Supplementary Document 16:

# CLIMATE CHANGE RISK VULNERABILITY ASSESSMENT AND ADAPTATION MEASURES

# CLIMATE CHANGE RISK VULNERABILITY ASSESSMENT AND ADAPTATION MEASURES

## VOLUME - II ANNEXURES

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# DETAIL DESIGN OF JALALPUR IRRIGATION PROJECT

# CLIMATE CHANGE RISK VULNERABILITY ASSESSMENT AND ADAPTATION MEASURES

## 1. INTRODUCTION

1. The Proposed Jalalpur Irrigation Project envisages to supply irrigation supplies through right bank of Rasul Barrage on River Jhelum. It is proposed as a non-perennial irrigation system, which will provide irrigation supplies to about 165,000 acres (66,759 ha) of cultivable land during Kharif season (i.e., from April to October). The main canal will have a length of about 110 km and a design discharge of about 38.15m$^3$/s (1,350 cusecs) at Rasul Barrage. Project Area map is shown in Figure 1-1. Main Components of the Project are:

(i) Construction of Main Canal, distribution system and allied infrastructure
(ii) Construction of Flood Carrier Channels for drainage of flood water arriving from hill-torrents and conveying it to river Jhelum
(iii) Command Area Development works.
(iv) Farmers training and Capacity Building

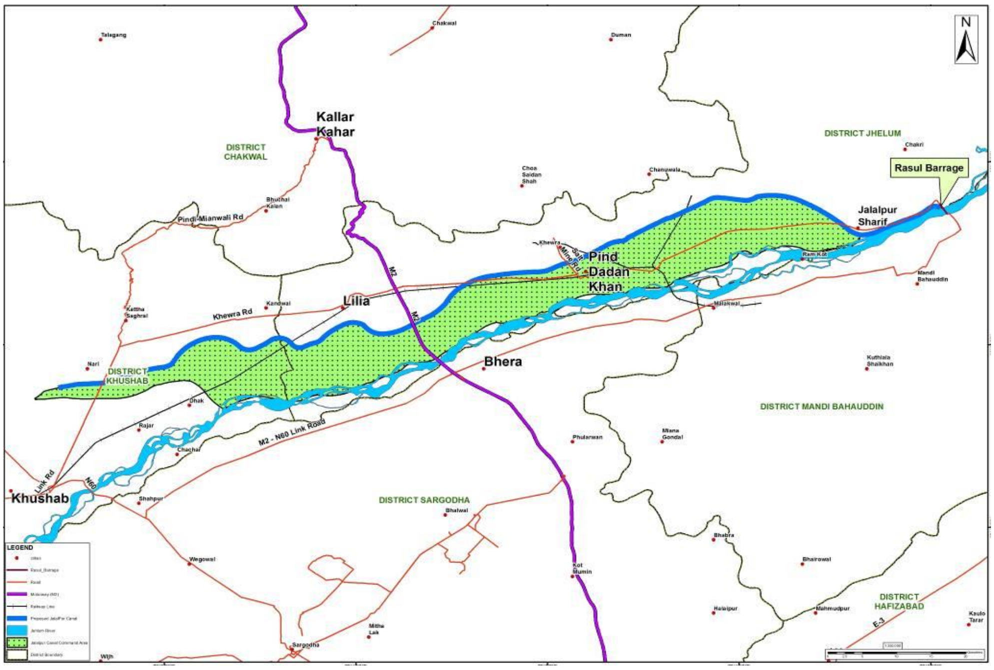



**Figure 1-1: Project area map**

### 1.1 Objectives of the Study

2. Climate Change is a natural phenomenon that has happened on earth throughout its existence. During ancient times the climate has been warmer as well as cooler as compared to today. Climate change is happening on a global scale with locally varying magnitude and is driven by physical processes. During the last century, for which detailed climate observations are available, an increasing trend has been recorded, indicating that we are in a warming phase. Next to natural drivers the warming is driven by anthropogenic activities, mainly the combustion of fossil fuels and respective release of "greenhouse" gases into the atmosphere. The "greenhouse" gases are promoting atmospheric warming by reducing thermal losses into space.

3. Most visible impacts of climate change are increasing variability in rainfall leading to more extreme events - floods and droughts, as well as increasing temperatures with respective impacts on evapotranspiration and respective agricultural impacts as well as impacts on snow and ice covers resulting in glacier melt, changes in the snow line and respective freshwater availability changes in space and time in many regions. Figure 1-2 gives a comparison of annual mean temperature change in Pakistan as calculated by the Pakistan Meteorological Department, with global temperature variations from Year 1860 to Year 2000.

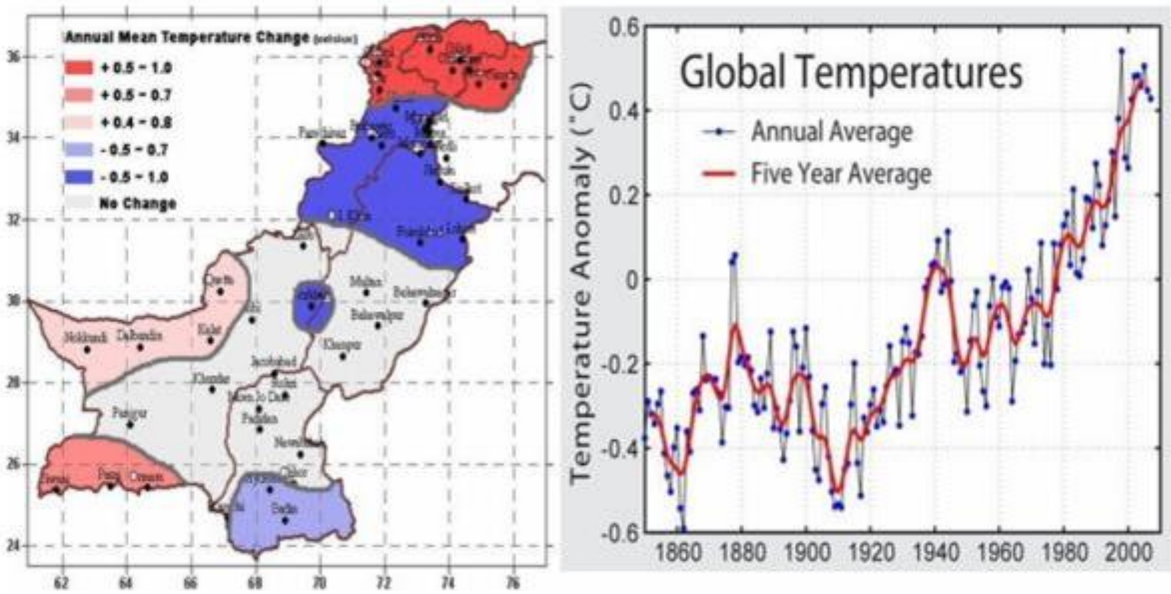



**Figure 1-2: Comparison of Annual Mean Temperature Change in Pakistan with Global Temperature Variations from 1860 to 2000**

4. Climate change may have impact on a project especially if the project is located in a water scarce area. The likely climate change impacts in the project area are increased temperatures with reduced water availability and occasional heavy floods from high rainfall. Any increase or reduction in water availability can affect the overall economics of the project.

5. Agriculture projects are both vulnerable to climate shifts and are also a source of the greenhouse gases driving changes. Climate change related threats to agriculture represent threats to society, and calls for adaptation and mitigation strategies are increasing. The main representative parameters of climate change for an Agriculture Project are temperature (maximum and minimum) and precipitation. Climate Change impact on these parameters have been simulated by the PPTA consultants (2014)[1] and has been discussed in this report.

## 1.2 Definitions of Terms Related to Climate Change

6. Definitions of common terms used in Climate Change assessment is given below:

**Weather:** The state of the atmosphere at a given time and place, with respect to the variables such as temperature, moisture, pressure etc.

[1] Climate Change Impact studies for the Project were conducted during the PPTA phase by NESPAK-ICS Joint Venture (PPTA Consultants). The Report on Climate Change Impact (Annex B) of Feasibility Study prepared by PPTA Consultants has been utilized and updated in the light of comments received by ADB. However, all analyses presented in this report correspond to analyses carried out by PPTA consultants.

**Climate:** Average weather. Statistical description of mean weather conditions over a period of several years, typically 2-3 decades.

**Climate Change:** The most general definition of climate change is a change in the statistical properties of the climate system when considered over long periods of time, regardless of cause. Accordingly, fluctuations over periods shorter than a few decades, such as El Niño, do not represent climate change. The term sometimes is used to refer specifically to climate change caused by human activity, as opposed to changes in climate that may have resulted as part of Earth's natural processes. In this sense, especially in the context of environmental policy, the term climate change has become synonymous with anthropogenic global warming. Within scientific journals, global warming refers to surface temperature increases while climate change includes global warming and everything else that increasing greenhouse gas levels will affect. On the broader scale, the rate at which energy is received from the sun and the rate at which it is lost to space determine the equilibrium temperature and climate of earth. This energy is distributed around the globe by winds, ocean currents, and other mechanisms to affect the climates of different regions. The Greenhouse Effect: plays a crucial role in maintaining a life-sustaining environment on the earth. If there was no Greenhouse Effect, the average temperature of the earth would have been -180°C (253°K) instead of the present 15°C. Human activity is enhancing the natural Greenhouse Effect by adding gases like carbon dioxide, methane, nitrous oxide, chlorofluorocarbons, ozone, etc. It is this Enhanced Greenhouse Effect which is causing Global Warming and Climate Change.

**Intergovernmental Panel on Climate Change (IPCC):** As an intergovernmental body jointly established in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), the Intergovernmental Panel on Climate Change (IPCC) has provided policymakers with the most authoritative and objective scientific and technical assessments. Beginning in1990, this series of IPCC assessment reports, special reports, technical papers, methodology reports and other products have become standard works of reference

**Global Circulation Model (GCM):** Global Circulation Models (GCMs) are complex, three-dimensional climate models that consider a range of factors with potential to influence our global climate system. They are also referred to as Global Climate Models.

### 1.3 Climate Change in JIP basin as per Historical Record

7. This section presents a review of climate and the historical data required to establish a baseline to assess the impact of climate change on the precipitation and temperature of the region.

**Climate and bio-climate of the study area**

8. The climate in the project area is hot and arid. Summer (May-August) temperatures vary from 18° to 46°C and winter (November-February from 0° to 24°C). In spring and autumn, temperatures are moderate. The rainfall is low and erratic and the pan evaporation is three times of average yearly rainfall, requiring irrigation essential for crop production.

9. The following Figure 1-3 represents the mean values of different climate parameters for different months at Jhelum city[2].

[2] http://www.climate-charts.com/Locations/p/PK41598.php

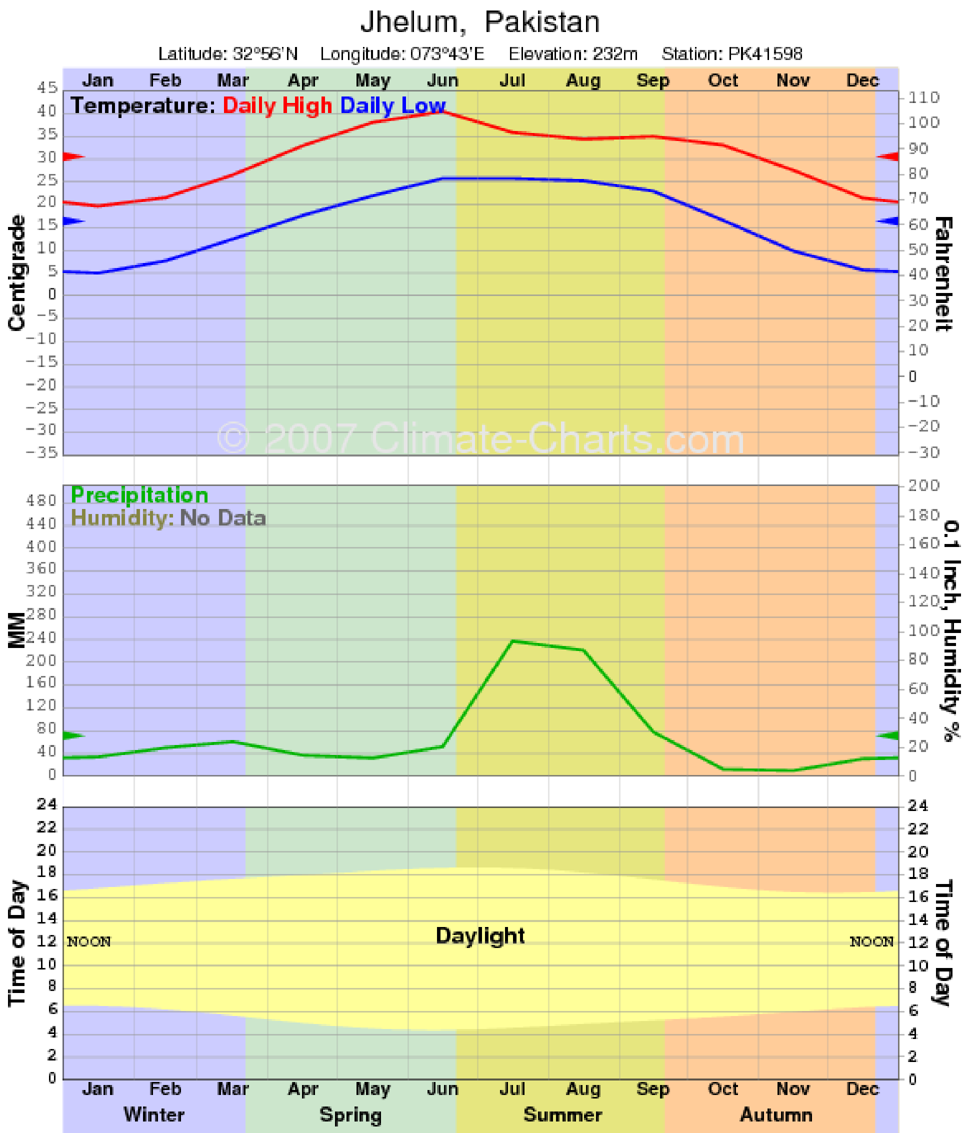



**Figure 1-3: NOAA Jhelum Data, Presented in both Metric and English Units**

### 1.3.1.1 Historic Precipitation and Temperature data

#### a.) Precipitation

10. The rainfall data has been recorded at various locations in the study area or in nearby area by Pakistan meteorological department (PMD), Punjab irrigation department (PID) and surface water hydrology (SWH), WAPDA. The description of rainfall stations is given in Table 1-1.

**Table 1-1: Rainfall gauges in the study area**

| Sr No | Station | Agency | Years of Record | Period of Record |
|---|---|---|---|---|
| 1 | Lilla | PID | 36 | 1978-2013 |
| 2 | Khewra | PID | 44 | 1969-2013 |
| 3 | Khushab | PID | 50 | 1963-2013 |
| 4 | Rasul | PID | 37 | 1969-2005, 2011 |
| 5 | Jhelum | PMD | 44 | 1970-2013 |
| 6 | Gujjar Khan | SWHP | 53 | 1961-2013 |

11. The Pakistan meteorological department (PMD) is the most concerned department regarding measurement of rainfall and temperature under guidelines of World's Meteorological Organization (WMO). So it has been decided to use the data of Jhelum rain gauge which is operational since 1970. The maximum recorded one day annual maximum rainfall is 242.2 mm in the year 1995 and minimum recorded one day annual maximum rainfall is 46.7 mm in the year 1972.

12. Annual Precipitation records shown Figure 1-4 describes that there is slightly downward trend for the annual rainfall at the Jhelum gauging station.

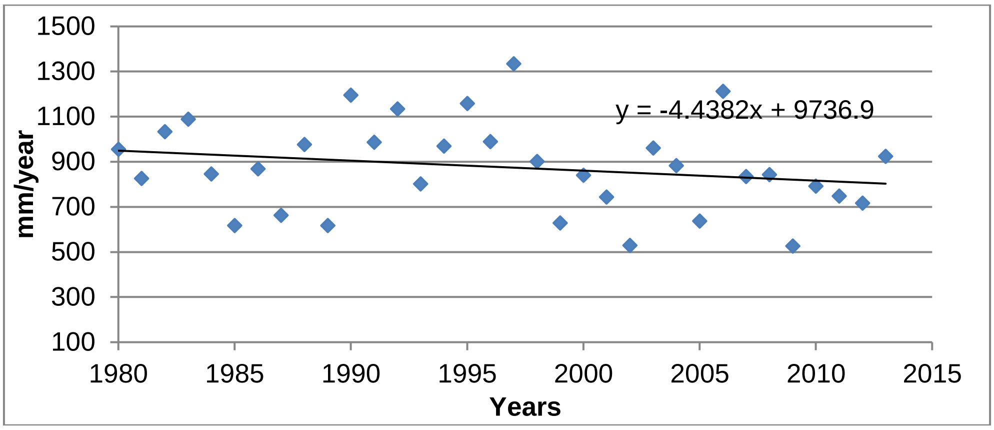



**Figure 1-4: Historical Precipitation Record of Jhelum**

### b.) Temperature

13. The Pakistan Meteorology Department has Jhelum station within the project area to record temperature. The daily maximum and minimum data from 1980 to 2013 was collected to determine the variability in the temperature. The results indicate that mean temperature over the period of 34 years is 30.68$^0$C, whereas maximum temperature was recorded in 2003 with a value of 33.07 $^0$C. The average minimum temperature recorded over the same period 16.77 $^0$C with minimum temperature of 11.74 $^0$C that was recorded in 2003. Figure 1-5 shows maximum and minimum annual temperature from 1980 to 2013.

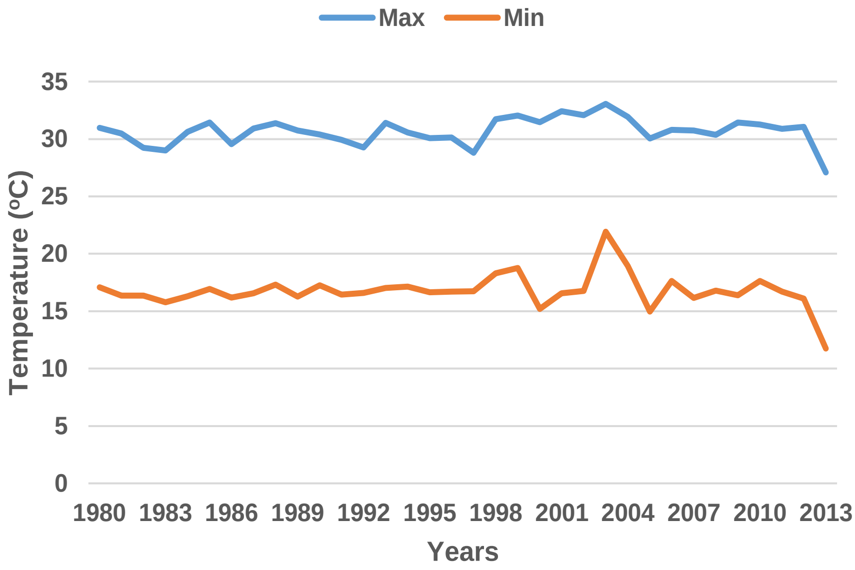



**Figure 1-5: Historic maximum and minimum temperature for the Jhelum**

**Historic Seasonal analysis of the climatic data for use as baseline in the GCM analysis**

14. The historic precipitation and temperatures for Jhelum station (continuous data) were averaged as shown below Figure 1-6, **Error! Reference source not found.** and Figure 1-8 for the period of 1980 to 2013.

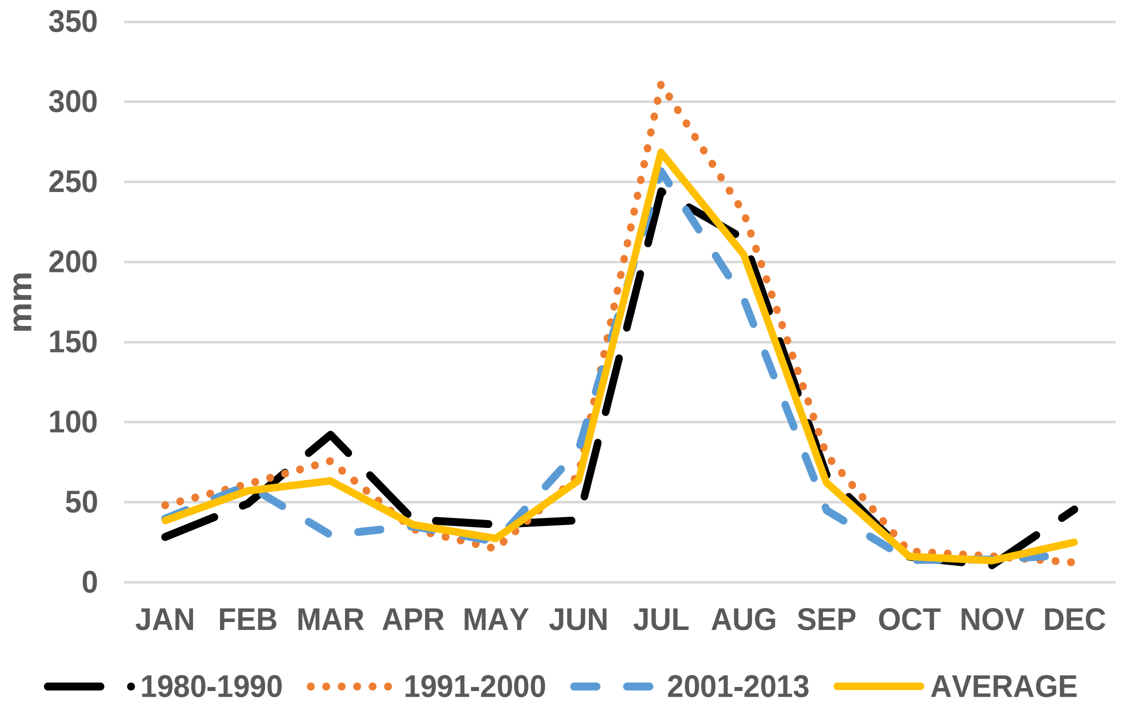



**Figure 1-6: Mean monthly rainfall at the Jhelum Station**

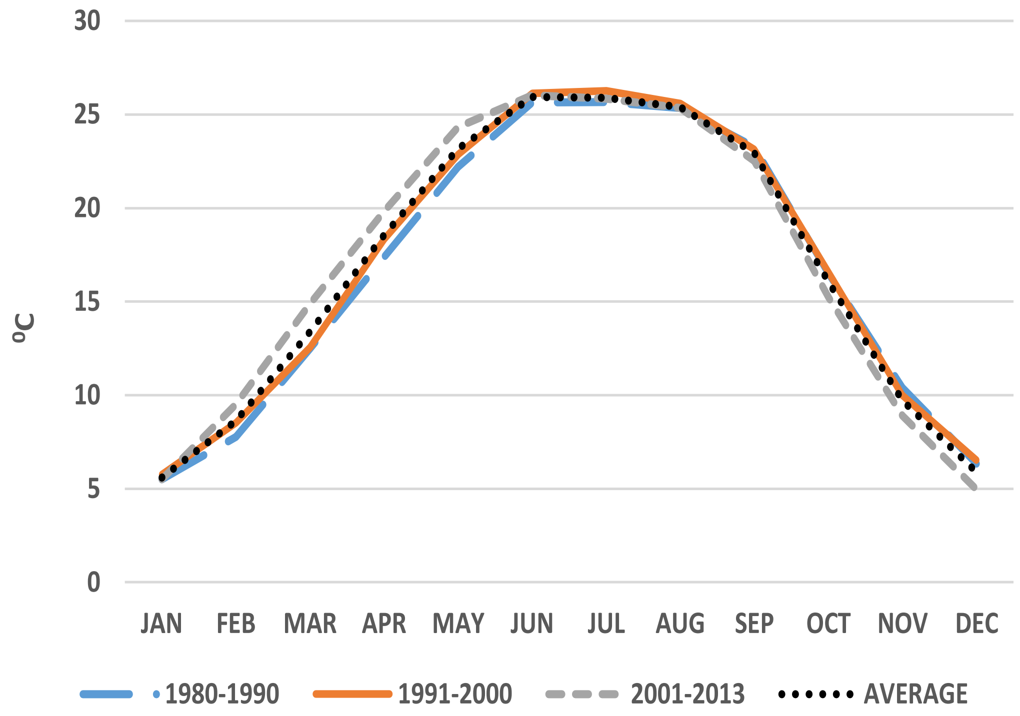


**Figure 1-7: Mean monthly minimum temperature at the Jhelum station**

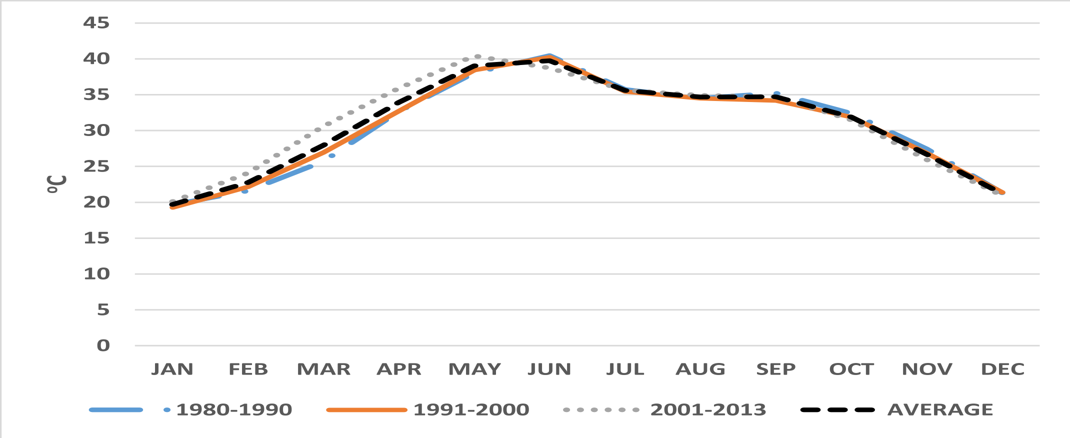



**Figure 1-8: Mean monthly maximum temperature for the Jhelum Station**

15. The seasonal data for precipitation shows relatively consistent seasons in the project area, with:

(i) Early Spring rainy season (Feb-Apr)
(ii) Spring dry season (May-Jun)
(iii) Summer rainy seasons (Jul-Sept)
(iv) Winter dry season (Oct-Jan)

16. It is significant to note the timing of the start and end of both the rainy and the hot seasons, because these have a direct impact on the growing season of the crops in the region and accordingly irrigation scheduling.

# 2. CLIMATE CHANGE ANALYSIS

## 2.1 Predicting the future climate

17. Climate change projections are an estimate of the response of the climate system to possible greenhouse gas and aerosol emissions over the next century. Such projections are typically based on climate model simulations. The modelling methodology for generating climate change projections is shown in Figure 2-1.

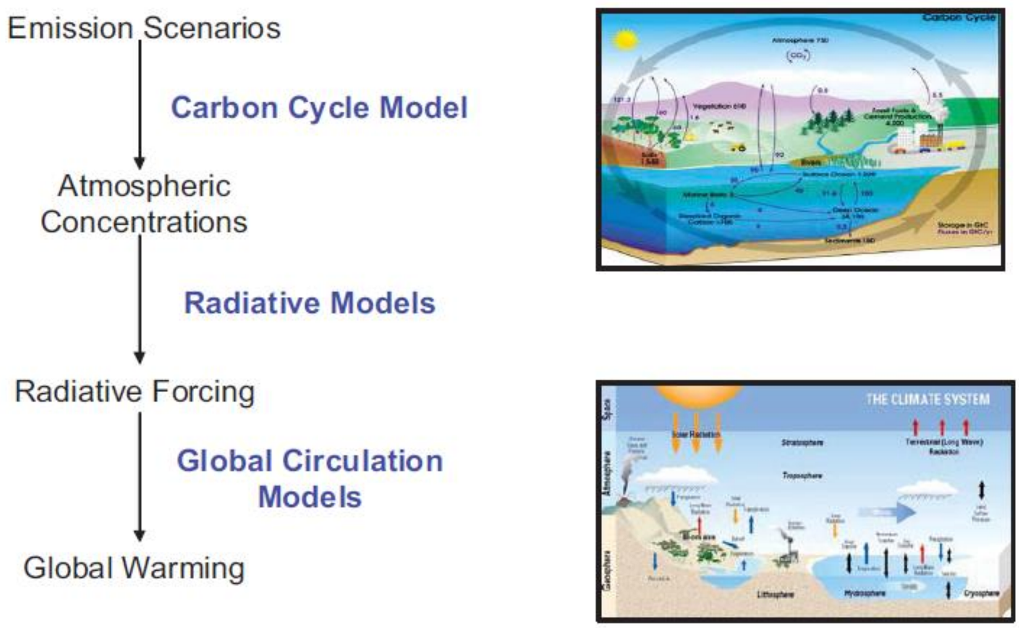



**Figure 2-1: The modelling methodology for generating climate change projections (Source: Climate Change Catchments and Coasts, University of the Sunshine Coast)**

18. The impacts of climate change will be significantly influenced by the greenhouse gas emissions which occur now and in the future. Emissions scenarios have been devised to provide a standardised method for estimating the potential future concentrations of greenhouse gas emissions. These scenarios are based on assumptions about the future evolution of society, including assumptions about demographic, socioeconomic and technological developments.

19. To estimate future climate change, IPCC developed a series of greenhouse emission scenarios-Special Report Emission Scenarios (SRES) scenarios which represented different assumptions on pollution, land use change and other driving forces of climate change. This scenario list was refined to six families for application in risk assessments with the descriptors A1FI, A1B, A1T, A2, B1 and B2.

20. In 2005, the process moved away from SRES with the development of Representative Concentration Pathways (RCPs) introduced at an IPCC Expert Meeting on Emissions Scenarios, followed by IPCC workshops (2005, 2007). For the first time the RCPs include scenarios that explore approaches to climate change mitigation in addition to traditional ‘no climate policy’ scenarios. Each RCP represents a different emission pathway: RCP8.5 leads to a greater than 1370 PPM (parts per million) CO2 equivalent by 2100 with a continued rise post-2100.

| Scenario | Global mean surface temperature ºC | | Emission Pathway |
|---|---|---|---|
| | ***2046-2065*** | ***2081-2100*** | |
| | ***Mean[1]*** | ***Mean[1]*** | |
| RCP8.5 | *2.0* | *3.7* | RCP8.5 peaks by 2100 at 1370 PPM $CO_2$ equivalent to 2100 without overshoot; |
| RCP6.0 | *1.3* | *2.2* | RCP6.0 stabilizes by 2100 at 850 PPM $CO_2$ equivalent to 2100 without overshoot; |
| RCP4.5 | *1.4* | *1.8* | RCP4.5 stabilizes by 2100, but at 650 PPM $CO_2$ equivalent without overshoot; |
| RCP2.6 | *1.0* | *1.0* | RCP2.6 peaks at 490 PPM $CO_2$ equivalent before 2100 and then declines. |

[1] Projected change relative to base period of 1990 – 1995.

## 2.2 Global Circulation Models (GCMs)

21. Global Circulation Models (GCMs) are complex, three-dimensional climate models that consider a range of factors with potential to influence our global climate system. They are also referred to as Global Climate Models.

22. GCM outputs have been widely used to assess climate change impacts for various geographical regions of the world. The IPCC obtains outputs from a range of GCMs which have been developed by more than a dozen scientific institutions across the globe, including the Australian Commonwealth Scientific Industrial and Research Organization (CSIRO), NASA and the Hadley Centre in the United Kingdom.

23. GCMs provide outputs at a global scale. Two methodologies exist for translating this information to regional and sub-regional scales. These processes are referred to as pattern downscaling and dynamic downscaling.

24. Over time there has also been an expansion in modelled variables, including both the marine and atmospheric environment. For AR5, many models have daily varying temperatures (with minimum, mean and maximum values) so that change patterns can be extracted for the first time; AR4 models did not contain this information. Only 12 AR4 GCMs produced daily precipitation outputs; with AR5 more daily outputs results in better modelling of extreme rainfall events.

## 2.3 Projected Climate Variability for the project area

25. Following projections for the climate change have been carried out SimCLIM (Simclim, 2013) that uses pattern downscaling methodology, where outputs are generated by adjusting local climate variables.

### Temperature

26. Based on analysis of observational data, the IPCC (IPCC 2007) has identified that there is evidence of increasing temperatures across the globe. The analysis of 30 years data (1980-2010) of Jhelum station also shows increasing trend to support this IPCC statement as, in general terms, the local data indicates that annual mean temperatures have been increasing across the Pakistan.

27. The IPCC (2007) has also indicated that temperatures will continue to shift in concert with increasing atmospheric concentrations of greenhouse gas emissions. Fewer cold days and more hot days are expected, with associated shifts in annual and seasonal means and extremes.

28. The future climate change is subject to considerable uncertainty. Any climate change scenario constructed on single Greenhouse Gas (GHG) emission rate and/or individual GCM output is generally considered inappropriate for vulnerability and assessment purposes, because it cannot provide information of the uncertainty range associated with its projection.

29. In this study, to reflect the uncertainties in future GHG emission rates and in climate sensitivity, a combination of different GHG Representative Concentration Pathways (RCPs) and climate sensitivities are used to characterise the future climate change scenario with the associated uncertainty range. RCP6.0 represents a middle range future global change scenario, and has been therefore used as an indicator of the median projection of the future global change.

30. Higher annual mean temperature is associated within the project area. Figure 2-2 shows the mean annual temperature within the project area for the current climate (1960-1995) along with mean annual temperatures for the project area for the 2025 and 2050 timeframes using ensemble of 40 GCM for RCP 6.0. The percentage change in temperature for the project site is illustrated in the Figure 2-3.

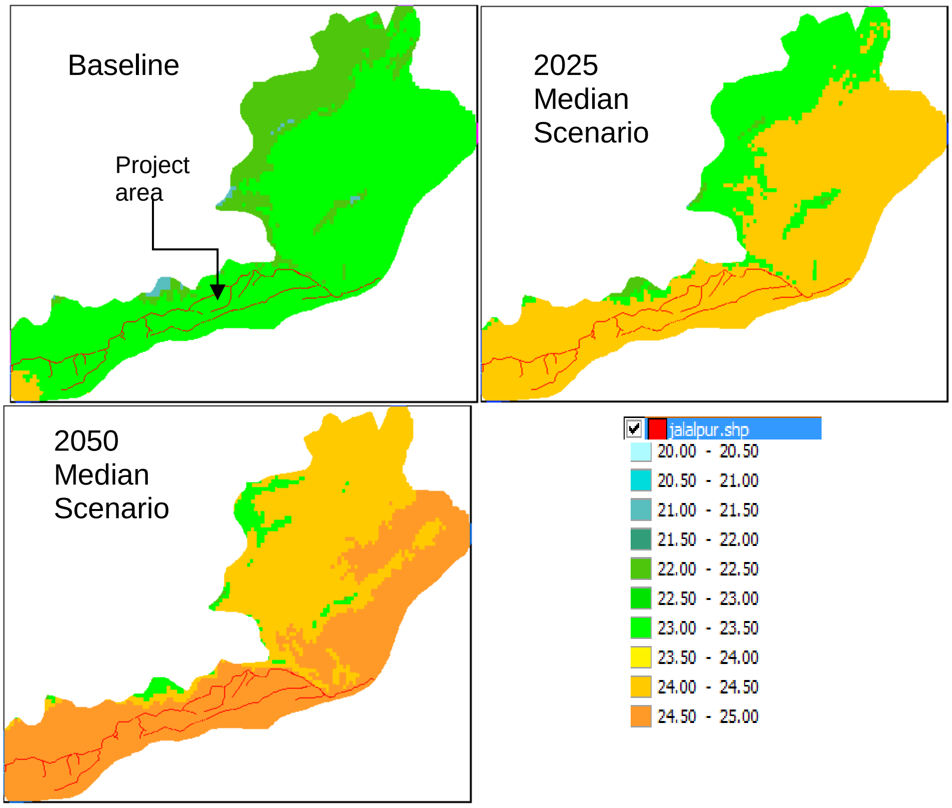



**Figure 2-2: Distribution of annual mean temperatures for the project area (baseline), Year 2025 and Year 2050 (Source: WMO included in the SimCLIM Model)**

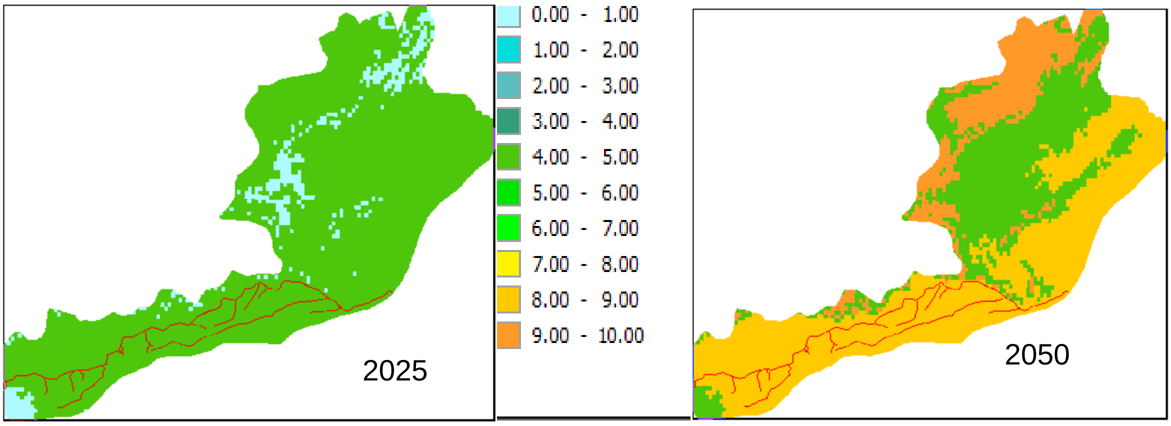
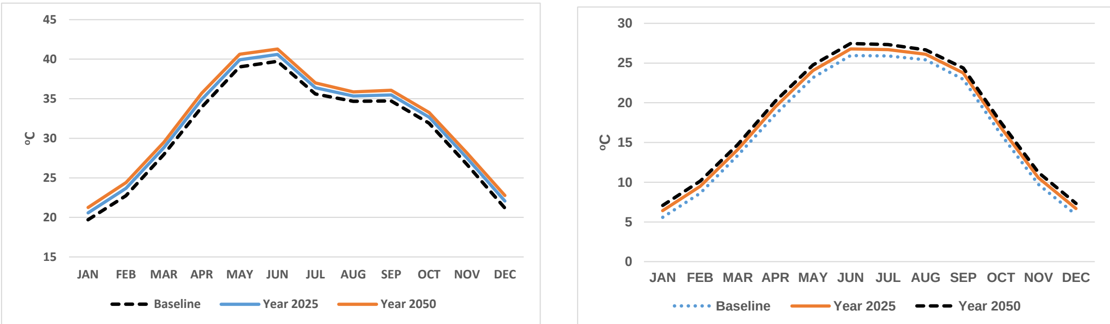



**Figure 2-3: Projected mean annual percentage temperature change for the project site using ensemble of 40 GCMs and IPCC 6.0 RCP**

31. The results indicate that there is an increase of 0.84ºC in the year 2025 and 1.50ºC for the maximum and minimum mean annual temperature in the year 2050 from the baseline period (1980-2013) as shown in the Figure 2-3 and Figure 2-4.




(Maximum Temperature) (Minimum Temperature)

**Figure 2-4: Projected monthly temperature for the year 2025 and year 2050 for the project site (Jhelum station) using ensemble of 40 GCMs and IPCC 6.0 RCP**

32. The Impact on Maximum and Minimum Temperatures for the Project Area for year 2050 is summarized in Table 2-1.

**Table 2-1: Maximum & Minimum Temperatures upto year 2050**

| Month | Min. Temp | | Max Temp. | |
|---|---|---|---|---|
| | Current Avg. | 2050 | Current Avg. | Year 2050 |
| Jan | 5.58 | 7.09 | 19.71 | 21.26 |
| Feb | 8.63 | 10.15 | 22.74 | 24.41 |
| Mar | 13.38 | 14.74 | 27.95 | 29.49 |
| Apr | 18.55 | 20.22 | 33.93 | 35.71 |
| May | 23.18 | 24.75 | 39.03 | 40.61 |
| Jun | 25.94 | 27.46 | 39.73 | 41.27 |
| Jul | 25.89 | 27.34 | 35.61 | 37.00 |
| Aug | 25.40 | 26.67 | 34.67 | 35.87 |
| Sep | 22.95 | 24.39 | 34.72 | 36.06 |
| Oct | 16.05 | 17.53 | 31.90 | 33.27 |
| Nov | 9.72 | 11.22 | 26.70 | 28.15 |
| Dec | 5.89 | 7.33 | 21.19 | 22.77 |

### Rainfall

33. Based upon the analysis of the Jhelum station data, there is no clear trend for the decrease on increase in the rainfall pattern. There is about 11% increase in annual rainfall in the decade (1990-2000) from the previous decade (1980-1990) while decrease (10%) in the annual rainfall was recorded in the next decade (2001-2010).

34. Rainfall is projected to increase in the future for the project area. However, there is considerable variability between the projected range of rainfall changes for the different GCMs. The results indicate that there is about 4% increase in annual rainfall for the year 2025 and 6.5% for the year 2050 using ensemble of 40 GCMs under IPCC emission scenario of RCP 6.0.

35. Figure 2-5 shows the annual spatial variability of rainfall for the baseline and future periods and Figure 2-6 shows the percentage change in annual rainfall in the region for the year 2025 and year 2050.

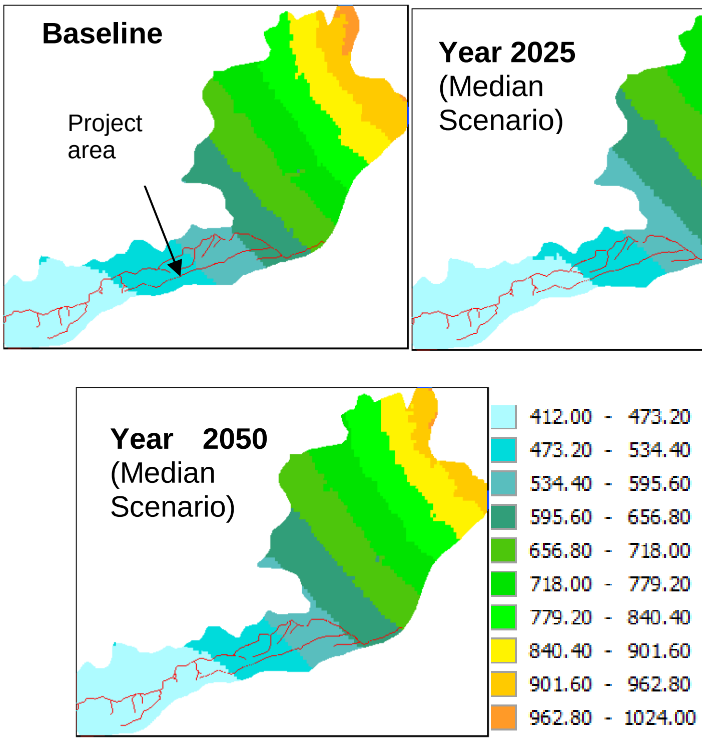



**Figure 2-5: Projected annual rainfall (mm) for the baseline period, year 2025 and year 2050 for the region using ensemble of 40 GCMs under IPCC emission scenario RCP 6.0**

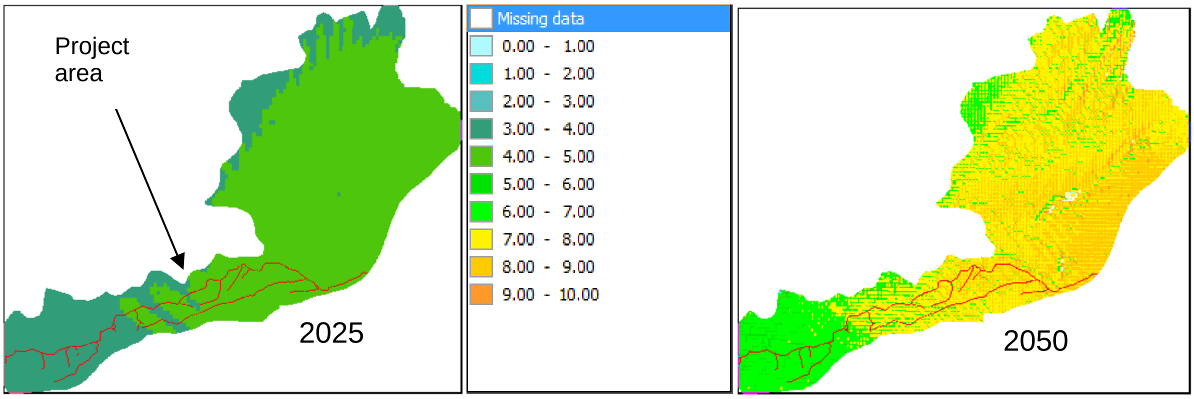



**Figure 2-6: Percentage annual rainfall for the baseline period, year 2025 and year 2050 for the region using ensemble of 40 GCMs under IPCC emission scenario RCP 6.0**

36. The mean monthly analysis was also carried out for the Jhelum station to determine the spatial variability of rainfall. The results show that maximum increase in the rainfall is likely to occur in the monsoon season (July to September) while there is decrease in the rainfall in the months from December to April as shown in Table 2-2 and Figure 2-7.

**Table 2-2: Precipitation upto year 2050**

| Month | Precipitation | |
|---|---|---|
| | Current Avg. | 2050 |
| Jan | 38.49 | 37.68 |
| Feb | 57.02 | 55.19 |
| Mar | 63.28 | 61.14 |
| Apr | 35.91 | 34.28 |
| May | 27.45 | 29.11 |
| Jun | 63.64 | 65.21 |
| Jul | 268.65 | 297.31 |
| Aug | 204.68 | 235.58 |
| Sep | 62.24 | 68.92 |
| Oct | 16.18 | 18.05 |
| Nov | 13.63 | 13.82 |
| Dec | 24.94 | 23.82 |

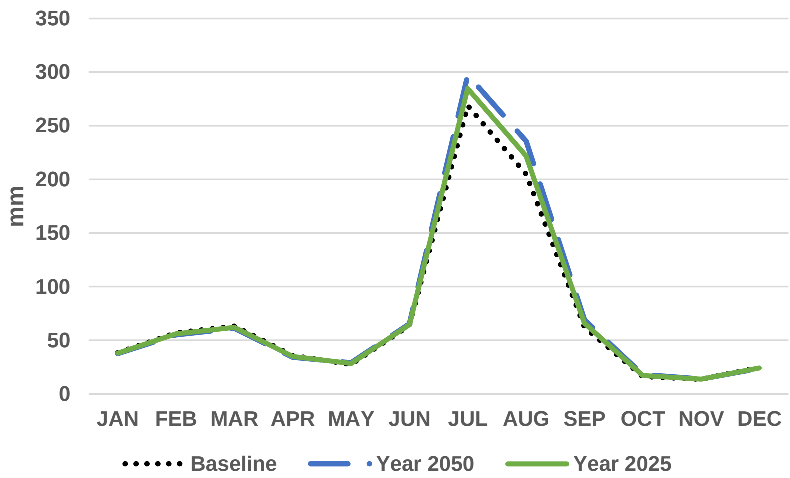



**Figure 2-7: Projected monthly rainfall for the year 2025 and year 2050 for the project site (Jhelum station) using ensemble of 40 GCMs Under IPCC emission scenario RCP 6.0**

## 2.4 Impact of climate change

### Rainfall Intensity and flooding

37. It is projected that climate change will impact on the frequency and intensity of extreme rainfall events, with fewer but larger rainfall events expected (IPCC, 2007). To provide an indication of this change, the SimCLIM model has been used to undertake a statistical analysis of historical daily rainfall data from the weather stations at Jhelum.

38. The change in the intensity of rainfall events is provided using estimated recurrence periods for historic and projected rainfall events. The recurrence period is an estimate of the probability that a given rainfall event would be equalled or exceeded in any given year. The results demonstrate that little extreme rainfall change is projected for the future. The maximum increase in extreme event for year 2025 is about 6% for 100 year return period whereas 10% increase in extreme event is predicted for 100 year return period for the year 2050 as shown in Figure 2-8. The variations of the extreme event change projection for the near term reflect the uncertainties between GCMs on the one hand, while on the other hand, the climate change signal may be still too weak to be identified in the near term and the analysed result may be influenced by the natural climate variability included in the GCM simulated data.

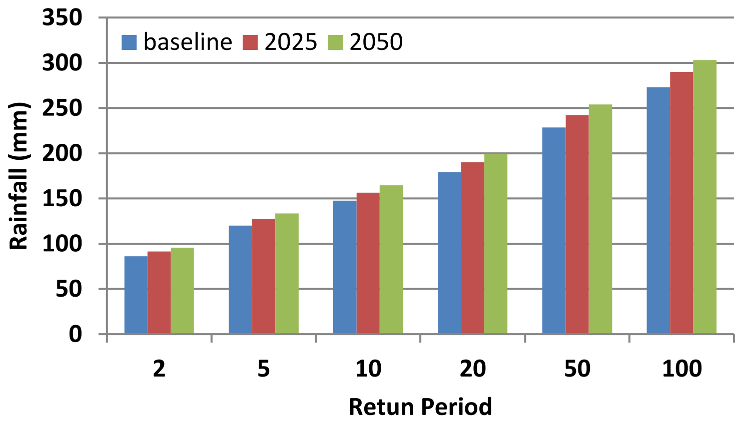



**Figure 2-8: Extreme Event analysis for the various return periods**

39. As discussed in the previous section that there is likely to be increase in the temperature and rainfall in the project area with more extreme events will be the characteristics of the future weather.

40. Higher temperatures could increase evaporation leading to drier soils. Moreover, due to shift in rainfall patterns will reduce water availability in the winter season. As a result of climate change, rainfall events which are the same size as the historic 1-in-100 year rainfall event are expected to occur more frequently in the future. In addition to the potential for more frequent flooding, this shift in the characteristics of rainfall events is also likely to:

- ✓ Increase runoff
- ✓ Increase soil erosion
- ✓ Impact on vegetation cover which provides soil stability.

41. However, the above impacts are outside the Project Area i.e., in the Contributing catchment of the nullahs / hill-torrents bringing flow into the Project Area. The topography of the Project Area is flat, and therefore the effects of soil erosion and impact on vegetation cover

are not applicable. Moreover, with increase in vegetal cover, the runoff from the Project Area will overall decrease due to development agricultural fields.

**Impact on Agriculture**

42. Climate Change Impact on agriculture have been evaluated during the PPTA studies. The impact was evaluated by determining crop-water requirements for the current climatic average as well as future crop-water requirements for projected temperatures and rainfall for year 2050 as per Median Climate Change (Using Ensemble of 40 GCMs under IPCC emission scenario RCP 6.0). The comparison of crop water requirements/irrigation requirements computed on the basis of 1981-2010 climatic data and projected data of temperature and rainfall up to 2050 is given below in Table 2-3.

**Table 2-3: Comparison of Irrigation Requirement Based on 1981-210 and Projected Data up to 2050**

| Category | Irrigation Requirement (1981-2010) | | Irrigation Requirement Projected data up to 2050 | |
|---|---|---|---|---|
| | Thousand A.FT | Cusecs | Thousand A.FT | Cusecs |
| Maximum | 26.8 | 1351.0 | 25.8 | 1300.0 |
| Minimum | 0.27 | 14.0 | 0.6 | 30.0 |
| Gross | 196.7 | 442.7 | 218.56 | 492.0 |

i. The study reveals that with the use of future projected climatic conditions, maximum canal discharge requirement decreases from 1351 cusecs (26.8 thousand acre feet) to 1300 cusecs (25.8 thousand acre feet) due to more availability of effective rainfall during the month of August during projected data 2050 as compare to 1981-2010 data.
ii. The gross irrigation requirement comes to 196,700 thousand acre feet (442.7 cusecs computed on the basis of 1981-2010 climatic data. Whereas, projected climatic data (Temperature and rainfall) up to 2050, gross irrigation requirements are 218,560 acre feet (492.0 cusecs) due to change in climate, which is 21,900 acre feet (49.3 cusecs) higher. This requirement can be fulfilled or adjusted from the allocated quantity of reclamation water as the water required for reclamation will decrease with the passage of time.
iii. It is concluded that the variation in temperature and rainfall by 2050 will not create negative impact on proposed crop yields and production. The proposed cropping intensity and crop yield level can easily be sustained on long-term basis.

# 3. CLIMATE CHANGE VULNERABILITY ASSESSMENT AND ADAPTATION MEASURES

## 3.1 Impact on Structures

43. Construction materials recommended are concrete, steel and earthwork. All of the construction materials can withstand the changes in temperature and precipitation. However, as precipitation increases, the O&M cost of maintenance of inspection paths will increase with time.

## 3.2 Cross-Drainage Structures

44. As discussed in Section 0 (Rainfall Intensity and flooding) there is likelihood of increase in flood events. The cross-drainage structures will need to be designed for higher discharges. Provision has been kept in the design of structure for accommodating 10% additional discharge through cross-drainage structures. These additional discharges can be taken care of with the conservative factors of safety for major crossings with little protection cost.

## 3.3 Impacts on Agriculture Production

45. As discussed in Section 3.3, no significant impact on agriculture production are foreseen. However, changes in temperature and humidity may impact rise of pest-management activity. This can be dealt with by application suitable pest-control mechanisms, which will be carried out through Agriculture Extension. In addition, with the Climate change, shift in crop-sowing periods may be required which will be taken care of with farmers training and awareness.

## 3.4 Cost of Climate Adaptation Measures

46. Climate change adaptation measures included in the project are:

- Increased capacity of Cross-drainage structures for flood passage.
- Farmer's capacity building for introduction of High Efficiency Irrigation System, farmer's field trips and establishment of demonstration centres.

47. A cost of US$ 1.70 million is included in the project cost on account of climate adaptation measures.

| Item | Units | Amount |
|---|---|---|
| **Cross-Drainage Structures (Aqueducts, Siphons, Drainage Culverts, Super passages)** | PKR Million | 81.0 |
| **Farmers Capacity Building** | | 10.0 |
| Demonstration Plots and Extension Services | PKR Million | 85.0 |
| Farmer’s Training and Capacity Building | PKR Million | 10.0 |
| Farmer's Field Trips | PKR Million | 1.5 |
| Total | PKR Million | 177.50 |
| | USD Million | **1.70** |

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