFIZABAD	174.42	**	HAFIZABAD	286.2	**	HAFIZABAD	43	**
KHANEWAL	56.01	**	KHANEWAL	19.03	**	KHANEWAL	75	**
NAROWAL	158.61	**	NAROWAL	278.22	**	NAROWAL	28.5	**
ATTOCK	55.81	**	ATTOCK	178.7	**	ATTOCK	209.02	**
ASTORE	29.35	26.4	ASTORE	22.73	25.3	ASTORE	13.32	20.9
BUNJI	19.01	17.9	BUNJI	32.03	24.5	BUNJI	8.43	11.2
BAGROTE	29.65	**	BAGROTE	54.64	**	BAGROTE	25	**
CHILAS	1.37	15.3	CHILAS	17.21	17.5	CHILAS	15.03	8.7
G.DOPATTA	120.7	263.3	G.DOPATTA	188	210.5	G.DOPATTA	71.7	98.2
GILGIT	9.76	14.7	GILGIT	18.98	15.6	GILGIT	11.24	8.6
GUPIS	23	19	GUPIS	12	29	GUPIS	81	15
KOTLI	190	284.4	KOTLI	514	251.8	KOTLI	63	84.3
MUZAFFARABAD AIRPORT	90.54	349.3	MUZAFFARABAD AIRPORT	334.01	213.2	MUZAFFARABAD AIRPORT	144	109.6
MUZAFFARABAD CITY	83.31	**	MUZAFFARABAD CITY	191.3	**	MUZAFFARABAD CITY	203	**
RAWALAKOT	78.81	**	RAWALAKOT	160.73	**	RAWALAKOT	47.4	**

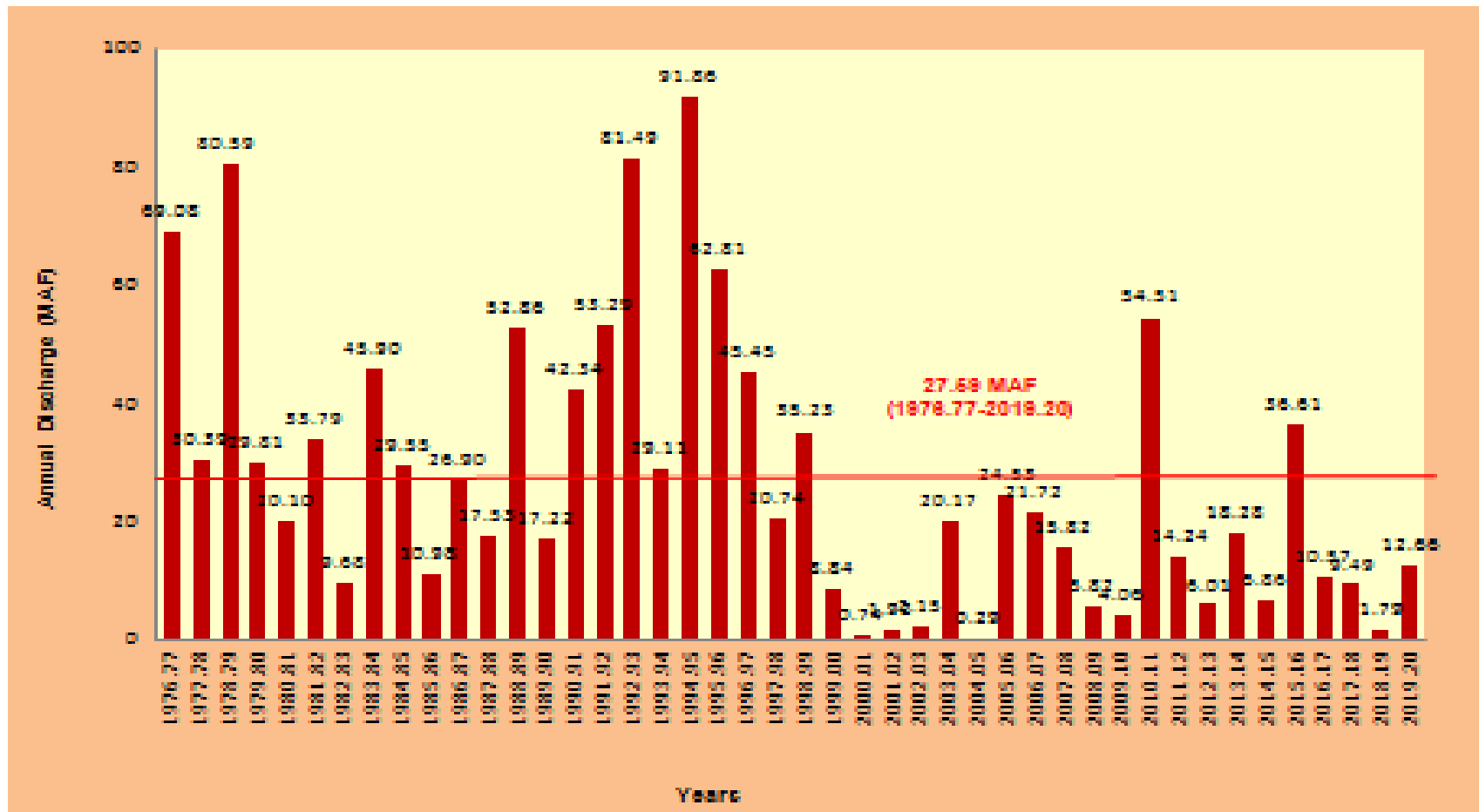
JULY 2020			AUGUST 2020			SEPTEMBER 2020		
HUNZA	8	**	HUNZA	13.8	13.2	HUNZA	14	**
SKARDU	9.17	11.2	SKARDU	18.14	**	SKARDU	7.02	9.9
BALAKOT	209	324.4	BALAKOT	476	265.5	BALAKOT	158	112.5
BANNU	44	63.6	BANNU	71.01	74.3	BANNU	2	31.4
CHERAT	17	85.5	CHERAT	221	94.2	CHERAT	158	35.1
CHITRAL	0.31	7	CHITRAL	0.58	6.6	CHITRAL	35	13.1
D.I.KHAN	21.01	69.6	D.I.KHAN	47	73.7	D.I.KHAN	106	31.2
DIR	69.4	154.5	DIR	73.6	147.5	DIR	105.6	76
LOWER DIR	21	**	LOWER DIR	127	**	LOWER DIR	97	**
DROSH	11.6	21.4	DROSH	0	18.3	DROSH	48.9	20.8
KAKUL	99.84	257.5	KAKUL	381	235.6	KAKUL	161.4	100.6
KALAM	35.4	**	KALAM	66.2	**	KALAM	165.9	**
KOHAT AIRBASE	136.02	83.2	KOHAT AIRBASE	96.06	103.3	KOHAT AIRBASE	121	45.1
MALAMJABBA	108	**	MALAMJABBA	382	**	MALAMJABBA	407	**
MIRKHANI	15.6	**	MIRKHANI	18	**	MIRKHANI	66.2	**
PARACHINAR	24	83.5	PARACHINAR	53	110.7	PARACHINAR	27	53.9
PESHAWAR AIRBASE	15.04	58.3	PESHAWAR AIRBASE	25.05	77.1	PESHAWAR AIRBASE	45.53	29.4
PESHAWAR CITY	25.05	**	PESHAWAR CITY	39.27	**	PESHAWAR CITY	56.22	**
PATTAN	35	**	PATTAN	163	**	PATTAN	157	**

JULY 2020			AUGUST 2020			SEPTEMBER 2020		
RISALPUR	7.04	143.2	RISALPUR	49.05	151.6	RISALPUR	150	49.5
SAIDU SHARIF	70	166	SAIDU SHARIF	117	124.7	SAIDU SHARIF	140.8	73
TAKHT BAI	15.3	**	TAKHT BAI	169.72	**	TAKHT BAI	65.4	**
BADIN	81.54	79.5	BADIN	231.85	85.9	BADIN	41.83	24.8
CHHOR	36.6	82.2	CHHOR	344.1	81.8	CHHOR	90.3	39.8
HYDERABAD	22	47.9	HYDERABAD	195.31	71.8	HYDERABAD	25.01	13
JACOBABAD	7	39	JACOBABAD	133.01	35.6	JACOBABAD	1	5.3
KARACHI A/P	101.29	60	KARACHI A/P	366.88	60.9	KARACHI A/P	0.01	11
LARKANA	31	48.6	LARKANA	189.5	34.5	LARKANA	8	3.7
MITHI	91.8	**	MITHI	431.4	**	MITHI	49.1	**
SH.B.ABAD	1.03	58.3	SH.B.ABAD	150.72	48.8	SH.B.ABAD	12.9	16.1
PADIDAN	73.01	41.8	PADIDAN	205.41	40.9	PADIDAN	2.6	5.4
ROHRI	55.51	39.7	ROHRI	56.53	24.8	ROHRI	1	3
SUKKUR	11.51	20.8	SUKKUR	62.1	20.4	SUKKUR	5	0.9
M.JO.DARO	14.02	39.9	M.JO.DARO	281.01	26.6	M.JO.DARO	0.01	6.6
THATTA	47.1	**	THATTA	256.8	**	THATTA	25	**
DADU	25.01	**	DADU	180	**	DADU	0	**
MIRPUR KHAS	56.5	**	MIRPUR KHAS	348.03	**	MIRPUR KHAS	134	**
TANDO JAM	6.51	**	TANDO JAM	171.21	**	TANDO JAM	53	**
SAKRAND	14.02	**	SAKRAND	125.04	**	SAKRAND	19	**
BARKHAN	56	98.7	BARKHAN	130.02	89.6	BARKHAN	2	34.7
DALBANDIN	0.51	4	DALBANDIN	15	0.7	DALBANDIN	0	0.1
GAWADAR	0.4	**	GAWADAR	32.71	**	GAWADAR	0	**

JULY 2020			AUGUST 2020			SEPTEMBER 2020		
JIWANI	0	3.1	JIWANI	9	2.6	JIWANI	0	0
KALAT	12	21.9	KALAT	72.2	11.8	KALAT	0	0.6
KHUZDAR	30.1	58.3	KHUZDAR	185.52	59.9	KHUZDAR	0	8
LASBELA	31.02	51.4	LASBELA	131.01	32.7	LASBELA	0.01	5.5
NOKKUNDI	0	0.7	NOKKUNDI	9	0.3	NOKKUNDI	0	0
PANJGUR	13	11.9	PANJGUR	19	7.5	PANJGUR	0	2.1
PASNI	6	6.9	PASNI	64.5	7.6	PASNI	0	0.7
QUETTA (SH MANDA)	5.4	**	QUETTA (SH MANDA)	18	**	QUETTA (SH MANDA)	0	**
QUETTA (SAMUNGLI)	1.02	11.2	QUETTA (SAMUNGLI)	20.02	13.1	QUETTA (SAMUNGLI)	0	2.3
SIBBI	33.02	38.4	SIBBI	212	39.2	SIBBI	0	10.7
TURBAT	30.6	8.1	TURBAT	66	1.4	TURBAT	0	0
ORMARA	4	10.7	ORMARA	117	4.5	ORMARA	0	0
ZHOB	29.02	66.4	ZHOB	24	44.8	ZHOB	0	9

Appendix-V

ESCAPAGE BELOW KOTRI
HYDROLOGICAL YEAR FROM APRIL TO MARCH



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