

CLIMATE CHANGE ASSESSMENT

I. INTRODUCTION

1. The proposed grant for Afghanistan for Qaisar–Dari Bum Road Project (the proposed project) will finance the construction of a 151-kilometer (km) section of road from Qaisar to Dari Bum, which is the last missing link of the national ring road (the Ring Road) and the top priority of the nation’s strategic corridors. The Ring Road, with a total length of 2,210 km, is considered the backbone of the Afghanistan’s transport system and the principal conduit for national and international passenger and freight traffic, as more than 80% of Afghans now live within 50 km of the Ring Road.

2. The geographical characteristics and arid climate makes Afghanistan and its infrastructure prone to a wide range of natural hazards—floods, droughts, landslides, avalanches, and earthquakes. Between 1980 and 2016, disasters triggered by natural hazards have caused more than 21,000 deaths, affected the lives and livelihoods of almost 9 million people, and resulted to approximately \$525 million in direct physical losses.¹ Modeling estimates indicate that Afghanistan, in the long term, experiences an average annual loss of \$239 million—equivalent to 1.2% of 2015 Gross Domestic Product—because of natural hazards, including \$146 million for earthquake and \$92 million for flood.²

3. With climate change, it is expected that the mean annual temperature will increase, spring precipitation will decrease, and the intensity and frequency of extreme weather events may change. This will further impact the lives, livelihoods, and assets of Afghan population. For example, it is estimated that the number of people affected each year by flooding could more than double by 2050 due to the combined effects of climate change and socioeconomic growth.³ Hence, the modeled impacts of 1 in 50-year floods and earthquake on the road sector alone could be \$30 million and \$5.5 billion, respectively.⁴ With road infrastructure being a high development priority of the Government of Afghanistan, it is essential that planning, design, construction, operations, and maintenance of road infrastructure factor measures to reduce risks from climate change and disasters.

4. The proposed project lies in Badghis and Faryab provinces in north and northwestern part of Afghanistan. Both provinces are at risk from flood, drought, landslide, and earthquake. Results of the preliminary climate risk screening and the climate and geophysical hazard screening using the AWARE tool indicate that the proposed project is at medium risk to climate change and has low risks from geophysical hazards. Climate and disaster risk assessment for the project provinces are not currently available. Moreover, the proposed project is the third attempt to complete this section of the Ring Road and there is no project preparatory technical assistance.⁵ The feasibility study conducted in 2004, with necessary updates using earth-observation data, is being used as the basis for preliminary design. Once approved, the proposed

¹ D. Guha-Sapir, R. Below, Ph. Hoyois – EM-DAT: The CRED/OFDA International Disaster Database – www.emdat.be – Universite’ Catholique de Louvain – Brussels – Belgium (accessed 16 May 2017).

² UN. 2015. *Global Assessment Report 2015 Data*. Available at http://www.preventionweb.net/english/hyogo/gar/2015/en/profiles/GAR_Profile_AFG.pdf

³ The World Bank. 2017. *Disaster Risk Profile Afghanistan*. Washington D.C.

⁴ Ibid.

⁵ Prior attempts faced major difficulties due to security threats in the project area, lack of support from the local communities, and poor capacity of the contractor and consultant.

project will engage a consulting firm to carry out the detailed design of the road section. Thus, recognizing the importance of strengthening climate and disaster resilience of the road sector—while no site-specific detailed climate risk and vulnerability assessment is undertaken—the project will include a component on capacity building specifically focusing on climate change and disaster risk reduction. The capacity building will provide an opportunity to generate climate and disaster risk information for the proposed project to inform the detailed design, as well as strengthening wider capacity of the road sector in Afghanistan to systematically look at climate and disaster risk issues as part of road sector operations. This document provides an overview of key disaster risk and climate risk issues in Afghanistan, including the issues faced by the road sector; and recommends measures for strengthening capacity.⁶

II. DISASTER RISK ASSESSMENT

5. Flooding is the most frequently occurring natural hazard with 21 out of 34 provinces in Afghanistan being vulnerable to floods.⁷ It is estimated that the total number of people affected each year by flooding is approximately 100,000.⁸ The recent 2014 floods, which was worst seasonal flooding in over 100 years, affected more than 90,000 people in 10 northern provinces— including Badghis and Faryab provinces—destroying houses, public infrastructure, roads, and thousands of acres of agricultural land. Floods in Afghanistan are mostly a result of heavy rainfall, snow melt water or the combination of both. Rainfall induced floods are common from March until May and floods from snowmelt during June and July. An assessment of past flood events in Afghanistan highlights that flash floods are the primary cause of loss of life due to inundation.⁹

6. Badghis and Faryab provinces face risks from floods, which often remain localized. The April 2014 flash floods in Badghis province resulted in the death of nine people, damaged more than 100 homes, affected 40 hectares of agricultural land, and damaged 30 km of irrigation system.¹⁰ A flash flood in November 2014 resulted in damaging and closure of the Badghis-Herat highway in Qala-i-Naw, thereby disrupting traffic. Similarly, flash floods in May 2015 killed seven people, damaged over 1500 homes, destroyed wide areas of crops and orchards, and led to the closure of Faiabada-Takhar highway.¹¹

7. Located in a tectonically active part of the world, Afghanistan is at risk from earthquake hazards, which causes many fatalities and damage to infrastructure. In the last 30 years, earthquakes have caused over 10,000 deaths and affected more than 250,000 people. The October 2015 earthquake in the Hindukush mountain killed 115 people, injured over 58,000, and resulted in more than 35,000 homeless.¹² In particular, the northeastern part of Afghanistan—Balkh, Baghlan, Badakhshan, Takhar, and Samangan provinces—are at high risk from earthquakes. Of the major cities in Afghanistan, Kabul, by far, has the highest risk from seismic hazard, primarily due to its proximity to the potentially fast-moving Chaman fault, which is more

⁶ Since the proposed project aims to access disaster risk reduction under ADF XII, which requires a disaster risk assessment, this document combines both disaster risk assessment and climate risk and vulnerability assessment.

⁷ SAARC Disaster Management Center. 2008. *South Asia Disaster Report*. New Delhi

⁸ The World Bank. 2017. *Disaster Risk Profile Afghanistan*. Washington D.C.

⁹ E. Hagen and J.F. Teufert. 2009. *Flooding in Afghanistan: A Crisis*. In: Jones J.A.A., Vardanian T.G., Hakopian C. (eds) *Threats to Global Water Security*. NATO Science for Peace and Security Series C: Environmental Security. Springer, Dordrecht.

¹⁰ N. Ghafar. 2016. *World Vision Afghanistan*.

¹¹ R. Davies. 2015. Afghanistan – Flash Floods in Faryab and Baghlan Leave 8 Dead. *Floodlist*. 11 May. <http://floodlist.com/asia/afghanistan-flash-floods-faryab-baghlan-8-dead>

¹² The World Bank. 2017. *Disaster Risk Profile Afghanistan*. Washington D.C.

than 1,000 km long and extends from the Hindukush region in northeastern Afghanistan into western Pakistan.¹³ Earthquake risk in Badghis and Faryab provinces is medium.

8. Landslides triggered by heavy rainfall and seismic activity are common in Afghanistan due to rugged mountainous terrain, unstable soil, change in land cover, and farming and irrigation practices. For example, the 2014 landslides in Badakhshan province resulted in the death of almost 2,700 people. Recent estimates indicate that over 3 million people and \$6 billion worth of assets in Afghanistan are exposed to landslides.¹⁴ Further, it is expected that due to population growth alone, the number of people affected by landslides could double by 2050.¹⁵ Both Badghis and Faryab provinces have been impacted by localized landslides in the past.

9. Avalanches hazardous area can be found in the mountainous range in the northeast and western region of Afghanistan. Nine of Afghanistan's provinces are at high-risk from avalanches.¹⁶ The January 2009 and February 2010 avalanches at the Salang tunnel claimed the lives of 10 and 165 people, respectively.¹⁷

10. Droughts of varying length and severity regularly affect the livelihoods and incomes of millions of Afghan people. Since 2000, four major drought events (2000, 2006, 2008, and 2011) have affected the lives of 6.5 million people and caused widespread impact on agriculture and hydropower production. Estimates indicate that, on average, droughts cause \$280 million in economic damages to agriculture annually.¹⁸ Both Badghis and Faryab provinces face drought risk. The drought of 2006 resulted in the decline by 80-90% of crops production in Faryab province.¹⁹ Moreover, with large number of population reliant on agriculture and/or livestock as their main source of income, drought impacts can result in the decline in consumption and adoption of negative coping strategy among the vulnerable population. The lack of long rains and reduced snowfall from December 2013 to February 2014, and the subsequent failure of rains in March 2014 in Badghis province, resulted in negative coping mechanism, and triggered stress and in-depth livelihoods shock among farmers and pastoralist households mainly due to water and grazing shortages.²⁰

11. The interaction of above mentioned natural hazards with low levels of socioeconomic development and decades of conflict contributes to high levels of disaster risk in Afghanistan. For example, it is estimated that floods in Afghanistan have increased significantly due to deforestation and vegetation loss, which decrease the water holding capacity of the lands.²¹ Likewise, high concentration of population and rapid unplanned urban development significantly contribute to earthquake risk in Kabul City. In the rural areas, the prevalence of mud and grass

¹³ O.S. Boyd et al. 2017. *Preliminary probabilistic seismic hazard map for Afghanistan*. U.S. Geological Survey Open-File Report 2007-1137.

¹⁴ The World Bank. 2017. *Disaster Risk Profile Afghanistan*. Washington D.C.

¹⁵ Ibid.

¹⁶ Government of Afghanistan. 2003. *National Disaster Management Plan*. Kabul.

¹⁷ I. Bahram. 2015. A Perfect (Snow) Storm: What Can Be Done Against Avalanche Damage in Afghanistan. *Afghanistan Analysts Network*. 10 March. <https://www.afghanistan-analysts.org/a-perfect-snow-storm-what-can-be-done-against-avalanche-damage-in-afghanistan/>

¹⁸ The World Bank. 2017. *Disaster Risk Profile Afghanistan*. Washington D.C

¹⁹ Provincial Profile for Faryab. *Regional Rural Economic Regeneration Strategies*. <http://afghanag.ucdavis.edu/country-info/Province-agriculture-profiles/faryab/Faryab.pdf>

²⁰ UN OCHA. 2014. Drought Rapid Assessment Report - Badghis Province. *Humanitarian Response*. 14 October. <https://www.humanitarianresponse.info/en/operations/afghanistan/assessment/drought-rapid-assessment-report-badghis-province>

²¹ Habib. H. 2014. *Water Related Problems in Afghanistan*. Kabul.

as building materials, and with houses often constructed on slopes contribute to fatalities and largescale damage every year.

12. The road sector is no exception and has high disaster risk due to exposure of the road network to natural hazards and vulnerabilities in the sector. For example, it is estimated that 10,000 km of roads are exposed to avalanches.²² While the core road network has grown from about 14,000 km in the early 1970s to about 23,000 km in 2015, years of conflict have damaged and destroyed large sections of road, thereby increasing their vulnerabilities to natural hazards. Data indicates that some 85% of the road network is in poor condition and only 50% is in serviceable condition throughout the year.²³ Moreover, the budget for road maintenance remains low, with data showing that, during 2010–2014, only 5% of road budget has been allocated for routine (preventive) maintenance. Thus, with limited reliable information on natural hazards and lack of capacity within the Ministry of Public Works (MPW), addressing disaster risk issues within the road sector operations remains a challenge.

III. CLIMATE RISK AND VULNERABILITY

13. Afghanistan has a very characteristic continental climate that is arid with cold winters and hot summers. Temperature ranges vary with elevation. The lowland plains in the South experience wide seasonal variations in temperature, with average summer (June–August) temperatures above 33°C and average winter (December–February) temperatures around 10°C.²⁴ The high-altitude regions of Afghanistan experience lower annual temperatures, with summer temperatures averaging 15°C, and winter temperatures below 0°C in the highest areas. Average annual precipitation is very little over the whole country, with large parts of the country receiving very little to no precipitation and with high unpredictability in the arid lowlands. Most precipitation occurs in the mountainous regions. Annual precipitation ranges from 51.56 mm in the southwestern regions of Afghanistan to 992.1 mm per year in the northeastern mountainous regions.²⁵ Precipitation is mainly limited to the months between October and May. In the mountains, most precipitation falls as snow during winter.²⁶

14. As described in Afghanistan’s Initial National Communication to the United Nations Framework Convention on Climate Change, Afghanistan presents several challenges in terms of climate risk and vulnerability assessment—lack of availability of reliable historical meteorological records, complex topography resulting in local variation in climate conditions, and poor quality of socioeconomic data.²⁷ There are very few scientific studies on climate change in Afghanistan.²⁸ The findings of the recently published study by the National Environmental Protection Agency and the United Nations Environment Program have been used in this

²² The World Bank. 2017. *Disaster Risk Profile Afghanistan*. Washington D.C

²³ <https://www.adb.org/sites/default/files/linked-documents/49229-003-ssa.pdf>

²⁴ The World Bank. 2017. *World Bank Climate Portal*. (accessed on 23 June 2017).

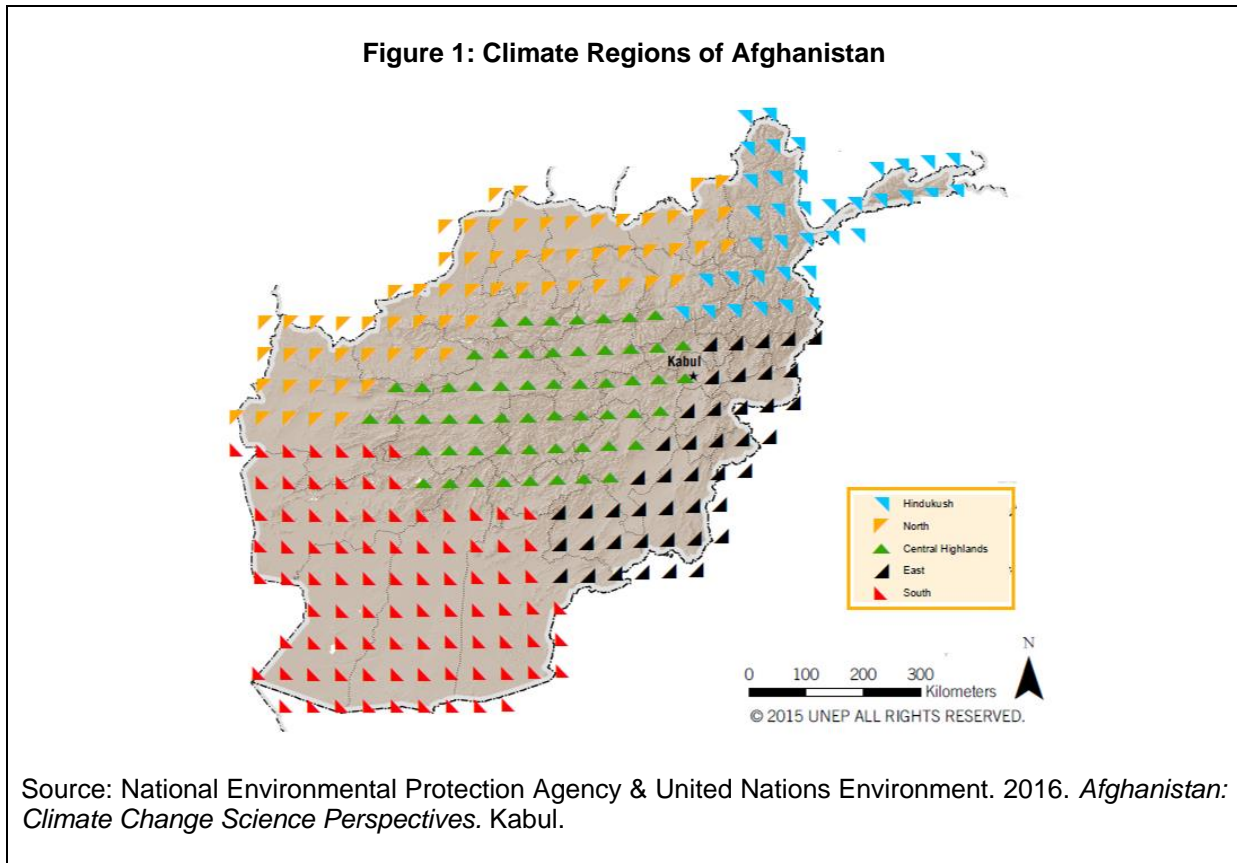
²⁵ Ibid.

²⁶ National Environmental Protection Agency & United Nations Environment. 2016. *Afghanistan: Climate Change Science Perspectives*. Kabul.

²⁷ Government of Afghanistan. 2013. *Initial National Communication to the United Nations Framework Convention on Climate Change*. Kabul.

²⁸ Until recently, the only analysis of past climate and future climate projections for Afghanistan was the study conducted in 2010 by the Oxford University for UNDP and DFID country profiles. (<http://www.geog.ox.ac.uk/research/climate/projects/undp-cp/index.html?country=Afghanistan&d1=Reports>). For climate projections, the analysis used the third generation of Global Climate Models generated within the Coupled-Model Intercomparison Project.

document to assess climate risk and vulnerability.²⁹ This study uses seven different Regional Climate Model (RCM) combinations generated from the CORDEX project for assessing future climate trends. The model uses a grid size of 0.5° (thus, Afghanistan is covered by over 300 cells in total), which permits a spatially detailed analysis. Due to the geographical heterogeneity of Afghanistan, the study has divided the country into five regions: (i) Hindukush region, the most mountainous part of Afghanistan; (ii) Northern Plains (North), mainly covered by grasslands; (iii) Central Highlands, characterized by deep valleys and mountain ranges; (iv) Eastern Slopes, covered by forests; and (v) Southern Plateau, largely covered by arid desert. The provinces of Badghis and Faryab fall under the Northern region as shown in *figure 1*.



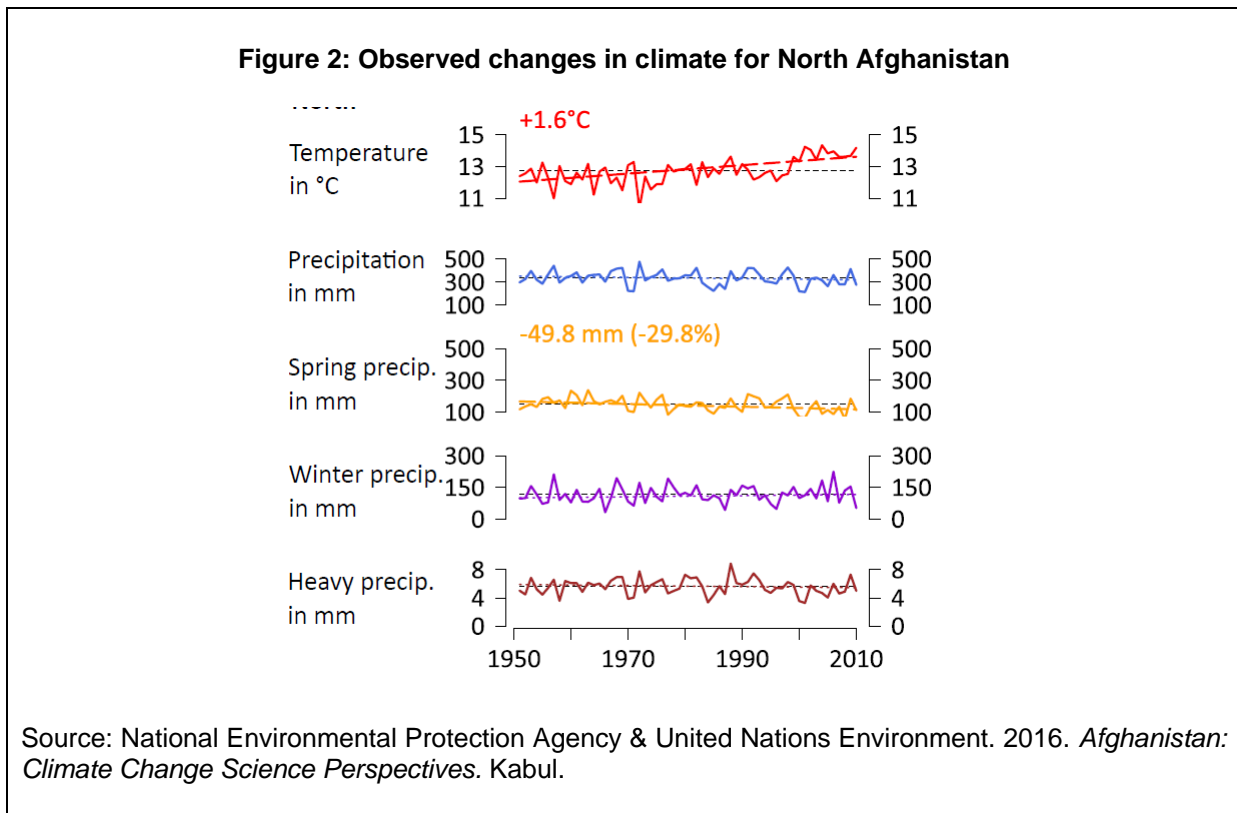
15. **Observed Changes in Climate.**³⁰ The mean annual temperature in Afghanistan has increased significantly since 1950 by 1.8°C. The spatial distribution of temperature changed over the period of 1951–1980 and 1981–2010, showing a strong warming trend in most parts of the country, including the provinces in the North. The frequency of “hot” days and nights in Afghanistan has increased in each season since 1960. The average number of “hot” days per year increased by 25 days, while “hot” nights per year increased by 26 nights between 1960 and 2003. September through November saw the greatest rate of increase in “hot” days and nights. The average number of “cold” days and nights per year have decreased since 1960. The average number of “cold” days per year decreased by 12 days, and “cold” nights experienced a similar

²⁹ National Environmental Protection Agency & United Nations Environment. 2016. *Afghanistan: Climate Change Science Perspectives*. Kabul.

³⁰ National Environmental Protection Agency & United Nations Environment. 2016. *Afghanistan: Climate Change Science Perspectives*. Kabul.

amount of decrease between 1960 and 2003. December through February experienced the greatest rate of decrease in “cold” days and nights.³¹

16. Regarding precipitation, while there is no observed significant overall change for the whole of Afghanistan and for all months, detailed analysis reveals that spring precipitation has significantly decreased by almost a third, and winter precipitation increased, though not by a statistically significant amount. The decrease in spring precipitation is of importance for the provinces in the North, which are largely dependent on rain-fed agriculture. Though there is no observed change in heavy precipitation (defined as 95th percentile of annual rainfall) between 1950 and 2010, such events, however, have been reported to have increased in the last decade, leading to more frequent and intense flooding and landslides. Other reasons could have also contributed to the increase in flooding and landslides, such as increase in temperature leading to more rapid and earlier spring snowmelt, causing an increased risk of flash flooding; and droughts hardening soils and reducing their permeability, thereby causing flash floods and landslides. *Figure 2* shows the observed changes in climate for the North of Afghanistan.



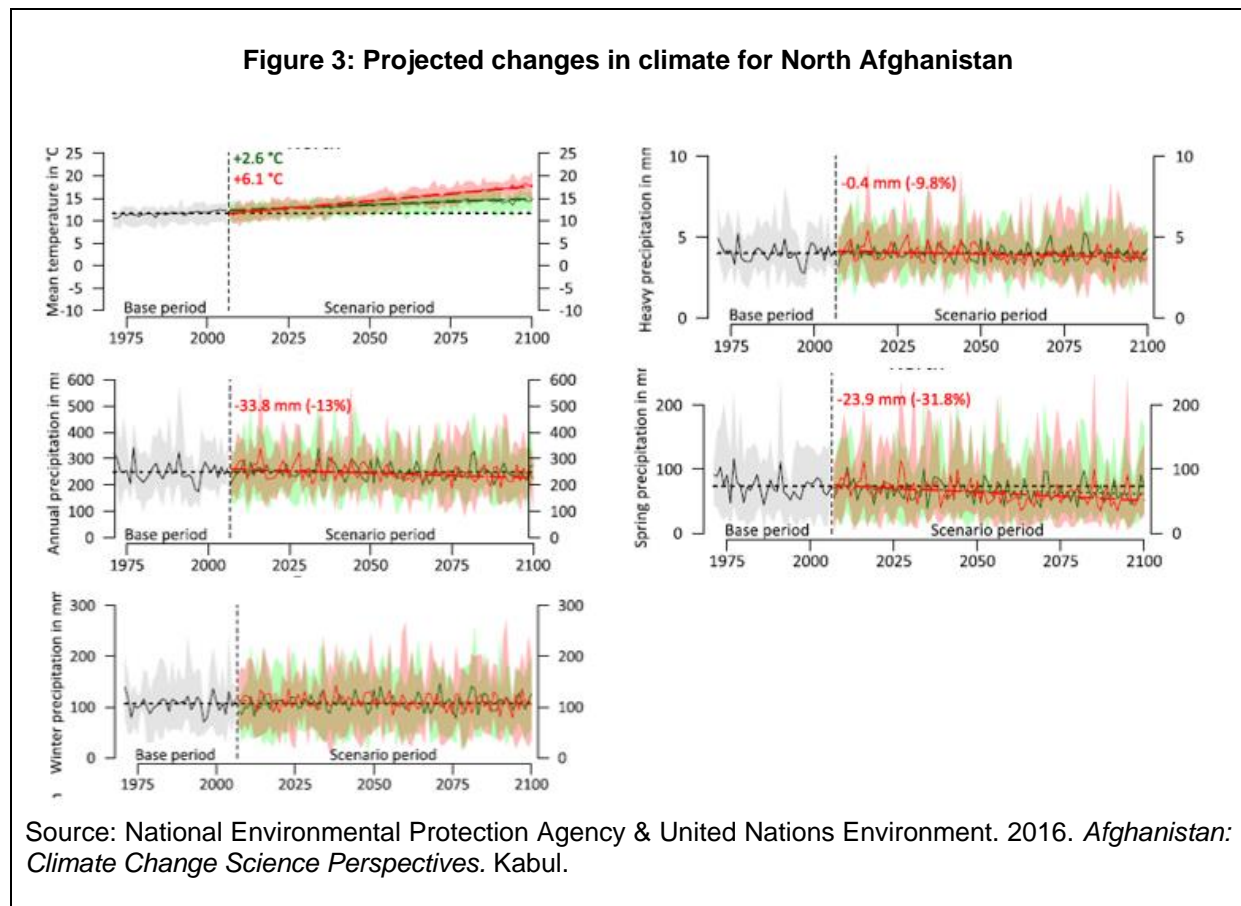
17. **Climate Projections.**³² The mean temperature over Afghanistan is expected to increase, which will have implications on agriculture, water resources, food security, energy, and other sectors. For the “optimistic” scenario (RCP 2.6) with low level of atmospheric greenhouse gas concentration, the projections show a warming around 1.4°C by 2050 and around 2.6°C by 2100. For the “pessimistic” scenario (RCP 8.5), the mean warming is extreme and model mean projects an increase of around 2°C by 2050 and of 6.3° C by the end of the century. The impacts will be

³¹ The World Bank. 2017. *World Bank Climate Portal*. (accessed on 23 June 2017).

³² National Environmental Protection Agency & United Nations Environment. 2016. *Afghanistan: Climate Change Science Perspectives*. Kabul.

particularly felt by the farmers in the northern and western river basins, where more than 60 % of rain-fed land is located.³³ The frequency of “hot” days and nights per year are projected to increase throughout the middle and late 21st century. “Hot” days are projected to increase and occur on 14–25% of days by the 2060s and 16–32% of days by the 2090s, while “hot” nights are projected to increase and occur on 16–26% of nights by the 2060s and 19–36% of nights by the 2090s. Both “hot” days and nights are projected to increase most rapidly in the summer months of June–August. “Cold” days and nights are projected to decrease in frequency and become exceedingly uncommon, with projections for the 2090s indicating that they will occur on 0–6% of days per year.³⁴

18. For annual precipitation, while the trend shows a slight decrease by 2100, including in the Northern parts of the country, the spatial variability is expected to be high during the whole period. However, there is a distinct and statistically significant decrease of precipitation during the months from March to May, especially under RCP 8.5. It is expected that, in the near future, this decrease in spring precipitation is most pronounced in the North, the Central Highlands, and the eastern part of the South regions. As far as winter precipitation is concerned, the trend shows stable situation in the North. Heavy precipitation is expected to increase slightly under RCP 4.5, and decrease slightly under RCP 8.5. *Figure 3* shows the projected changes in climate for the North parts of Afghanistan.



³³ Government of Afghanistan. 2013. *Initial National Communication to the United Nations Framework Convention on Climate Change*. Kabul.

³⁴ The World Bank. 2017. *World Bank Climate Portal*. (accessed on 23 June 2017).

19. The potential impacts of climate change may result in increased vulnerability of the road sector in Afghanistan. Increase in mean annual temperature may result in cracking, rutting, and bleeding of pavements and thermal expansion of bridge joints, thus requiring measures such as the development of new heat-resilient paving material, adapting cooling system, designing landscape protection for highways, etc. Increase in precipitation may lead to flooding of roads causing disruption and closure, scouring of bridges, and slope failures, and landslides. Such impact can result in socioeconomic losses, including increased maintenance requirements. Risk management measures could include developing climate-resilient paving materials, improving flood protection, strengthening early warning, upgrading road drainage systems, adopting bioengineering measures for slope stabilization, etc. Moreover, the interconnectedness of road network may result in climate and disaster impacts being felt in other sectors—such as energy—thus requiring comprehensive system-wide assessments.

IV. PROPOSED DISASTER AND CLIMATE RISK MANAGEMENT MEASURES

20. The Government of Afghanistan recognizes the importance of strengthening climate and disaster resilience for achieving sustainable development in the country and is attaching increased priority to disaster risk reduction and climate change adaptation. Afghanistan is a signatory to the key international agreements, including the Sendai Framework for Disaster Risk Reduction and the Paris Agreement on climate change. It has developed the Nationally Determined Contribution, which details the key priorities for climate change adaptation including, among others, reducing the vulnerability of the country and its population through enhancement of adaptive capacity and resilience, and deployment of disaster risk reduction measures.³⁵ The recently approved Afghanistan National Peace and Development Framework (ANPDF) 2017–2021, a 5-year strategic plan that articulates the development priorities of the country, recognizes that Afghanistan faces high risk from disasters and weather-induced shocks, and that the impact of such events are heightened due to the lack of “preventive and adaptive infrastructure and social insurance.”³⁶

21. However, there remains large gaps in systematically addressing climate change and disaster risk considerations as part of development processes in different sectors. These gaps include limited availability of climate and disaster risk information; lack of comprehensive risk and vulnerability assessment covering all natural hazards and uniform geospatial coverage; limited awareness on the potential impacts of climate and disaster risk on development and the cost and benefits of risk management measures; inadequate technical standards and capacity to factor climate and disaster risk considerations in infrastructure design, construction, operations, and maintenance; limited capacity on the use of alternate technology for managing climate and disaster risk; and inadequate financing.

22. The ANPDF has identified infrastructure development as a priority and recognizes the need to improve the design and construction of roads to meet the country’s expanding transport needs. The Afghanistan Transport Sector Master Plan Update 2017–2036 specifically identifies disasters triggered by natural hazards affecting the performance of the transport sector and the need to integrate climate change considerations in the road sector operations.³⁷ Thus, with the importance of the road sector for the development of Afghanistan and the role the sector can play strategically to strengthen resilience, the proposed project will strengthen capacity of the stakeholders involved in the road sector on climate and disaster resilience. Specific support will

³⁵ Government of Afghanistan. 2015. *Intended Nationally Determined Contribution*.

³⁶ Government of Afghanistan. 2017. *Afghanistan National Peace and Development Framework 2017–2030*.

³⁷ ADB. 2017. *Afghanistan Transport Sector Master Plan Update 2017–2030*. Manila.

include the following activities and will be led by the MPW with close partnership with the Afghanistan National Disaster Management Authority (ANDMA) and the National Environmental Protection Agency (NEPA).

- (i) Undertaking a climate change and disaster risk assessment for the road sector of Afghanistan. The assessment will build on existing and ongoing assessments and databases (such as road sector GIS asset inventory) undertaken by the government and other development partners, where relevant, and identify climate change and disaster risks to the existing and planned road infrastructure in the country.³⁸ The results of the assessment will provide an improved understanding on the potential impacts of climate change and disaster risk on road sector, including, identifying critical road sections, the expected annual losses (for key hazards) for the critical sections, and recommendations on ex-ante and ex-post measures to manage the risk. The assessment will result in recommendations for strengthening climate and disaster resilience in the context of road asset management process. The results of the assessment will feed into Afghanistan Disaster Risk Info (<http://disasterrisk.af.geonode.org/>), which is a public platform for creating, sharing and accessing geospatial data and maps for disaster risk-related decision making.
- (ii) Undertaking probabilistic flood risk assessment for the proposed Qaisar to Dari Bum road project. The assessment will build on the disaster risk management decision making tool developed by MPW with support from the World Bank, currently focusing on earthquakes and landslides, and expand its scope to include data on flood risk.³⁹ The assessment will be prioritized and where necessary use earth-observation data to ensure the results are produced in a timely manner in order to inform the design work of the proposed road project. To the extent possible, this activity will also support the cleaning and standardizing of available historic climate data for Badhis and Faryab province to strengthen future ability to downscale climate projections.
- (iii) Undertaking a review of current design standards used for road construction in Afghanistan—the Afghan Interim Road and Highway Standards—and provide recommendations for factoring climate and disaster risk considerations in the standards, where relevant. The review will also factor in relevant guidelines for road construction by other ministries, where relevant. The recommendations on improving road design standards from climate change and disaster risk angle will specifically look at locally appropriate and cost effective measures and will be developed based on extensive consultations with relevant national stakeholders, including various ministries, academic, and scientific organizations; and relevant international good practices.

³⁸ The World Bank has recently developed a disaster risk profile for Afghanistan. The UNDP is currently developing provincial level climate downscaled data.

³⁹ With the support from the World Bank, the Ministry of Public Works has recently developed an online decision support system that allows analysis and visualization of potential disaster risk scenarios for specific section of road network, namely, Baghlan to Bamiyan road and the Salang Highway. The system currently includes earthquake, landslide (dry), and avalanche risk. The system provided disaster risk reduction strategies at the transport corridor scale, such as slope stabilization using vegetation, etc.

- (iv) Conducting sensitization workshops for decision makers on strengthening climate change and disaster resilience in the transport sector. Based on the findings of the climate and disaster risk assessment assessments and reviews undertaken, and global good practices and case studies, the workshops will sensitize decision makers from key ministries/agencies, including MPW, Ministry of Finance, Ministry of Economy, ANDMA, and NEPA. The workshops will aim at raising awareness on the adverse impacts of climate change and disaster risk on the transport sector, and the interventions—policy, financial, and technical—required to manage the risks.
 - (v) Developing and delivering trainings targeted at MPW staff (at national and provincial level), staff of the project management office of the proposed project, and local contractors on integrating climate change and disaster risk considerations into road design, construction, maintenance, and operations. The training modules will pay specific attention to topics related to hydrology, slope protection work, erosion control, bioengineering and their role in strengthening climate and disaster resilience. The training courses will also include staff from ANDMA and NEPA.
23. It is estimated that the total cost of the above-mentioned support will be \$5million.