

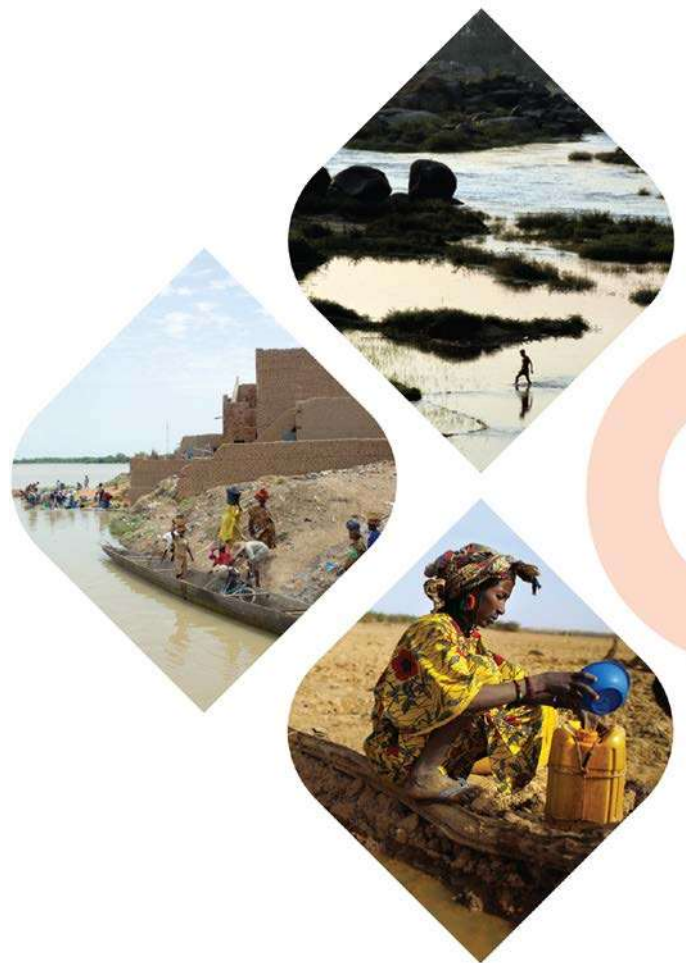


**CARIIA**  
*Collaborative Adaptation Research  
Initiative in Africa and Asia*

# **Review of Current and Planned Adaptation Action in Pakistan**

*CARIIA Working Paper #15*

*Jo-Ellen Parry*



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Titles in this series are intended to share initial findings and lessons from research and background studies commissioned by the program. Papers are intended to foster exchange and dialogue within science and policy circles concerned with climate change adaptation in vulnerability hotspots. As an interim output of the CARIAA program, they have not undergone an external review process. Opinions stated are those of the author(s) and do not necessarily reflect the policies or opinions of IDRC, DFID, or partners. Feedback is welcomed as a means to strengthen these works: some may later be revised for peer-reviewed publication.

### **Contact**

Collaborative Adaptation Research Initiative in Africa and Asia  
c/o International Development Research Centre  
PO Box 8500, Ottawa, ON  
Canada K1G 3H9  
Tel: (+1) 613-236-6163; Email: [cariaa@idrc.ca](mailto:cariaa@idrc.ca)

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## Abstract

Pakistan's extensive arid and semi-arid areas, frequent exposure to natural hazards, and significant dependence on monsoon rainfall and the glacier-fed Indus Basin make it vulnerable to climate change. The country's socioeconomic circumstances further augment its vulnerability to projected temperature increases, more variable rainfall patterns, and greater risk of floods and droughts. Pakistan continues to struggle with slow economic growth, weak governance capacity, a rapidly growing population, ongoing security concerns, and gender inequality. It also faces growing water scarcity, insecure energy access, and low agricultural productivity. Pakistan has taken steps to prepare for climate change, releasing its National Climate Change Policy in 2012 and a framework for implementing this policy in 2013. However, limited progress has been made toward implementation of the actions identified in these documents. A modest amount of internationally funded discrete adaptation programming is occurring in the country, mostly focused on water resource management, agriculture, and disaster risk management, and often being implemented in the country's high mountain areas and provinces of Punjab and Sindh. Significant engagement, capacity building, knowledge sharing, institutional strengthening, mainstreaming, and implementation remain to be undertaken to better enable Pakistan to adapt to climate change—particularly at the provincial level, given the recent devolution of responsibilities under the 18th Amendment to Pakistan's constitution. These issues are explored more fully in this report, which is one in a series of country reviews prepared to provide the Collaborative Adaptation Research Initiative in Africa and Asia with a snapshot of adaptation action in its countries of engagement.

## Résumé

### Examen des mesures d'adaptation actuelles et prévues au Pakistan

Les grandes étendues de terres arides et semi-arides du Pakistan, l'exposition fréquente aux catastrophes naturelles et la grande dépendance envers les pluies de mousson et le bassin de l'Indus alimenté par les glaciers rendent le pays vulnérable sur le plan des changements climatiques. Qui plus est, la situation socioéconomique du pays ajoute à cette vulnérabilité, en raison de la hausse prévue des températures, de la plus grande variabilité de la pluviosité et du risque accru d'inondation et de sécheresse. Le Pakistan est toujours aux prises avec une faible croissance économique, une faible capacité de gouvernance, une croissance démographique rapide, des problèmes constants en matière de sécurité et l'inégalité entre les sexes. Il fait également face à une pénurie d'eau croissante, à un accès précaire à l'énergie et à une faible productivité agricole. Le Pakistan a pris des mesures pour se préparer aux changements climatiques : il a publié sa politique nationale sur les changements climatiques en 2012, puis un cadre pour sa mise en œuvre en 2013. Néanmoins, la progression de l'instauration des mesures décrites dans ces documents est limitée. Un petit nombre de programmes d'adaptation bénéficiant d'un financement de sources internationales voit le jour dans le pays; ils sont pour la plupart ciblés sur la gestion des ressources en eau, l'agriculture et la gestion des risques de catastrophe, et sont souvent mis en œuvre dans les zones de hautes montagnes du pays et les provinces du Pendjab et du Sindh. Un engagement important, l'accroissement des capacités, l'échange des connaissances, le renforcement des institutions et la mise en œuvre restent toujours à être accomplis pour que le Pakistan soit davantage en mesure de s'adapter aux changements climatiques, en particulier au niveau des provinces, auxquelles des responsabilités ont été récemment cédées en vertu du 18<sup>e</sup> amendement à la constitution du Pakistan. Ces questions sont examinées plus en détail dans ce rapport, qui s'inscrit dans une série d'examins de pays menés dans le cadre de l'Initiative de recherche concertée sur l'adaptation en Afrique et en Asie (IRCAAA), pour donner un aperçu des mesures d'adaptation dans les pays où elle est déployée.

## Acronyms

ADB	Asian Development Bank
CARIAA	Collaborative Adaptation Research Initiative in Africa and Asia
CCD	Climate Change Division
CDKN	Climate and Development Knowledge Network
DFID	UK Department for International Development
GFDRR	Global Facility for Disaster Reduction and Recovery
GLOF	glacial lake outburst flood
GOP	Government of Pakistan
ICIMOD	International Centre for Integrated Mountain Development
IDRC	International Development Research Centre
IISD	International Institute for Sustainable Development
IPCC	Intergovernmental Panel on Climate Change
ISSET	Institute for Social and Environmental Transition
IUCN	International Union for the Conservation of Nature
LEAD	Leadership for Environment and Development
MNFSR	Ministry of National Food Security and Research
MOCC	Ministry of Climate Change
MPDR	Ministry of Planning, Development and Reform
NCCP	National Climate Change Policy
ND-GAIN	Notre Dame Global Adaptation Index
OECD	Organisation for Economic Co-operation and Development
RCP	Representative Concentration Pathway
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme

UNFCCC United Nations Framework Convention on Climate Change

WWF World Wildlife Fund (Canada and the United States)/World Wide Fund for Nature (International)

## About the authors

### **Jo-Ellen Parry**

Adaptation Lead, International Institute for Sustainable Development (IISD)

Winnipeg, Canada

Jo-Ellen Parry is principal investigator with the CARIAA-supported review of current and planned adaptation in the CARIAA program's countries of focus. Within IISD's Resilience program, she researches policies and measures that build the capacity of communities and governments—in both developing countries and Canada—to manage climate risks.

Contact: [jparry@iisd.ca](mailto:jparry@iisd.ca)

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# Synopsis

Climate risks	<ul style="list-style-type: none"> <li>Rising temperatures</li> <li>Uncertain changes in interannual rainfall and monsoon patterns</li> <li>Uncertain impact on rate of glacial melt and snowmelt patterns, with implications for water flow in the Indus River Basin</li> <li>Increased risk of drought and flooding</li> </ul>	Key sources of vulnerability	<ul style="list-style-type: none"> <li>Weak economic performance and high dependence on agriculture</li> <li>Rapid population growth and strong pace of urbanization</li> <li>Weak governance capacity and continuing security concerns</li> <li>Weak health care, low literacy rates, and high gender inequality</li> <li>Growing water scarcity, land degradation, and declining forest cover</li> </ul>		
Vulnerable sectors	Illustrative potential impacts on vulnerable sector	Illustrative priority adaptation measures in each sector			
Water	<ul style="list-style-type: none"> <li>Changes in the pattern of seasonal water flows in the Indus River system, including timing of peak runoff</li> <li>Higher temperatures will lead to more evaporation and a potential increase in demand for water for cooling</li> </ul>	<ul style="list-style-type: none"> <li>Conserve water by adopting appropriate techniques and measures</li> <li>Develop and implement integrated water resource management</li> <li>Develop and enforce regulations to protect water resources from climate change-related vulnerabilities</li> <li>Enhance awareness of and capacity to manage hydrological system</li> </ul>			27%
Coastal zone management  Agriculture (crops and livestock)	<ul style="list-style-type: none"> <li>Increased frequency and intensity of tropical cyclones</li> <li>Greater saline water intrusion due to sea level rise</li> <li>Decreases in growing season are expected to occur in all regions of Pakistan</li> <li>Higher temperatures could reduce productivity of crops and animal fodder and reduce production of meat and milk</li> </ul>	<ul style="list-style-type: none"> <li>Develop adaptation to climate change impacts on coastal and marine ecosystems</li> <li>Build climate change resilience into Pakistan’s agricultural system</li> <li>Improve irrigation practices and land management</li> <li>Enhance capacities of the relevant institutions to undertake research and development on agriculture and livestock</li> <li>Enhance farmers’, agricultural industries’, and policymakers’ understanding of climate change issues</li> </ul>			8%  23%
Forestry	<ul style="list-style-type: none"> <li>Decreased productivity and loss of biodiversity</li> <li>Changes in exposure to pests and diseases</li> </ul>	<ul style="list-style-type: none"> <li>Conduct research to improve understanding of the relationship between forests and climate</li> </ul>			0%

<sup>1</sup> Percentage of total identified discrete adaptation projects and programs based upon research undertaken as part of this review. Note that individual projects may address more than one sector.

	<ul style="list-style-type: none"> <li>• Greater exposure to events such as floods and forest fires</li> </ul>	<ul style="list-style-type: none"> <li>• Minimize damage to and increase resilience of forest ecosystems</li> <li>• Improve governance and management of forests</li> <li>• Build awareness of and institutional capacities for climate change adaptation</li> </ul>	
Biodiversity	<ul style="list-style-type: none"> <li>• Impacts on species distribution and phenology, community composition, and ecosystem dynamics</li> </ul>	<ul style="list-style-type: none"> <li>• Strengthen legal and institutional set-up for biodiversity conservation</li> <li>• Enhance scientific research and institutional capacity</li> </ul>	8%
Health	<ul style="list-style-type: none"> <li>• Loss of life and injury due to extreme weather events</li> <li>• Increased psychological problems</li> <li>• Greater incidence of diarrheal diseases, malnutrition, pneumonia, heatstroke, cholera, and heart attacks</li> </ul>	<ul style="list-style-type: none"> <li>• Address the impact of climate change on human health</li> </ul>	0%
Infrastructure	<ul style="list-style-type: none"> <li>• Increased damage to transportation, irrigation, and water management systems from extreme weather events</li> </ul>	<ul style="list-style-type: none"> <li>• Develop climate change–resilient infrastructure</li> </ul>	4%
Urban areas	<ul style="list-style-type: none"> <li>• Adverse impacts on poor urban infrastructure caused by extreme weather events; exposure of Karachi to sea level rise</li> </ul>	<ul style="list-style-type: none"> <li>• Introduce innovations in town planning to adapt to and mitigate the impacts of climate change</li> </ul>	15%
Disaster risk Management	<ul style="list-style-type: none"> <li>• Greater exposure to extreme weather events such as floods, droughts, cyclones, flash floods, landslides, and glacial lake outburst floods, with consequent adverse economic, social, and environmental impacts</li> </ul>	<ul style="list-style-type: none"> <li>• Increase awareness of the impact of climate change–related natural disasters and our capacity to respond</li> <li>• Develop integrated hazard–mitigation strategies</li> <li>• Assess future flood levels in the Indus River system against climate scenarios</li> <li>• Provide reliable natural disaster information and early–warning systems</li> </ul>	19%
<b>Particularly vulnerable regions</b>		<b>Status of climate governance (policies, institutions)</b>	
<ul style="list-style-type: none"> <li>• Rain-fed arid and hyper-arid areas</li> <li>• Low-lying coastal areas and flood-prone lowlands</li> </ul>	<ul style="list-style-type: none"> <li>• Particularly vulnerable groups</li> <li>• Coastal communities, small farmers, women, and those currently living in poverty in rural and urban areas</li> </ul>	<ul style="list-style-type: none"> <li>• National Climate Change Policy and framework for implementation of policy in place</li> <li>• Climate change is integrated into a small number of federal policies</li> </ul>	



## Introduction

The Islamic Republic of Pakistan is a country rich in ecological diversity, natural resources, culture, and history. Since its formation in 1947, its people have worked to build a vibrant economy, achieve political stability, eradicate poverty, advance gender equity, and conserve its considerable ecological heritage. Today, though, Pakistan continues to struggle with slow economic development, weak governance capacity, rapid population growth, social tensions and insecurity, a huge infrastructure deficit, energy shortages, and environmental degradation. As stated by the Government of Pakistan (GOP), the country has “not performed to potential or initial expectations” (Ministry of Planning, Development and Reform [MPDR], 2014, p. 21) and faces significant economic, social, and ecological challenges on its path toward sustainable development.

Climate change presents an additional challenge for Pakistan. Over the next century it is projected to experience rising temperatures; changing precipitation patterns; and greater risk of climate hazards such as floods, droughts, and cyclones. Pakistan’s vulnerability to such risks has been amply demonstrated in recent years by the economic and social consequences of the historic drought of 1999–2002, Cyclone Yemyin in 2007, and the super-flood of 2010—the latter of which affected one-fifth of the country, an estimated 21 million people, and cost more than US\$9.6 billion (Global Facility for Disaster Reduction and Recovery [GFDRR], 2011, 2014; CCD, 2013). Recognizing the risk climate change poses for its future development and food, energy, and water security, the GOP has initiated efforts to better understand, plan for, and implement actions that reduce its vulnerability to a changing climate.

This report provides a snapshot of current and planned efforts in Pakistan to advance action at the local, subnational, and national levels that supports adaptation to the impacts of climate change. Drawing upon available literature, it has been prepared to support the work of the Collaborative Adaptation Research Initiative in Africa and Asia (CARIAA). Jointly funded by the UK Department for International Development (DFID) and the International Development Research Centre (IDRC), CARIAA aims to help build the resilience of poor people to climate change in three hot spots in Africa and Asia: semi-arid areas, deltas in Africa and South Asia, and glacier- and snow-fed river basins in the Himalayas. To achieve this goal it is supporting four consortia to conduct high-calibre research and policy engagement activities that will inform national and subnational planning processes in 17 countries, including Pakistan.

This report documents the policies, programs, and projects presently supporting climate change adaptation in Pakistan. It begins by summarizing the current understanding of existing and projected climate risks, followed by an exploration of the development challenges that presently increase Pakistan’s vulnerability to climate change. The potential impact of climate change on vulnerable sectors, regions, and groups is described, along with priority adaptation needs as identified by the national government. An overview is then

provided of the critical national and subnational policies and plans shaping Pakistan's efforts to adapt to climate change. To assess the extent to which efforts to address the country's critical adaptation priorities are presently under way, Section 5 paints a general picture of the scale, type, and focus of current and planned adaptation programs and projects under way in Pakistan as well as the level of adaptation finance flowing into the country. A profile of in-country efforts to advance adaptation learning and knowledge sharing by networks and communities of practice is then provided in Section 6. The paper concludes with an assessment of the general status of adaptation planning in Pakistan.

## 1. Current climate and projected changes

Pakistan is a land of diverse ecoregions due to its varied geography encompassing the Hindu Kush–Himalayan and Karakoram mountain ranges in the north, the fertile Indus River plains, the arid and semi-arid regions of the Balochistan Plateau in the west, the Thai and Thar Deserts in the east, and coastal lowlands along the Arabian Sea. Reflecting this variability, eight climatic zones are distinguished within the country (Janjua, 2009), ranging from the cool and moist northern highlands that receive between 760 mm and 2,000 mm of precipitation per year to the generally hot and dry southern low-lying plains and coastal zone. Most of the country is arid to semi-arid, with about three-quarters of the country receiving less than 250 mm of rainfall per year and 20% receiving 125 mm or less. Temperatures are highly variable spatially and seasonally, reflecting the country's largely continental climate; while temperatures in the northern mountains can fall well below 0°C during the winter months, they can exceed 40°C on the plains during the summer (Chaudhry, Mahmood, Rasul, & Afzaal, 2009). Pakistan experiences four distinct seasons, the onset and duration of which vary somewhat within the country: a cool (winter) season (November to February), a hot and dry pre-monsoon season (March to mid-June), a monsoon (summer) season (mid-June to mid-September), and a retreating-monsoon season (mid-September to October). In addition to the monsoon rains, the country experiences precipitation driven by the prevailing westerly winds during the winter (Chaudhry et al., 2009).

Interannual rainfall fluctuates significantly, and the country is frequently affected by extreme climatic events such as landslides; droughts, which are often associated with the El Niño phase of the El Niño Southern Oscillation; floods along the Indus River, particularly in July and August due to heavy monsoon rains; and cyclones, which affect the low-lying plains of Sindh and Balochistan (GFDRR, 2011). Pakistan is among the countries most affected by extreme weather events; it experienced 141 recorded climate-related extreme events between 1994 and 2013 that caused an average of over 450 deaths per year and average annual economic losses of US\$3.99 billion (Kreft, Eckstein, Junghans, Kerestan, & Hagen, 2014). These events include drought (1997–2004 and 2013–14), floods (2005, 2008, 2011, 2012, and 2013), the super-flood of 2010, heavy snowfall in the northern mountains (2005–2013), heat waves (2010, 2013, and 2015), cyclones (2007), heavy rains, glacial lake

outburst floods (GLOFs), and landslides (Atta-Ur-Rahman & Shaw, 2015). Given the frequency that Pakistan is exposed to extreme weather events, it is not surprising that it was ranked 10th in the world in terms of countries affected by the impacts of weather-related loss events on the 2015 Global Climate Risk Index (Kreft et al., 2014).

## 1.1 Observed climatic changes

The process of climate change is increasingly being witnessed in Pakistan. Between 1900 and 2000, mean temperatures rose by  $0.057^{\circ}\text{C}$  per decade, although this change has not been statistically significant in many parts of the country. Warming during this period was greatest in Balochistan ( $1.15 \pm 0.25^{\circ}\text{C}$ ), Punjab ( $0.56 \pm 0.25^{\circ}\text{C}$ ) and Sindh ( $0.44 \pm 0.20^{\circ}\text{C}$ ) (Chaudhry et al., 2009). More rapid warming has been experienced in the north than in the south (Climate Change Division [CCD] & United Nations Environment Programme [UNEP], 2013), in the winter than the summer, and at night compared to during the day (Ahmad, Iqbal, & Khan, 2013).<sup>2</sup> The country has also seen an increase in the number of extreme heat days<sup>3</sup> and, between 1980 and 2007, a rise in the number of heat waves<sup>4</sup> of 31 days on average across the country (Chaudhry et al., 2009).

In parallel there was an increase in mean annual precipitation between 1901 and 2000 for all of Pakistan, primarily in the monsoon season (Planning Commission, 2010b; Salik, Ishfaq, Saeed, Noel, & Syed, 2015; Yu et al., 2013). The Pakistan Meteorological Department, though, has concluded that increases in summer monsoons and winter rainfall between 1901 and 2007 were not statistically significant and have demonstrated the variability of monsoon rains along 20- to 30-year decadal cycles (Chaudhry et al., 2009). On a subregional basis, declines in annual precipitation of 10 to 15% have been observed in the Indus Delta and along the coasts since about 1960 (GFDRR, 2011), while increases of 15 to 25% have been observed in the north, particularly during the monsoon season (Climate Service Center, 2013). There has been an observed increase in the frequency of extreme weather events in the country's northern, semi-arid, and arid areas, and in the incidence of extreme precipitation (heavy rainfall) throughout the country, but particularly in its northern areas, Sindh and Balochistan (Salik et al., 2015). Looking across South Asia, an increase in the frequency and intensity of extreme rainfall has been observed in the glacial-fed river basins (Kilroy, 2015), along with a decrease in light rain events (Christensen et al., 2013). Glaciers in most of the Himalayas are retreating to varying degrees, with the exception of those in the Karakoram region, where glaciers are either advancing or stable (Kilroy, 2015; Khan & Pervaiz, 2012; World Bank, 2013).

Along the coast, sea levels have risen by about 1.2 mm per year in recent decades, which is slightly below the global average of 1.7 mm per year (Planning Commission, 2010b; M.A. Khan, 2015). Combined with delta flooding, this process has already adversely affected

<sup>2</sup> Since 1960, the number of hot nights has increased by 23 days and the number of cool nights has decreased by 9.7 days (GFDRR, 2011).

<sup>3</sup> Defined as days in which the maximum temperature was more than the 90th percentile.

<sup>4</sup> Defined as when the maximum temperature was more than the 90th percentile six days in a row.

water availability and led to the loss of important archaeological sites and tourism opportunities (GFDRR, 2011).

## 1.2 Projected climatic changes

A modest amount of climate modelling using multiple model ensembles under different scenarios has been undertaken at the regional level to inform analysis of how Pakistan's climate will change in the future; subnational-level projections are largely absent (Salik et al., 2015). Generally, the model outcomes suggest that the observed trend of rising temperatures will continue over the remainder of this century. Pakistan's mean annual temperature is projected to rise by 3.8°C (within a range of 2.1°C to 5.1°C) by 2100 (Climate Service Center, 2013).<sup>5</sup> Other studies suggest an increase of 1.4°C to 3.7°C by the 2060s, and a potential increase to 6.0°C by the 2090s (GFDRR, 2014). This increase will not occur uniformly across the country or on a seasonal basis, with greater warming expected in northern regions and during the winter (GFDRR 2011; World Bank, 2015c).

Uncertainty remains regarding how precipitation levels will change at regional, national, and subnational levels. Analysis by the Intergovernmental Panel on Climate Change (IPCC) released in 2013 generally suggests an increase in mean precipitation over the remainder of this century.<sup>6</sup> IPCC model results also suggest the potential for greater interannual variability and an increase in the frequency of extreme rainfall events by 2060 at higher Representative Concentration Pathways (RCPs) (Christensen et al., 2013). Summer precipitation is projected to increase, but to a lesser degree in Pakistan compared to other parts of South Asia (Christensen et al., 2013).

Precipitation projections undertaken specifically for Pakistan are also uncertain. Analysis by the Climate Service Center (2013) suggests that precipitation levels could decrease by 25% or increase by 26% by the period of 2071–2100, resulting in low confidence that there will be no significant change in annual precipitation levels over all of the country. In slight contrast, analysis by the Sustainable Development Policy Institute found that there could be an increase in precipitation levels in the areas of Pakistan adjoining southern Afghanistan (an arid area where a small increase in precipitation would result in a significant percentage change) and a decrease in precipitation in the monsoon belt, particularly the arid and semi-arid areas, under the RCP8.5 scenario (as cited in Salik et al., 2015). Other analysis suggests that there will be an overall increase in precipitation in the summer and a decrease in the winter, with changes being more pronounced in southern regions (Yu et al., 2013).

<sup>5</sup> This increase in temperatures is compared to a reference period of 1961–1990 (Climate Service Center, 2013).

<sup>6</sup> Analysis for South Asia suggests that mean annual precipitation could increase by 3% by 2035 (range of –2 to 11%), by 8% by 2065 (range of 0 to 17%), and by 18% by 2100 (range of –7 to 45%) under a Representative Concentration Pathway (RCP) 8.5 scenario. These projections represent a 50% likelihood of occurrence, using 39 global models and the RCP8.5 scenario for the time periods 2016–35, 2046–65, and 2081–2100, against a baseline period of 1986–2005.



Of particular interest to Pakistan are potential changes in Indian summer monsoon patterns. While significant uncertainty remains, there is the potential for South Asia to see increases in both mean precipitation levels and rainfall extremes, and to see earlier onset and later retreat of the monsoon (Christensen et al., 2013). Interannual and intra-seasonal variability in monsoon rainfall could significantly increase as global temperatures rise, increasing the risk of flooding during the monsoon season as well as the risk of drought (World Bank, 2013). There is no clear consensus at present regarding whether the future occurrence of extreme monsoon years will be linked to El Niño Southern Oscillation variability (Christensen et al., 2013).

Changing climatic conditions also have implications for the glaciers and snow cover within the Hindu Kush, Karakoram, and Himalayan mountain ranges of northern Pakistan. While the glaciers of the Himalayas are expected to retreat, uncertainty remains regarding whether the Karakoram anomaly (of stable or expanding glaciers) will continue in the future. Changes in winter precipitation patterns will also occur. Climate change scenarios and models developed for the Upper Indus Basin suggest a shift in the timing of peak runoff but no significant change in interannual streamflow variations or annual runoff volume (Yu et al., 2013). Continued warming in the northern mountain ranges will likely increase the risk of GLOFs (Planning Commission, 2010b). How glacial extent, snow cover levels, and precipitation patterns change in the future will have significant implications for downstream water availability in the Indus River Basin and raise the potential for greater flood risk in the future, particularly during the monsoon season.

Future changes of extreme weather events in Pakistan and elsewhere are challenging to project. Current analysis, though, places medium confidence in the likelihood of an increase in the number of tropical cyclones in South Asia (and other regions of the world) and an increase in the number of intense storms (Christensen et al., 2013). Rising temperatures, changes in the seasonal distribution of rainfall, and higher evapotranspiration rates may also further reduce water availability in drought-prone areas (GFDL, 2011). The northwestern region of Pakistan seems particularly vulnerable to a potential increase in the frequency of drought conditions (World Bank, 2013).

Changes in sea level have implications for Pakistan's coastal regions, including the Indus River Delta. Sea level rise along the coasts of South Asia is projected to be 0.26 m to 0.55 m under a low-emissions scenario and 0.45 m to 0.82 m under RCP8.5 by the period of 2081–2100 (compared to a baseline period of 1986–2005; IPCC, 2013). However, local sea level rise can differ substantially from global rates; therefore, the rate of change along Pakistan's coasts is uncertain (Climate Service Center, 2013).

## 2. Vulnerability to climate change

Pakistanis' capacity to prepare for and respond to further temperature increases, changes in monsoon patterns, rising sea levels, and potential increases in extreme weather events will

be largely determined by their economic and social well-being, the ability of government institutions to facilitate adaptation efforts, and the degree to which ecosystems services are maintained and enhanced. To set the stage for understanding Pakistan's vulnerability to climate change, an overview is therefore provided of the economic, political, demographic, social, and environmental context within Pakistan that influences its adaptive capacity. Analysis of the vulnerability of key economic sectors, regions, and groups is then provided.

## 2.1 Current drivers of vulnerability

Pakistan's vulnerability to climate change is driven by a combination of factors that reduce the adaptive capacity of its governments, institutions, and people. The most prominent of these factors are the country's economic challenges, changing demographic patterns, weak governance capacity, slowly improving social conditions, and growing levels of environmental degradation.

Pakistan has struggled to achieve internal political stability since gaining Independence in 1947, which in turn has affected its ability to achieve macroeconomic stability and growth. In the mid-2000s, the country experienced considerable economic variability (CCD & UNEP, 2013), leading to balance of payments concerns and steady deflation of the Pakistani rupee. Economic reforms introduced in 2013 by the government of Prime Minister Nawaz Sharif have since helped to stabilize the economy and spur economic growth in all sectors. The country experienced an increase in GDP of 4.14% in 2013–14—the highest growth rate since 2008–09 (Ministry of Finance, 2014a)—and total GDP reached \$243.6 billion in 2014 (World Bank, 2015a). Despite this progress, the country's rate of economic growth remains lower than that of most other South Asian countries (World Economic Forum, 2015). Foreign investment remains low due to concerns such as weak governance and electricity shortages (Central Intelligence Agency, 2015). Foreign remittances form a significant component of the Pakistan economy and typically constitute the second-largest source of external financing after foreign direct investment (Ministry of Finance, 2014a).

Although Pakistan is classified as a lower-middle-income country, poverty remains a critical challenge. The country has experienced a reduction in poverty levels since 2001–02, when 34.5% of the population lived below the poverty line (MPDR & United Nations Development Programme [UNDP], 2013). By 2012, this proportion of the population had declined to an estimated 22.3% of Pakistanis (Asian Development Bank [ADB], 2014b), in part due to social protection programs like the Benazir Income Support Programme (MPDR & UNDP, 2013). Still, more than 45% of the population continues to live in multi-dimensional poverty (UNDP, 2014).

Pakistan's economic dependence on agriculture further increases its vulnerability to climate change. While the services sector is now the country's largest economic sector, agriculture remains the main livelihood source of many Pakistanis. The agriculture sector employs 43.7% of the total workforce, produces 21.0% of GDP, and generates 70% of export revenues (Ministry of Climate Change [MOCC], 2012; Ministry of Finance, 2014a;

International Union for the Conservation of Nature [IUCN] Pakistan, 2009; Sattar, 2012). Production occurs primarily on small farms, which account for 90% of all farms (Tariq, Tabasam, Bakhsh, Ashfaq, & Hassan, 2014); 81% of farms in Pakistan are less than five hectares in size (GFDRR, 2011). Growth within the sector has only been 3.3% over the past decade due to low uptake of modern farming techniques, limited investment in needed infrastructure, slow technology innovation, pest and livestock disease problems, and limited access to credit for production and processing (MPDR, 2014). Land degradation is a particular challenge, with soil erosion affecting 18 million hectares, salinization affecting over 5 million hectares, and waterlogging affecting a further 2 million hectares (CCD & UNEP, 2013).

Pakistan's weak economic performance is intimately connected to its historical challenges in achieving stable political governance. The country has oscillated between democratically elected governments and military rule since its formation, only achieving its first successful transition from one democratically elected government to another in 2013. This uncertainty has contributed to inconsistent development planning within and between successive governments (Salik et al., 2015). Systematic corruption is also a significant problem, with the federal government consistently ranked among the most corrupt on global indices (Diamond, 2015). This situation has been cited as the leading barrier to doing business in Pakistan (World Economic Forum, 2015).

This situation has further been challenged by tensions between different regions and ethnic groups within Pakistan, as well as the long-standing conflict with India and the ongoing instability in Afghanistan. Security concerns have adversely impacted economic growth, diverted government investment away from social and infrastructure development, and impeded the state's capacity to deliver programming in parts of the country. While the country's security situation improved in 2015 (Craig, 2015), the government's capacity to effectively act in all areas of the country to address challenges such as climate change remains limited.

A further challenge for Pakistan is its high population growth rate. Already the seventh most populous country in the world (MPDR, 2014), with a total population of 182.1 million in 2013 (UNDP, 2014), Pakistan's average population growth rate is 2.7% per year (CCD & UNEP, 2013). By 2025, it is expected to be home to more than 227 million people, approximately 63% of whom will be under 30 years of age (MPDR, 2014). With approximately 39% of Pakistanis already living in urban areas, Pakistan is currently the most urbanized country in South Asia (World Bank, 2015b). By 2025, more than 50% of Pakistanis are expected to live in urban areas (MPDR, 2014). Many of these individuals will live in Karachi, which has doubled its population since 2000 and is now the second most populous city in the world (Kovach, 2015).

These demographic projections have profound implications for the country's economy, as it must generate about 1.5 million new jobs every year just to absorb the number of young

people entering the workforce (MPDR, 2014). The challenge of meeting this need is reflected in the country's ratio of unemployment rate to population, which increased from 27.1% in 2001–02 to 30.9% in 2010–11 (MPDR & UNDP, 2013). The growing number of unemployed young people presents a threat to the country's efforts to increase its stability (Diamond, 2015). The country's growing population also places considerable demand on its already overburdened social systems and critical resources such as water, food, and energy.

These economic, political, and demographic challenges have contributed to Pakistan's slow pace of social development, with the country ranking 147 out of 187 countries on the Human Development Index (UNDP, 2014). Food security remains a critical challenge; approximately 60% of Pakistanis are food insecure, and an estimated 44% of children under the age of five experience chronic malnutrition (MPDR, 2014). The country's health system is among the most underfunded in South Asia (Diamond, 2015), a factor contributing to its failure to achieve its Millennium Development Goal of reducing the under-five mortality rate to 52 deaths per 1,000 live births; it remained at 89 deaths in 2012–13 (MPDR & UNDP, 2013). Average life expectancy in Pakistan is only 67 years (Diamond, 2015).

The country also lags well behind its neighbours in the area of literacy. Only 57% of Pakistanis are literate, a level that declines in rural areas to 50% (MPDR, 2014). While efforts have been made to promote gender parity in education, significant gender-based differences remain: male literacy rates reach 70%, while female literacy rates are 47% (MPDR & UNDP, 2013). There are striking regional differences as well, with the literacy rate in Sindh averaging 60% (72% of males; 47% of females) while in Balochistan an average of 46% of the population is literate (65% of males; 23% of females).

These gender-based differences in education reflect continued challenges for advancing women's rights in Pakistan. While women play a vital role in supporting agricultural production, they continue to lack access to information about improved farming methods and technologies and access to credit. Migration by men to urban areas places further burden on women (Begum & Yasmeen, 2011; Food and Agriculture Organization, 2015). Non-agriculture wage employment ranges from 13.25% in Punjab to as low as 2.32% in Balochistan (MPDR & UNDP, 2013). Additionally, Pakistani women experience mobility restrictions and lack access to health care and sanitation facilities (Begum & Yasmeen, 2011). Given these factors it is perhaps not surprising that Pakistan is ranked last on the South Asia Women's Resilience Index, which considers the extent to which women's needs are integrated into disaster risk reduction and recovery efforts (Economist Intelligence Unit, 2014).

The country also faces a number of concerns related to water scarcity and environmental degradation. Pakistan is presently classified as a "water-stressed" country, as its current surface and groundwater supplies are low (less than 1,100 m<sup>3</sup> per person) and declining. It is at risk of becoming a "water-scarce" country due a growing gap between water demand

and supply spurred by factors such as population growth, rapid urbanization, growing industrial demand, over-extraction of groundwater, and growing water contamination from municipal and industrial waste (CCD & UNEP, 2013; MPDR, 2014). These concerns are compounded by poor water infrastructure, usage laws, and pricing systems, as well as outdated water management systems. Inadequate water storage presents an additional concern: only 9% of average annual flows are stored, while the world average is 40% (CCD & UNEP, 2013). Consequently, the maximum amount of stored water that Pakistan can supply is equivalent to a 30-day supply, while the recommended level is a 1,000-day supply for countries with a similar climate (MPDR, 2014).

Environmental degradation in Pakistan may be seen in the rate at which it is losing its forest cover, creating an additional source of vulnerability to climate change. Based on the last survey completed by the Food and Agriculture Organization in 2007, natural forests covered 43,400 km<sup>2</sup> of Pakistan, or only 4.8% of the country (Khan, Amir, Ramay, Munawar, & Ahmad, 2011; CCD, 2013). Forested lands are estimated to be declining at a rate of between 0.2 and 0.4% per year (Khan et al., 2011). Other environmental concerns include waterlogging of the soils in the low-lying areas of Sindh Province and degradation of coastal mangroves (GFDRR, 2011). These concerns are compounded by weak capacity to enforce existing environment-related regulations (Khan & Pervaiz, 2012). The World Bank has estimated that environmental degradation and resource damage costs the Pakistan economy about 365 billion Pakistani rupees (approximately CA\$4.5 million) per year, or about 6% of GDP, and that the poor are disproportionately impacted by these costs (World Bank, 2006). These existing circumstances, which limit Pakistan's adaptive capacity and increase its sensitivity to climate change, leave the country particularly vulnerable to this global process.

Category	Indicator	Year	Value	Source
Human development	Human Development Index (score <sup>d</sup> /rank <sup>d</sup> out of 187 countries)	2013	0.537/146	UNDP (2014)
	Population in multi-dimensional poverty (%)	2013	45.6%	
	Under-five mortality rate (per 1,000 live births)	2013	86	
	Adult literacy rate (15 years of age and above)	2013	54.9 <sup>c</sup>	
	Improved water source, rural (% of population with access)	2012	89%	World Bank (2015b)
	Improved sanitation facilities (% of population with access)	2012	48%	

	Access to electricity (% of population)	2010	91.4%	
Gender	Gender Inequality Index (value <sup>e</sup> /rank <sup>d</sup> out of 187 countries)	2013	0.563/146	UNDP (2014)
Demographics	Total population (in millions)	2013	182.142 <sup>a</sup>	UNDP (2014)
	Average annual population growth rate	2010	1.8%	
	Population, urban (% of population)	2011	36.8% <sup>b</sup>	
Economic development	GDP (in current USD, millions)	2013	232,286.78	World Bank (2015b)
	GDP growth (annual %) (average of period of 2010–2013)		3.1%	
	Agricultural land (% of land area)	2012	35.1%	
Governance	Corruption Perceptions Index (score <sup>f</sup> /rank <sup>d</sup> of 174 countries)	2014	29 / 126	TI (2014)
	Fragile States Index (score out of 120 <sup>g</sup> )	2014	103.0	Fund for Peace (2014)
	Fragile States Index (status)	2014	High Alert	
	Expenditure on education, public (% of GDP)	2012	2.4% <sup>c</sup>	UNDP (2014)
	Expenditure on health (% of GDP)	2011	2.5%	
Environment	Population living on degraded land (%)	2010	4.5%	UNDP (2014)
	Change in forest area, 1990/2011	2013	-34.9%	
<sup>a</sup> Projections based on medium-fertility variant <sup>b</sup> Because data are based on national definitions of what constitutes a city or metropolitan area, cross-country comparison should be made with caution <sup>c</sup> Data refer to the most recent year available during the period specified <sup>d</sup> Where 1 or first is best <sup>e</sup> Where 0 is best <sup>f</sup> Where 0 is highly corrupt and 100 is very clean <sup>g</sup> Where 120 is very high alert, and 0 very sustainable				

## 2.2 Vulnerability of key sectors, regions, and groups

Although a comprehensive vulnerability assessment for Pakistan has not yet been completed (Planning Commission, 2010b), critical areas of concern for the country are its future security with respect to water, food, and energy. Climate change is anticipated to only exacerbate Pakistan's current water security challenges, with rising temperatures expected to increase demand for water supplies and evapotranspiration. The country is largely dependent on water flow through the Indus River system, which supports one of the world's largest irrigation systems (CCD & UNEP, 2013). Key questions remain regarding how

this system's future hydrologic patterns will change given uncertainty regarding the role of runoff in the hydrometeorological regime of the mountains that feed the Indus Basin, the pace of glacial retreat in the Himalayas, whether the Karakoram glaciers are expanding, and future winter precipitation patterns (Kilroy, 2015; Yu et al., 2013). Although there is concern that water flows will significantly decrease, studies have also suggested that future interannual streamflows in the Upper Indus Basin will be comparable to current conditions but with a potential change in the timing of peak runoff (Yu et al., 2013). This uncertainty—along with a lack of studies on the implications of climate change for downstream groundwater recharge—is of critical importance to Pakistan given that runoff due to snowmelt and ice melt provides 50–80% of the average water flows within the Indus River Basin (Yu et al., 2013).

The well-being of the Indus Delta (which is approximately 6,000 km<sup>2</sup>) is an additional concern. Already, salt water has been detected in the Indus Delta as far as 80 kilometres inland (Planning Commission, 2010b; M.A. Khan, 2015). This situation may be exacerbated in the future by higher temperatures leading to more evapotranspiration, changing river water flows, and further sea level rise. Apprehension has also been expressed that diverting water from the Indus River for irrigation through the construction of barrages, particularly the Kotri Barrage (Akhtar, 2015), has significantly reduced water flow to the Indus Delta<sup>7</sup> and could be contributing to saltwater intrusion in the delta. However, there is no evidence to support this conclusion (M.A. Khan, 2015).

Improved water management, particularly for irrigation, is needed to reduce the risks posed by climate change. The GOP recognizes the need to improve all Pakistanis' access to water through actions such as increasing water storage capacity, minimizing wastage by promoting conservation and efficiency of use, promoting more efficient allocation, and establishing institutional mechanisms to more effectively manage water sources and water allocations (MPDR, 2014). A number of multi-million dollar initiatives are under way in the country that aim to help achieve these objectives, such as projects supported by the World Bank that are working to improve irrigation systems in Punjab and Sindh, improve barrages in Sindh, and strengthen the capacity of the Water and Power Development Authority.

The uncertainty about the availability of future water supplies, rising temperatures, and saltwater intrusion has direct implications for anticipated levels of future agricultural production in Pakistan's 10 agro-ecological zones. Agricultural production in the country's dry regions, flood-prone lowlands of Sindh and Punjab Provinces, and coastal areas affected by saltwater intrusion are at greater risk (Ministry of National Food Security and Research [MNFSR], 2013). The country's most critical crops are wheat, rice, cotton, sugarcane, and maize (GFDRR, 2011). However, only a limited number of desk-based studies have been undertaken on the impacts of climate change on the country's crop yields, and there is a

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<sup>7</sup> Water flow in the Indus River has declined “from 185,000 million cubic metres per annum in 1892 to 12,300 million cubic metres in the 1990s” (Climate Change Division & UNEP, 2013, p. 4).

general absence of field-based studies.<sup>8</sup> Sivakumar and Stefanski project a decline in wheat production by 5–7% with a 1°C rise in temperature (as cited in Ahmad et al., 2013, p. 4). The exception is Pakistan’s northern mountainous areas, which produce a minor amount of the country’s overall wheat crop. There, wheat production is projected to increase should there be an increase in temperatures of up to 4°C (Ahmad et al., 2013; World Bank, 2015c). Additionally, recent analysis focused on wheat production in Punjab found that yields would decline for rain-fed production but could increase for irrigated production (Tariq et al., 2014). Even so, the authors forecasted an overall per capita decline in wheat availability in Punjab—from 198 kg per annum in 2012 to an estimated 86 kg per annum by 2050—due to the combination of population growth and climate change.

The growing season for rice and its production are also expected to decrease in all regions of Pakistan (World Bank, 2015c). A 2011 study by Ali (as cited in Ahmad et al., 2013, p. 5) projected a 15–18% decline in basmati rice production by 2080. Livestock production is also anticipated to be adversely affected by higher temperatures, which could result in lower milk and meat production, reduced livestock reproduction, and reduced fodder production (IUCN Pakistan, 2009; Planning Commission, 2010b).

Priority measures identified by the government to address understood risks include identifying rain-fed agricultural areas vulnerable to drought and heat stress; establishing a risk management system for crop production; improving local veterinary facilities; increasing farmers’ and other stakeholders’ awareness of efficient land use strategies, water conservation techniques, and integrated cropping methods; strengthening extension services; strengthening agricultural research in Khyber Pakhtunkhwa Province; and developing drought- and heat-tolerant crop varieties (CCD, 2013). Many priority actions focus on Balochistan.

Energy shortages are also a significant constraint on Pakistan’s current economy. Climate change could compound this situation by increasing energy demand (e.g., for air conditioning and water pumps) and reducing supply, since erratic water supplies could reduce hydropower production and affect thermal plants’ cooling facilities (Planning Commission, 2010b). Energy infrastructure could also be put at greater risk by extreme events such as cyclones and floods (Planning Commission, 2010b), particularly in low-lying coastal areas (GFDRR, 2011). In response, the GOP has announced plans to increase the provision of centralized and distributed solar energy, on-shore large-scale wind energy (e.g., the Gharo–Keti Bandar Wind Corridor), geothermal energy, and large and mini/micro hydroelectric power (Energy research Centre of the Netherlands & IISD, 2015). A number of these efforts to strengthen Pakistan’s energy security could provide adaptation co-benefits, as could efforts to improve the energy efficiency of buildings and enforce energy conservation legislation. However, there is a risk that the GOP’s push to develop

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<sup>8</sup> Pakistan Agricultural Research Council, personal communication, March 4, 2015.



hydropower sources (CCD, 2013) may increase the country's vulnerability over the long term.

Climate change may be expected to directly and indirectly affect the health of Pakistanis. Warmer temperatures and higher humidity could increase the risk of water- and vector-borne diseases such as malaria, particularly in northern regions (CCD & UNEP, 2013; M.A. Khan, 2015). An increase in extreme events could also lead to greater incidence of malnutrition, pneumonia, heatstroke, cholera, and heart attacks (CCD & UNEP, 2013). The expected increase in the frequency and intensity of heat waves across Asia, for example, may be expected to lead to increases in mortality and morbidity in vulnerable groups (Hijioka et al., 2014). However, currently there is little understanding of the risk these changes pose for Pakistan (Planning Commission, 2010b).

A projected increase in the risk of storm surges, heavy rains, GLOFs, and overland flooding also threatens Pakistan's underdeveloped transportation system and its irrigation and water management infrastructure (GFDRR, 2011). Additionally, unease has been expressed regarding the potential for a further decline in Pakistan's limited forest cover, with associated implications for biodiversity if natural species migration is unable to keep pace with the projected rate of climatic change (MOCC, 2012a).

The variations in potential climatic impacts in Pakistan mean that several regions are considered to be particularly vulnerable to climate change. These include the Indus River Valley, home to the majority of Pakistan's population, due to its exposure to changing water flows (including greater risk of floods) and poor water management practices (GFDRR, 2011). The country's extensive arid and hyper-arid areas, including the Thar, Cholistan, Kharan, and Thal deserts, are also at risk due to climate change—particularly in locations not supported by the extensive Indus River irrigation system. This includes the province of Balochistan as well as parts of the provinces of Khyber Pakhtunkhwa, Punjab, and Sindh, which are highly dependent on climate-sensitive economic activities such as agriculture and have limited development opportunities (Salik et al., 2015).

Pakistan's coastal areas, including the city of Karachi, are also particularly vulnerable due to their significant populations and concentrations of economic assets (e.g., energy, manufacturing, tourism, agriculture, fisheries). Sea level rise, storm surges, monsoon waves, and cyclone activity are likely to continue to erode coastal areas, intrude salt water further inland, and damage infrastructure (Planning Commission, 2010b). A detailed and geographically explicit vulnerability assessment of Pakistan's coastal regions remains to be undertaken (GFDRR, 2011). Particularly vulnerable populations have been identified as those living in coastal communities, small farmers—especially those dependent on rain-fed agriculture—and those currently living in poverty more generally (CCD, 2013; M.A. Khan, 2015).

Overall, Pakistan ranks among the countries most vulnerable to the impacts of climate change, scoring 46.8 (or 122 of 178 countries examined) on the Notre Dame Global

Adaptation Index (ND-GAIN) due to its high vulnerability and low readiness to implement adaptation actions (ND-GAIN, 2015a, 2015b). The index points in particular to Pakistan's rate of freshwater withdrawal and its limited dam storage capacity per capita, along with limited numbers of medical staff and poor access to improved sanitation facilities, as key factors contributing to its vulnerability. With respect to readiness, impediments identified included limited availability and use of information and communications technology infrastructure, low enrolment in tertiary education, and limited indications of innovation as measured by the number of patent applications (ND-GAIN, 2015a, 2015b).

**Table 2 – Comparison of Global Adaptation Index scores for Pakistan and neighbouring countries**

Country	Vulnerability*			Readiness**			Overall		
	World rank	Score	Trend	World rank	Score	Trend	World rank	Score	Trend
Pakistan	118	0.438	↓	140	0.349	↓	127	45.5	↑
Afghanistan	174	0.591	↓	169	0.292	↑	174	35.1	↑
Bangladesh	142	0.500	↓	141	0.347	↑	142	42.3	↑
India	123	0.488	↓	118	0.389	↑	122	47.0	↑
Nepal	132	0.472	↓	126	0.370	↑	130	44.9	↑

\* A lower score indicates lower vulnerability. The vulnerability score is determined based on indicators of exposure, sensitivity, and adaptive capacity, taking into consideration indicators related to six life-supporting sectors: food, water, health, ecosystem service, human habitat, and infrastructure.

\*\* A higher score indicates a higher degree of preparedness. The readiness score takes into account measures of economic readiness, governance readiness, and social readiness to pursue adaptation actions.

Source: ND-GAIN, 2015a

### 3. Adaptation planning context

The GOP has recognized its vulnerability to climate change and began to address the issue in the early 1990s. It established the Cabinet Committee on Climate Change in 1995 and the Standing Committee on Climate Change within the National Assembly in 2011. In recent years, the federal government has also put in place a national policy and framework to guide efforts to mitigate and adapt to climate change. However, progress in terms of integrating climate change into broader national planning and decision-making processes has been limited (see Table 3), as described in this section.

<b>Table 3 – National adaptation planning context: Summary of progress as of September 2015</b>	
<b>Indicator</b>	<b>Progress</b>
Climate change recognized in the country's guiding development vision/plan	Climate change is recognized in <i>Pakistan 2025</i> as a threat to the country's energy, water, and food security
National-level coordinating entity for climate change established and active	Not present
Climate change policy and/or law in place	National Climate Change Policy (NCCP) released in 2013
Climate change strategy published	Framework for implementation of NCCP released in 2014
Climate change action plan published	Not yet prepared
Adaptation plan published	Not yet prepared
Climate change fund or adaptation fund operational	Not present
Climate change units established in key ministries	Not present
Climate change integrated into national sectoral policies	Largely not integrated into national sectoral policies

### 3.1 National-level development policy context

Adaptation action in Pakistan is largely shaped by two overarching national-level policy commitments. The first is *Pakistan 2025: One Nation—One Vision* (MPDR, 2014), which is the national development vision framed in 2014 by the new federal government. This document sets forth a vision of Pakistan becoming an upper-middle-income country by 2025 (reflected in a per capita GDP increase from US\$1,300 to US\$4,200), and being among the 10 largest economies in the world by 2047. This vision is to be achieved through actions under seven pillars<sup>9</sup> and aided by five enabling factors.<sup>10</sup> *Pakistan 2025* identifies climate change as a priority area for action, recognizing it as a compounding challenge, particularly with respect to its potentially negative implications (along with water resource depletion) for meeting the food security and nutrition needs of a growing population. Under *Pakistan 2025*'s pillar focused on achieving water, energy, and food security, the document also identifies key goals for responding to the impacts of climate change, namely:

<sup>9</sup> These seven pillars are: (1) Putting people first—developing human and social capital; (2) Achieving sustained, indigenous and inclusive growth; (3) Democratic governance, institutional reform and modernization of the public sector; (4) Water, energy and food security; (5) Private sector and entrepreneurship led growth; (6) Developing a competitive knowledge economy through value addition; and (7) Modernizing transportation infrastructure and greater regional connectivity (MPDR, 2014).

<sup>10</sup> Key enablers identified in *Pakistan 2025: One Nation—One Vision* are a shared vision, political stability and continuity of policies, peace and security, rule of law, and social justice.

- “Design water, food and energy security policies and plans of the country with specific reference to the profound challenges posed by climate change.
- “Explicit recognition of the relevant risks (and associated economic and social costs) and implementation of well-defined mitigation and adaptation strategies/measures.
- “To promote long term sustainability, conservation and protection of natural resources” (MPDR, 2014, p. 67).

The government also commits to aggressively exploring emerging opportunities for financing mitigation and adaptation through the Green Climate Fund and accessing capacity-building and institutional-strengthening support provided under the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol (MPDR, 2014).

The second critical overarching national policy influencing adaptation action in Pakistan is the 18th Amendment to the Constitution passed by the National Assembly of Pakistan in 2010. The stated objective of this process is to improve the delivery of services, including health, education, water, and electricity, to the poor and marginalized populations of Pakistan (Planning Commission, 2011). Among the changes enacted by the amendment are devolution of federal government responsibility and a strengthening of provincial authority and autonomy. As such, responsibilities of what was then the Ministry of Environment, including climate change, were devolved to the provinces in 2011. Effectively, this has shifted primary responsibility for the development and implementation of adaptation plans to the provinces. This shift provides Pakistan’s provinces with greater potential to tailor adaptation plans and action so that they better address their different risk and priorities. However, sufficient leadership, resources, and capacity must be in place for this potential to be realized. As well, although devolution has assigned greater responsibility to subnational governments, federal institutions and policies continue to influence adaptation planning and action. The federal government also remains responsible for Pakistan’s engagement in international processes, including those of the UNFCCC.

### **3.2 National-level climate policy context**

Pakistan first took concerted steps toward the development of targeted climate change policies in 2008 when the Planning Commission established the Task Force on Climate Change. An objective of the Task Force was to formulate a “climate change policy that would assist the government in pursuing the paramount goal of sustained economic growth by appropriately addressing the challenges posed by the threat of climate change” (Khan, 2011, p. 5). It was also to identify and make recommendations regarding measures that would help ensure security of the country’s water, energy and food resources; strengthen existing institutional capacities; and enhance awareness and understanding of climate change (Khan, 2011). The Task Force delivered its final report in February 2010.

Building on the content of the Task Force’s report, the GOP initiated development of a National Climate Change Policy (NCCP). Completed in 2012 and officially launched in February 2013, the goal of the NCCP is to “ensure that climate change is mainstreamed in the economically and socially vulnerable sectors of the economy and to steer Pakistan toward climate resilience development” (MOCC, 2012a, p. 1). Adaptation is the primary focus of the policy, with a strong focus on ensuring the country’s future water security, food security, and energy security. It also aims to promote pro-poor and gender-sensitive adaptation measures; integration of climate change policy with other national policies; inter-ministerial coordination; climate awareness; and access to national and international opportunities, particularly funding opportunities (MOCC, 2012a). High-level policy measures to reduce the vulnerability of the following sectors are identified: water resources, agriculture and livestock, health, forestry, biodiversity, and other vulnerable ecosystems (mountain areas, rangelands and pastures, arid and hyper-arid areas, coastal and marine ecosystems, and wetlands). It also identifies policy measures to address more cross-cutting areas of need, namely disaster preparedness, poverty, gender, capacity building, technology transfer, and international cooperation (MOCC, 2012a).

To further advance the work of the NCCP, in 2013 the government released the Framework for Implementation of Climate Change Policy (“the Framework”). Building on the NCCP, it aims to provide an “effective institutional framework to mainstream climate change concerns into overall national planning and to promote climate-compatible development with clear sets of roles and responsibilities at the federal and provincial levels” (CCD, 2013, p. 7). Its primary focus remains adaptation. For the priority areas identified in the NCCP, the Framework sets out more specific objectives to be achieved, strategies for achieving these objectives, the timeframe by which they are to be implemented,<sup>11</sup> and the institutions tasked with implementation. Objectives identified for each adaptation priority area are captured in Table 4.

The NCCP lays out plans for a new institutional structure for managing climate change in Pakistan, including establishment of a national climate change commission to coordinate national and international climate change activities. It also calls for federal- and provincial-level climate change policy implementation committees to facilitate effective implementation and monitor progress at each of these jurisdictional levels. It further calls for the establishment of climate change cells in sectoral ministries at the national and provincial levels, and for a Pakistan climate change fund to finance needed projects (MOCC, 2012a). The Framework also highlights the need to significantly increase institutional capacity at the federal and provincial levels to implement planned climate change actions, including securing funding. In particular, it notes the need to strengthen the capacity of the Climate Change Division (CCD) (now the Ministry of Climate Change [MOCC]). However, no plans for implementing the institutional changes described in the NCCP are included in the Framework, nor have they been initiated in practice.

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<sup>11</sup> Within the Framework, priority actions are to be achieved within two years, short-term actions within five years, medium-term actions within 10 years, and long-term actions within 20 years (CCD, 2013).

The NCCP and the Framework form the building blocks upon which the federal government anticipates developing a formal National Adaptation Plan. It may be expected that the plan will address current gaps within the Framework with respect to identification of measurable targets and required financial resources. It may also be noted that neither the NCCP nor the Framework specifically identify the need to develop a comprehensive system for monitoring and evaluating adaptation progress. Steps toward development of such a system do not appear to have been initiated by the federal government. Additionally, the NCCP does not appear to clearly treat climate change as an additional stressor on development activities and thus address its incremental impact across a range of sectors in an integrated manner (Sud, Mishra, Varma, & Bhadwal, 2015).

**Table 4 – Objectives identified for the areas for adaptation action identified in Pakistan’s Framework for Implementation of Climate Change Policy**

<b>Actions</b>	<b>Objectives</b>
Water sector	<ul style="list-style-type: none"> <li>• Conserve water by adopting appropriate techniques and measures</li> <li>• Increase awareness of the need to adapt to the changing water resource situation due to climate change</li> <li>• Develop and implement integrated water-resource management</li> <li>• Develop and enforce required legislative and regulatory frameworks to protect water resources from climate change–related vulnerabilities</li> <li>• Enhance capacity to manage the country’s hydrological system</li> <li>• Develop climate change–resilient water infrastructure in the country and strengthen it according to the country’s needs</li> </ul>
Agriculture and livestock	<ul style="list-style-type: none"> <li>• Build climate change resilience into Pakistan’s agricultural system</li> <li>• Enhance crop productivity through improved irrigation and land management techniques</li> <li>• Enhance capacities of the relevant institutions to undertake research and development on agriculture and livestock</li> <li>• Enhance the understanding of climate change issues by farmers, agricultural industries, and policymakers to enable them to make informed decisions</li> </ul>
Forestry sector	<ul style="list-style-type: none"> <li>• Improve the understanding of the relationship between forests and the climate through enhanced scientific research</li> <li>• Minimize damage to and increase resilience of forest ecosystems</li> <li>• Improve governance and management of forests to acclimatize to the impact of the changing climate</li> <li>• Intensify mass awareness and build capacities of institutions and professionals on climate change adaptation</li> </ul>
Health sector	<ul style="list-style-type: none"> <li>• Address the impact of climate change on human health</li> </ul>
Disaster preparedness	<ul style="list-style-type: none"> <li>• Increase awareness of the impact of climate change–related natural disasters and our capacity to respond</li> </ul>

	<ul style="list-style-type: none"> <li>• Improve our understanding of the processes that produce natural hazards</li> <li>• Develop integrated hazard-mitigation strategies</li> <li>• Assess likely future flood levels in the Indus River System against future climate change scenarios</li> <li>• Provide reliable information about and early warning of natural disasters where and when it is needed</li> <li>• Develop climate change–resilient infrastructure</li> </ul>
Biodiversity	<ul style="list-style-type: none"> <li>• Strengthen legal and institutional set-up to materialize efforts toward biodiversity conservation</li> <li>• Enhance scientific research on and the practice of biodiversity conservation</li> <li>• Enhance national and provincial capacities to identify, conserve, and monitor conservation processes</li> </ul>
Mountain areas	<ul style="list-style-type: none"> <li>• Map out vulnerability of ecosystems to climate change in mountainous areas and prepare action plans for its mitigation</li> <li>• Sustain food security from agriculture crops and livestock production in mountain areas</li> <li>• Sustain and protect mountain ecology and plains areas from degradation and pollution</li> </ul>
Coastal and marine ecosystems	<ul style="list-style-type: none"> <li>• Develop adaptation to climate change impacts on coastal and marine ecosystems</li> </ul>
Rangelands and pastures	<ul style="list-style-type: none"> <li>• Develop climate change adaptation strategy for rangelands and pastures</li> </ul>
Wetlands	<ul style="list-style-type: none"> <li>• Protect the habitat of birds and biodiversity, including fish, in wetlands ecosystems</li> <li>• Provide the necessary inputs to ensure sustainability of wetlands ecosystem in Pakistan</li> </ul>
Arid and hyper-arid areas	<ul style="list-style-type: none"> <li>• Develop and manage scarce water resources in a sustainable manner</li> <li>• Combat land degradation and desertification</li> <li>• Introduce low delta crops and dry land trees and livestock</li> </ul>
Urban planning	<ul style="list-style-type: none"> <li>• Introduce innovations in town planning to adapt and mitigate the impact of climate change</li> </ul>

Source: CCD, 2013

### 3.3 Institutional structure for climate governance

Reflecting Pakistan’s history of political instability, institutional arrangements for climate change management have frequently been altered over the past two decades. This may be demonstrated by changes at the federal ministerial level. Responsibility for climate change

management originally rested with the Ministry of the Environment, but following the devolution process in 2011 this responsibility was transferred first to the Ministry of Planning and then to the Ministry of National Disaster Management (R.S. Khan, 2015). In 2012, the MOCC was established and tasked with responsibility for leading coordination of climate change actions with other key ministries (e.g., Planning and Development, Water and Power, Health, Food Security, and Finance) and agencies, as well as serving as Pakistan's focal point to the UNFCCC.

Following the change in government in 2013, the MOCC became the CCD under the Cabinet Secretariat and had its annual budget cut by over 62% (R.S. Khan, 2015; Responding to Climate Change, 2013). This decision was reversed in January 2015, when the government reinstated the MOCC and named a new federal minister, but did not increase the ministry's budget. The re-established ministry is to act as a facilitator and coordinator between federal departments and increase access to funding from the international community (R.S. Khan, 2015).

Cross-government coordination is further facilitated by the Standing Committee on Climate Change within the National Assembly that was first established in 2011 (Nachmany et al., 2014). The current 16-person committee comprises members from four political parties (GOP, 2015).

Research and action on climate change in Pakistan is also supported by a number of federal agencies and research institutes. Prominent among these are the Pakistan Meteorological Department and the Global Change Impact Studies Centre. Originally established by the federal government in 2002, the Global Change Impact Studies Centre was granted official status as an autonomous climate change research centre in March 2013. Both of these organizations have undertaken scientific research on the potential biophysical impacts of climate change. Other key federal agencies and research institutes include the Pakistan Council of Research in Water Resources and the Climate Change, Alternate Energy and Water Resources Institute, which is part of the Pakistan Agriculture Research Council. The Pakistan Agriculture Research Council is also actively engaged in climate change activities. Other federal agencies that play a role in support adaptation planning and action include the Planning Commission, the Water and Power Development Authority, the Pakistan Environmental Protection Agency, and the National Institute of Oceanography.

### **3.4 National-level sectoral policies**

Climate change action has been integrated into a small number of Pakistan's federal policies, including the National Environmental Policy, the National Sustainable Development Strategy, the National Disaster Risk Reduction Policy, the draft national Agriculture and Food Security Policy, and—to a small degree—the National Drinking Water Policy and National Forest Policy. As indicated by the synthesis in Table 5, this review suggests that different ministries are aware of the need to integrate climate change considerations into their policies and plans but that progress toward this goal is presently



limited. Relatively few policies have identified specific actions for reducing climate change–related risks, and none of those reviewed have set targets for these actions.

Examining these policies more closely in terms of their references to and policy actions in support of adaptation efforts, the National Environmental Policy 2005 includes a section on climate change and ozone, which notes potential development by the federal government of a national climate change policy and action plan (Ministry of Environment, 2005). A revised policy reflecting the implications of the 18th Amendment has not yet been prepared.

In 2012, Pakistan released its National Sustainable Development Strategy (Khan & Pervaiz, 2012), which gives focused attention to the implications of climate change for Pakistan’s development. In terms of adaptation to climate change, it calls for “mainstreaming of climate change into national decision-making on economically important and vulnerable sectors of the economy” (Khan & Pervaiz, 2012, p. 57). The strategy also makes broad recommendations for actions that could be taken to enhance the capacity of the country to cope with climate change, such as undertaking strategic actions that will facilitate adaptation at the local level; ensuring water, energy and food security in a changing climate by devising and implementing appropriate measures in different sectors; and minimizing disaster risk through actions such as climate proofing existing infrastructure. The strategy further calls for the adoption of sustainable land management practices, strengthening of inter-ministerial coordination and building governance capacity at the national and provincial levels, promoting regional research cooperation and shared early-warning systems, and creating a national climate change fund. Specific actions to support achievement of these goals are not identified (Khan & Pervaiz, 2012).

The country’s National Disaster Risk Reduction Policy formulated in 2012 recognizes the potential threat posed by climate change throughout the document. Its objectives include “[c]reating an integrated national capacity to identify and monitor vulnerability and hazard trends including potential climate change impact” and “[p]romoting development planning that considers and addresses disaster risks alongside environmental and climate change concerns” (MOCC, 2012b, pp. 8–9). It also indicates an intention to develop an integrated multi-hazard damage and loss database to support vulnerability and risk monitoring, and strengthen climate change–focused research on glaciers and ice caps (MOCC, 2012b).

In 2013, the government released a draft national Agriculture and Food Security Policy (MNFSR, 2013) whose aims include ensuring capacity to “flexibly adapt to climate change and be resilient enough to quickly recover from shocks and emergencies” (MNFSR, 2013, p. 10). Actions needed to promote climate-smart agriculture are mentioned. The draft policy also calls for the launching of special national flagship programs to address the vulnerability of dry, flood-prone, and coastal regions of the country, but does not identify a program explicitly focused on climate adaptation (MNFSR, 2013).

With respect to water concerns, the National Drinking Water Policy 2009 simply states that “due consideration will be given to the adverse impacts of climate change in planning and

development of drinking water supply systems” (Ministry of Environment, 2009, p. 8). A draft National Water Policy was prepared in 2005, but climate change was not integrated into this document (IUCN Pakistan, 2009). The government has committed in Pakistan 2025 to addressing the country’s need for a comprehensive water strategy (MPDR, 2014).

The National Forest Policy 2010 focuses primarily on the potential for Pakistan’s forest to play a positive role in carbon sequestration through afforestation activities, but also calls for forestry education and for research institutions to increase capacity to cope with climate change impacts (Ministry of Environment, 2010). Climate change mitigation and adaptation are not addressed in Pakistan’s National Power Policy 2013.

<b>Table 5 – Integration of climate change into national sectoral strategies, policies and plans: An assessment of progress</b>				
<b>Policies</b>	<b>Absent</b>	<b>Climate change mentioned as potential risk</b>	<b>Possible actions for reducing risk identified</b>	<b>Targets identified for specific adaptation measures</b>
National Environmental Policy		✓		
National Sustainable Development Strategy		✓	✓	
National Disaster Risk Reduction Policy		✓	✓	
Draft national Agriculture and Food Security Policy		✓	✓	
National Drinking Water Policy		✓		
National Forest Policy		✓		
National Power Policy	✓			

### **3.5 Subnational policies**

Implementation of Pakistan’s NCCP is expected to largely take place at the provincial level, with the federal government providing coordination and fundraising support (Shaikh & Tunio, 2015). The policy explicitly calls for all relevant ministries and agencies at the provincial, territorial, and local levels to develop plans and programs to support its implementation (MOCC, 2012a; CCD, 2013). To date, however, development of climate-related policy at the subnational level has largely not progressed.

In Punjab Province, the government’s development program for 2014–15 identifies increasing understanding and awareness of climate change as an environment-related objective, and addressing “climate change and biodiversity preservation” as one of its forestry-related objectives (Government of Punjab, 2014, p. 359). In the past, the Government of Punjab sought to build capacity to engage in the Clean Development Mechanism, including making plans to establish a climate change cell in its Environmental Protection Agency (Punjab Environmental Protection Agency, 2012). In Sindh, the Department of Forest, Environment and Wildlife has included completion of a study on the impacts of climate change, including floods and rains in 2010 and 2011, in its Annual Development Programme (Government of Sindh, 2014). Despite these commitments, neither Punjab nor Sindh has yet taken concrete actions to support the implementation of climate change adaptation measures (World Wild Fund for Nature Pakistan [WWF-Pakistan], 2015). Climate change–related initiatives of the Governments of Balochistan and Khyber Pakhtunkhwa have not been identified.

The limited action on climate change by provincial governments is symptomatic of their general lack of resources and capacity to deliver public policies—a situation that has only been exacerbated by the additional responsibilities stemming from the devolution process (Diamond, 2015). For climate change (and other development issues) to be effectively addressed by Pakistan’s provinces, greater capacity building and institutional development must take place (World Bank, 2013). There is also a need for experience to be gained in the development of adaptation plans. An example of ongoing efforts to address this need is the Climate Leadership for Effective Adaptation and Resilience project being implemented by Leadership for Environment and Development (LEAD) Pakistan in the provinces of Sindh and Punjab (described in Annex B), which is working to develop local adaptation plans of action in 12 districts (Gillick, 2013).

## 4. Current and planned adaptation programs and projects

Significant investment by the federal and provincial governments, supported by the international community, is required to achieve the adaptation goals and priorities identified in the country’s various policies and plans. At present, however, a relatively modest number of dedicated adaptation programs and projects are under way, particularly in comparison to other South Asian countries. The orientation of these projects and the level of adaptation finance flowing into the country are described in this section.

### 4.1 Adaptation projects and programs

To assess the range of discrete adaptation projects and programs currently being implemented in Pakistan, we undertook an extensive review of websites of UN agencies,

multilateral development banks, bilateral development agencies, and international and national NGOs. The research focused on projects and programs that specifically aim to support climate change adaptation, as reflected in their title, goals statement, and/or objective statement. A detailed description of the methodology used in the review is provided in Annex A.

The analysis identified a total of 26 projects under way or recently completed in Pakistan. As summarized in Table 6, the largest proportion of these projects are being undertaken exclusively within Pakistan, but the country is also engaged in a sizable number of large regional projects. Many of the projects under way in Pakistan continue to focus on undertaking research to understand the country's vulnerability to the impacts of climate change. Capacity building and the development of appropriate governance structures for managing climate change are also significant focuses. Fewer projects are directly engaged in supporting the implementation of priority adaptation measures. A full list of the projects identified in this review is provided in Annex B.

<b>Table 6 – Sector of focus of current adaptation projects and programs identified</b>					
<b>Sector of focus</b>	<b>Priority sectors for adaptation</b>	<b>Number of projects*</b>	<b>Percentage of total projects**</b>	<b>Geographical scale</b>	
Agriculture	✓	6	23%	National projects	12
Aquaculture	✓	1	4%	Regional projects	10
Biodiversity protection	✓	1	4%	Global projects	4
Ecosystem conservation	✓	1	4%	Total	26
Watershed management	✓	4	15%		
Freshwater supply	✓	3	12%		
Coastal zone management	✓	2	8%		
Disaster risk management	✓	5	19%		
Gender		1	4%		
Private sector		1	4%		

Insurance		1	4%
Buildings		1	4%
Urban areas	✓	4	15%
Climate information		2	8%
Government		4	15%
Civil society		2	8%
Multisectoral		2	8%
* Individual projects may address one or more sectors.			
**Calculated by the number of projects active in this sector relative to the total number of projects identified, reflecting the potential for a single project to be addressing adaptation needs in more than one sector.			

Reflecting concerns regarding Pakistan's growing per capita water scarcity and the potential impact of climate change on its future water resources, a majority of the projects identified have a strong focus on freshwater and watershed management. In particular, Pakistan is engaged in several large regional projects looking at the potential impacts of climate change water resources in the Hindu Kush–Himalayan mountain ranges. Among these are two projects being implemented by the International Centre for Integrated Mountain Development (ICIMOD): the Himalayan Climate Change Adaptation Programme, which has a strong emphasis on understanding the uncertainties associated with the impact of climate change on the water resources of the major river basins of the Hindu Kush–Himalayan region, and the Rural Livelihoods and Climate Change in the Himalayas project, which seeks to increase the resilience of poor and vulnerable mountain communities.<sup>12</sup> Similarly, the Himalayan Adaptation, Water and Resilience project being implemented as part of the CARIAA program combines research and the piloting of community-based activities to help build the adaptive capacity of poor populations living within the river basins fed by the Hindu Kush–Himalayan mountains, including the Indus Basin. In addition to these regional projects, the GOP and the Adaptation Fund are co-financing the Reducing Risks and Vulnerabilities from Glacial Lake Outburst Floods in Northern Pakistan project being implemented by the UNDP. It too has a strong focus on building the capacity of federal and local government institutions and local communities, as well as implementing pilot community-level activities, in order to improve risk mapping, early-warning systems, and disaster planning. In collaboration with the UNDP, Pakistan has submitted a request to the Green Climate Fund to finance a second phase of this project (UNDP, 2015).

<sup>12</sup> In addition to these initiatives, in January 2016, ICIMOD announced funding for the Agricultural Water, Energy and Hazard Management in the Upper Indus Basin for Improved Livelihood project, the implementation of which will be led by the WWF. Other national partners are the Pakistan Council of Research in Water Resources, Karakoram International University, and the Gilgit Baltistan Disaster Management Authority. Taking place in Upper Hunza, Gilgit Baltistan, the project seeks to improve agricultural water management and reduce the vulnerability of communities to natural hazards (ICIMOD, 2016).

A relatively significant number of projects in Pakistan focus on improving resilience within the country's rapidly expanding urban areas. Prominent among these initiatives is the Managing Climate Risk for Urban Poor project, a multi-million-dollar regional initiative implemented by the Rockefeller Foundation. It is working in 25 medium-sized cities in six Asian countries, including two in Pakistan, to strengthen capacity to consider climate change risks in planning processes. It particularly focuses on new investments in physical infrastructure, such as flood protection and wastewater systems. A more targeted initiative is the Mainstreaming Climate Change Adaptation through Water Resource Management in Leather Industrial Zone Development project being implemented in Sialkot District of Punjab Province. Working specifically with the region's large leather industry, the project also aims to integrate climate change adaptation into urban development planning while demonstrating technologies that improve water treatment and conservation. These projects highlight the importance of improving capacity within government and industry to adapt to the anticipated impacts of climate change on Pakistan's large cities.

Promoting a more resilient agriculture sector was either the focus or an important component of the largest number of projects identified through the review, and the focus of most of the projects being implemented exclusively within the borders of Pakistan. The majority of these projects, though, have a strong research focus; three are in fact being implemented under an umbrella program financed by IDRC. Significantly less attention is being given to building the capacity of farmers to adapt to the impacts of climate change through the adoption of climate-smart agricultural practices. An exception to this observation is the recently launched Sindh Irrigated Agriculture Productivity Enhancement Project with its strong focus on infrastructure investments intended to improve irrigation water management in light of the increasing per capita scarcity of water within Pakistan. None of the projects identified direct attention to the needs of those whose livelihoods depend primarily on livestock and rangelands management.

Disaster risk management emerges as a priority objective of a number of projects, such as the aforementioned Reducing Risks and Vulnerabilities from Glacial Lake Outburst Floods in Northern Pakistan project. Capacity in this area is also being built within the National Disaster Management Authority through the Disaster Risk Insurance for Vulnerable Communities in Pakistan project. It is helping to design an insurance fund and develop an insurance strategy to guide the formation and operation of this fund. In addition to these discrete adaptation projects, a number of other initiatives are under way in Pakistan to improve its early-warning systems and disaster risk management capacities, particularly in light of the consequences of the 2010 super-flood. Among these initiatives are the UN's Disaster Risk Management Support project and efforts to strengthen Balochistan's Provincial Disaster Management Authority with financing from the Khyber Pakhtunkhwa, Federally Administered Tribal Areas and Balochistan Multi-Donor Trust Fund administered by the World Bank. While increasing resilience to climate change may not be specifically stated as an objective of these initiatives, they may be expected to make a positive contribution toward this goal.

A number of gaps in adaptation programming were also identified through this review. From a geographical perspective, although Pakistan's coastal region is vulnerable to a range of climate risks and the site of significant economic activity and critical infrastructure, very limited attention has been given to promoting adaptation efforts in this area. Similarly, few adaptation initiatives appear to be targeting Pakistan's arid and hyper-arid regions, which are among the most vulnerable areas of the country. Within its Framework for implementing the NCCP, for instance, the government identifies a number of priority adaptation actions to be implemented in Balochistan, particularly in the agricultural sector, in recognition of its vulnerability to climate change due to its arid climate. The limited number of discrete adaptation projects under way in this province could be linked to the ongoing security challenges within this region. One of the few examples of programming specifically focused on addressing needs in Pakistan's arid areas is the CARIAA program's Pathways to Resilience in Semi-Arid Economies project. As part of a multi-country initiative, the project is undertaking research in Pakistan to better understand climate risks and opportunities, and enable the use of this knowledge to inform policies and investment decisions.

From a sectoral perspective, notably absent within the projects identified is a focus on addressing the potential implications of climate change for Pakistan's health sector. As well, although also identified as a priority area for adaptation action within the NCCP, none of the projects directed significant attention to enhancing the resilience of forest ecosystems. As well, despite Pakistan's status as a biodiversity hotspot, relatively little effort appears to be under way to integrate climate change considerations into efforts that promote ecosystem conservation and biodiversity protection. The gender dimensions of climate change, and how to enhance the adaptive capacity of Pakistani women, are also largely overlooked. This finding is particularly troublesome given Pakistan's weak performance on integrating women's needs into disaster risk reduction and recovery efforts, as reflected in its poor ranking on the South Asia Women's Resilience Index.

## 4.2 Climate finance

Pakistan is a modest recipient of international climate change adaptation financing, which is the primary source of funding for its adaptation initiatives. The majority of international financial flows is oriented toward mitigation-focused initiatives. Climate Funds Update (2015), for example, notes that as of April 2015, Pakistan had received US\$20.8 million in funding from dedicated multilateral and bilateral climate funds, of which US\$7.3 million (or 35%) had been directed toward adaptation initiatives financed through the Adaptation Fund and the Special Climate Change Fund. Compared to other South Asian countries, Pakistan has received significantly less funding for climate change action from dedicated climate funds (see Figure 1).

A similar picture emerges from an examination of the climate financing data tracked by the Organisation for Economic Co-operation and Development (OECD). It reports that in 2013, a

total of US\$192.4 million in climate-related funding from bilateral and multilateral sources was approved for expenditure in Pakistan, of which US\$28.6 million (14.9%) was oriented primarily toward adaptation. These figures are biased in part by a large hydroelectric power project financed by the World Bank. The sectors that received the greatest amount of financial support for adaptation between 2010 and 2013 were transportation and storage, followed by water supply and sanitation. Little funding was allocated to the agriculture sector, despite it being identified by Pakistan as a priority sector for adaptation efforts. Looking more closely at the financial support received from bilateral donors, as indicated in Figure 2, there has been a general trend toward financing projects for which support for climate change adaptation was a significant, not principal, part of the activity (OECD, 2015).

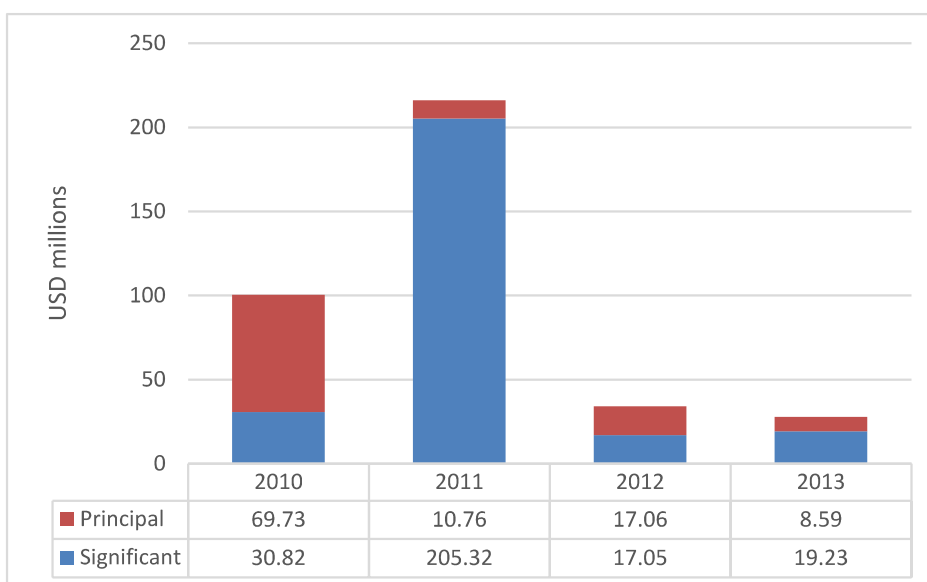
Funding by the GOP for adaptation projects and programs has been quite limited. While it has co-financed projects such as Reducing Risks and Vulnerabilities from Glacier Lake Outburst Floods in Northern Pakistan, few resources have been allocated to addressing climate change through the national budget. Actual expenditures of the CCD (now MOCC) in fiscal year 2011–12 were 334,639,000 Pakistani rupees (approximately CA\$4.22 million) and increased tenfold in 2012–13 to about 3,259 billion Pakistani rupees (approximately CA\$41 million). However, budgeted and forecasted expenditures for the fiscal years of 2013–14 to 2016–17 foresee a return to expenditure levels of about 300.0 million Pakistani rupees (approximately CA\$3.78 million) per year (Ministry of Finance, 2014b). Additional funding could be made available in the future through a dedicated climate fund, reflecting plans contained in the Framework for Implementation of Climate Change Policy (CCD, 2013). A background study to support the establishment of this fund was undertaken in 2013 with the support of the Climate and Development Knowledge Network (CDKN) (Parry, Keller, & Murphy, 2013), but further progress toward this objective does not seem to have been made.





\*Reducing emissions from deforestation and forest degradation

**Figure 1 – Comparison of approved funding from designated multilateral and bilateral climate funds to countries in South Asia since 2003, in USD millions, as of April 30, 2015 (based on Climate Funds Update, 2015)**



**Figure 2 – Bilateral development aid in Pakistan identified as having adaptation support as its principal or significant objective,<sup>13</sup> 2010 to 2013, in USD millions, constant 2012 prices (based on OECD, 2015)**

<sup>13</sup> Based on the definitions used by the OECD Rio Markers system, activities are considered to have supporting adaptation as their principal objective “when promoting the objectives of the UNFCCC is stated in the activity documentation to be one of the principal

## 5. Networks and communities of practice

Adaptation policy and practice are shaped by a relatively small number of organizations and institutions outside of federal and provincial government ministries, agencies, and research institutes. Prominent among these are several national and international NGOs, particularly LEAD Pakistan, the World Wild Fund for Nature (WWF), the International Union for the Conservation of Nature (IUCN), and Oxfam. LEAD Pakistan has historically led efforts to establish broader communities of practice around climate change, establishing the Knowledge Network on Climate Change in March 2008. Through a moderated email listserv, the network consists of graduates of LEAD’s climate change programs (LEAD Pakistan, n.d.). Around the same time it also initiated the National Network on Climate Change, but this network no longer appears to be active.

Adaptation efforts in the country are also informed by a number of research-focused organizations, several of which are affiliated with academic institutions. Prominent among these are the Centre for Climate Research and Development at COMSATS Institute of Information Technology Islamabad, the Pakistan Institute of Development Economics at Quaid-i-Azam University Campus, and the Center for Advanced Studies in Agriculture at the University of Agriculture, Faisalabad—the latter of which has established a Climate Change Chair that will undertake analysis related to climate change risks and impact. Among the independent research institutes advancing adaptation knowledge and action in Pakistan is the Sustainable Development Policy Institute, which is leading implementation of the Pathways to Resilience in Semi-Arid Economies project in Pakistan, among other initiatives.

While these organizations are helping to advance adaptation efforts in Pakistan, active collaboration and knowledge sharing between research institutes engaged on climate change issues is limited. This has been identified as an impediment to efforts to strengthen adaptation planning and action in Pakistan (CCD, 2014).

## 6. Conclusions

To achieve its vision of becoming an upper-middle-income country by 2025, Pakistan needs to develop policies and programs that promote an economy and society resilient to a range of shocks and stresses, including those induced directly and indirectly by climate change. The GOP has taken steps toward this objective by re-establishing the MOCC and preparing its NCCP and associated Framework. These steps set the direction of the country’s efforts to address climate change and identify priority actions to be taken in the immediate, short,

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reasons for undertaking the activity. In other words, the activity would not have been funded but for that objective. Activities marked ‘significant’ have other prime objectives, but have been formulated or adjusted to help meet climate concerns” (OECD, 2015, p. 3).

medium, and long terms. While efforts to address climate change were largely seen to be “put on the backburner” immediately following the change in government in 2013 when the MOCC became the CCD (R.S. Khan, 2015), reversal of this decision suggests that greater momentum toward implementation of these climate change commitments will occur in the future. This new momentum may lead to a review of current climate-related commitment and priorities, as well as the development of a National Adaptation Plan.

However, a number of barriers to progress on adaptation action in Pakistan remain to be overcome. Most prominent among these is the need to strengthen institutions and build capacity at the national and subnational levels. Existing institutional bodies at the federal level lack the required capacity to fulfill their intended roles and support the implementation of existing policy commitments (CCD, 2013; Parry et al., 2013). In particular, there is a need to strengthen the capacity of the MOCC so that it may better support adaptation actions by other federal ministries and the provincial governments now responsible for adaptation planning and implementation within their jurisdictions. Greater awareness of the implications of climate change for achieving Pakistan’s development goals is also required to more strongly advance integration of climate risk considerations into policy and planning processes within key ministries such as Finance, Water and Power, Planning and Development, Food Security, and Health Services Regulation and Coordination. Systems for monitoring and evaluating progress toward achievement of the goals and objectives outlined in the NCCP and associated Framework also remain to be established.

While strong institutions are needed at the federal level, there is perhaps even greater need to build knowledge and capacity at the provincial level, given the transition of responsibility for key sectors such as agriculture, water, health, and education under the 18th Amendment. At present, climate change policy and planning at the provincial level is quite limited, and the risks associated with this process are weakly understood. Greater effort is needed to mainstream climate change into provincial decision-making if Pakistan is to effectively prepare for the impacts of climate change.

A number of critical knowledge gaps also remain to be addressed. Fundamental research remains to be done to better understand how projected changes will influence the future availability of surface water and groundwater resources, and drought risk in the country’s extensive arid, semi-arid, and hyper-arid regions. Limited research has been conducted on the potential implications of climate change for the country’s main agricultural crops and its livestock sector. Comprehensive vulnerability assessments for at-risk regions and specific sectors, particularly for water resources and agriculture, still need to be completed. Alongside these efforts there is also a need to deepen understanding of potential adaptation strategies and options available to different sectors and groups.

Alongside efforts to build a knowledge base within Pakistan, there is a need to create a stronger culture of knowledge exchange and collaboration among various government

research institutes, NGOs, and academic institutes. The absence of an active community of practice focused on climate change in Pakistan creates a further barrier to adaptation, given the critical role of iterative learning, knowledge sharing, and interdisciplinary collaboration in advancing vulnerability reduction efforts. Strengthening existing relationships and creating more opportunities for knowledge creation and exchange could help address this concern. As well, there is a need to build relationships with practitioner networks active in other fields, particularly the private sector, to encourage the incorporation of climate adaptation considerations into their work. Greater efforts are also needed to inform the general public of the risks posed by climate change and the potential means by which these risks may be ameliorated.

As it strives to advance its adaptation efforts, Pakistan will require greater support from the international community. To date, a relatively limited number of adaptation-focused projects and programs have been implemented in Pakistan—particularly in comparison to the level of action in other South Asian countries and given its high ranking on different vulnerability indices. As noted by the GOP in its Framework, “A major challenge for Pakistan in this area to date has been the lack of [donor] interest in environment and climate change issues” (CCD, 2013, p. 7). Pakistan’s major development partners are primarily directing their assistance to meeting the country’s range of immediate development priorities. The United States, for example, is focused on addressing development needs such as education (particularly for women and girls), public health, energy provision, and peacebuilding and security (United States Agency for International Development, 2014). Investments in projects and programs that build infrastructure, promote peace and security, strengthen disaster risk management capacity, improve agricultural production, and enhance water resource management can contribute to vulnerability reduction in Pakistan and provide adaptation co-benefits. However, the extent to which future climate risks are being considered in the design and implementation of these initiatives is unclear, raising the possibility that some of today’s investments might prove to be maladaptive over time.

Climate change poses a significant threat to Pakistan—one that has the potential to accentuate existing food, water, and energy security concerns as well as increase tensions between social groups and regions. Greater effort is needed to better understand and communicate the risk posed by climate change; identify and promote options for effectively responding to climate change while advancing sustainable development; and strengthen the capacity of different levels of government, the private sector, and civil society to engage in adaptation planning and action. Investments in these actions will better enable Pakistan to achieve its development objectives in both the immediate future and the longer term.

## 7. Annexes

### Annex A: Methodology

This section presents the research parameters established to guide development of the standardized reviews of current adaptation action in the CARIAA program's countries of engagement. It sets forward definitions used in this study, particularly with respect to the identification, selection, and classification of programs and projects considered in the review. This methodology was previously developed by the International Institute for Sustainable Development to support a review of current and planned adaptation action in 12 regions, which was completed in 2011 for the Adaptation Partnership. Modest updates to this original methodology were made to support the current review undertaken for the CARIAA program. For more information, see Adaptation Partnership (2015).

#### A.1 Adaptation actions included in the review

Within the review, adaptation action was defined as “policies, programs, and projects designed and implemented specifically to address the current and projected impacts of climate change.” Therefore, the review focused on examining policies, programs, and projects in which specific reference has been made to supporting adaptation to climate change or climate risk reduction.

Consistent with this definition, the review gave attention to discrete, time-bounded programs and projects designed and implemented specifically to support preparation for or implementation of practical adaptation actions within the broader context of achieving development objectives. Therefore, at least one of the following terms appeared in the title, goals statement, or objectives statement of each program or project included in the review: “adaptation,” “climate change adaptation (CCA),” “climate risk management,” or “climate vulnerability reduction.”

Based upon these parameters, the following types of programs and projects were not included in the review: disaster risk reduction, prevention, or management projects, unless they specifically reference that this activity is being undertaken in support of CCA; primary scientific research studies (for example agrology, botany, or meteorology) on the potential impacts of climate change (for example on changes in crop production, glacial melt rates, or typhoon patterns); long-term monitoring efforts (whether climatic or socioeconomic) needed to inform decision-making; stand-alone workshops, conferences, and training programs; and capacity building to support participation in processes related to the UNFCCC (such as training for negotiators, enabling activities to prepare reports).

The following additional parameters were established to guide the selection of programs and projects incorporated in the study:

- *Official start date.* To ensure that only “current” projects were included in review, selected projects needed to have begun on or after January 1, 2012, with the

exception of projects that began before this date but were still ongoing as of January 1, 2015.

- *Official end date.* Ongoing projects are those whose official completion day is on or after January 1, 2015. Projects completed after January 1, 2012, were classified as completed.
- *Funding characteristics.* Projects with a value of US\$100,000 or more were included in the study. However, reflecting the greater level of adaptation action underway in Bangladesh and India, the minimum value of projects included in the reviews for these two countries was raised to US\$250,000. Projects financed by international and domestic sources of funding were considered.

Additionally, identified projects were classified by geographical scale in accordance with the following definitions:

- **Global:** Projects involving countries throughout the world, including the profiled country.
- **Regional:** Multi-country projects within a particular subregion, be it a continent or subcontinental area (such as South Asia or West Africa), that includes the profiled country.
- **National:** Projects occurring within one country.

## **A.2 Type of project being undertaken**

To better understand the orientation of the projects underway in the countries examined as part of the review, projects were classified by type using the following definitions:

- *Research.* Encompassing efforts to develop new knowledge or organize existing information so as to increase understanding of the links among climate change, human society, and ecosystems and inform adaptation decision-making.
- *Assessment.* Encompassing risk, impact, and vulnerability assessments, as well as monitoring of ecological and societal trends.
- *Capacity building.* Encompassing the provision of technical training, technical assistance, institutional strengthening, and education.
- *Knowledge communication.* Encompassing efforts to share information, knowledge, and practices related to CCA, including awareness raising and engagement of media.
- *Policy formation and integration.* Encompassing efforts to inform, develop, and implement CCA plans, strategies, frameworks, and policies at the local, subnational, national, and international levels.
- *Field implementation.* Encompassing physical measures to reduce vulnerability to the impacts of climate change, including the implementation of pilot projects, construction of infrastructure, development and modification of technologies, and management of physical resources.

- *Community-based adaptation.* Encompassing actions that directly engage community members in efforts to understand, plan for, and respond to the impacts of climate change.

### A.3 Sector or area of focus

To further inform analysis of the range of adaptation action taking place in each country reviewed, programs and projects examined in the study were classified by sector using the following definitions:

1. **Food, fibre, and forests.** Defined as the management and use of terrestrial natural resources to directly improve human well-being. Its subcategories are:
  - *Agriculture.* Encompassing subsistence agriculture, commercial agriculture, and the rearing of confined domestic animals.
  - *Pastoralism.* Encompassing the use of domestic animals as a primary means for obtaining resources from habitats (UNEP, 2007), particularly in nomadic and semi-nomadic communities.
  - *Forestry.* Encompassing afforestation, reforestation, agroforestry, commercial forestry, community-based forest management, and woodland management.
  - *Fire management.* Encompassing monitoring, planning, and management to address the impact of fires on settlements and ecosystems, including forested and grassland ecosystems.
  - *Aquaculture.* Food production through the rearing of aquatic animals, such as fish, crustaceans, and molluscs, or the cultivation of aquatic plants in natural or controlled marine or freshwater environments.
2. **Ecosystems.** Defined as a system of living organisms interacting together and with their physical environment, the boundaries of which may range from very small spatial scales to, ultimately, the entire Earth (IPCC, 2001). Its subcategories are:
  - *Biodiversity protection.* Encompassing activities related to the maintenance of living organisms at various spatial scales, including the establishment and protection of parks and bioreserves.
  - *Ecosystem conservation.* Encompassing efforts to *maintain* the health of particular ecosystems, such as wetlands, grasslands, forests, mangroves, and coral reefs.
  - *Ecosystem restoration.* Encompassing efforts to *restore* the health of particular ecosystems, such as wetlands, grasslands, forests, mangroves, and coral reefs.
3. **Freshwater resources.** Defined as the management and use of freshwater contained in terrestrial ponds, lakes, rivers, and watersheds, among others. Its subcategories are:
  - *Freshwater fisheries.* Encompassing the catching, packing, and selling of fish and shellfish derived from lakes, rivers, and ponds, as well as through freshwater aquaculture.

- *Watershed management.* Encompassing management of the basins that supply water to different streams, rivers, lakes, and reservoirs, including integrated watershed management.
  - *Freshwater supply.* Encompassing efforts to access and preserve freshwater for human consumption and use, including drinking water sources, groundwater resources, rainwater harvesting, and water infrastructure such as wells, dams, and dikes.
4. **Oceans and coastal areas.** Defined as the management and use of coastal areas and oceans. Its subcategories are:
- *Coastal zone management.* Encompassing the management of land and water resources in coastal areas, including through integrated coastal zone management and the establishment and maintenance of coastal infrastructure.
  - *Marine management.* Encompassing the management and use of offshore ocean and sea resources.
  - *Marine fisheries.* Encompassing the catching, packing, and selling of fish, shellfish, and other aquatic resources found in the oceans and seas, including through marine and coastal aquaculture.
5. **Disaster risk management.** Defined by the United Nations International Strategy for Disaster Reduction (2009) as the “systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster” (p. 10). It includes emergency response measures, preparation for extreme events and early warning systems. No sub-categories were established in relation to this macro project category.
6. **Migration and security.** Defined as efforts to support the movement of people and maintain their personal security in the face of incremental climate changes or climate shocks.
- *Migration.* Encompassing preparations for and responses to the potential movement of people from one location to another due to climate change impacts.
  - *Security.* Relating to personal security and freedom from violence, crime, and war due to natural and human-induced disasters (UNEP, 2007) and encompassing peace building, conflict reduction, and conflict avoidance.
7. **Gender.** Defined as the social attributes and opportunities associated with being male and female and the relationships between women and men, and girls and boys, as well as the relations among women and among men. These attributes, opportunities, and relationships are socially constructed and are learned through socialization processes (United Nations Entity for Gender Equality and the Empowerment of Women, n.d.). This category includes efforts to understand the vulnerability of women to the impacts of climate change, gender-sensitive adaptation strategies, and measures to improve the



situation of women at the local and policy level, including through gender mainstreaming. No subcategories were established in relation to this macro project category.

8. **Business.** Defined as the purchase and sale of goods and services with the objective of earning a profit. Its subcategories are:
  - *Tourism.* Encompassing the adjustment and development of tourist facilities and operations to account for current and future vulnerabilities, including these actions in relation to ecotourism.
  - *Private sector.* Encompassing potential impacts of climate change and potential adaptation strategies on the diverse activities underway in the portion of the economy in which goods and services are produced by individuals and companies including industry, mining, and other economic sectors.
  - *Trade.* Encompassing the exchange of goods and services within and between countries.
  - *Insurance.* Encompassing the development, testing, and adjusting of insurance and risk-management schemes, including weather-based index systems.
  
9. **Infrastructure.** Defined as the basic equipment, utilities, productive enterprises, installations, institutions, and services essential for the development, operation and growth of an organization, city or nation (IPCC, 2001). Its sub-categories are:
  - *Energy.* Encompassing energy-related systems and infrastructure, including small-scale and large-scale energy generation through hydroelectric power generation, wind, solar, and other forms of traditional and new energy sources, as well as transmission networks.
  - *Transportation.* Encompassing the components of the system required to move people and goods, including roads, bridges, railway lines, shipping corridors, and ports.
  - *Waste management.* Encompassing sanitation, sewage systems, drainage systems, and landfills.
  - *Buildings.* Encompassing actions related to built structures such as houses, schools, and offices, including changes to building codes, building practices, and green ways of construction.
  
10. **Human settlements.** Defined as a place or area occupied by settlers (IPCC, 2001). Its subcategories are:
  - *Peri-urban areas.* Encompassing the outskirts of urban centres and the transition zones between rural and urban areas.
  - *Urban areas.* Encompassing municipalities, towns, and cities, as well as areas in these centres (such as slums).
  - *Rural areas.* Encompassing villages and other small settlements, as well as rural landscapes and integrated rural development.

11. **Human health.** Defined as a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity (WHO, n.d.). It includes efforts to assess vulnerabilities to and the impacts of climate change on human health directly and indirectly, and the development and implementation of appropriate adaptation strategies at the local, regional, and national levels. No subcategories were established in relation to this macro project category.
12. **Climate information services.** Defined as the production and delivery of authoritative, timely, and usable information about climate change, climate variability, climate trends, and impacts to different users at the local, subnational, national, regional, and global levels. It includes efforts to develop, adjust, and provide short- and long-term climate forecasts, including climate change projections, to different audiences. No subcategories were established in relation to this macro project category.
13. **Governance.** Defined as the institutions (laws, property rights systems, and forms of social organization) through which societies define and exercise control over resources (UNEP, 2007). Its subcategories are:
- *Government.* Encompassing efforts to build the capacity of government officials, either at the national or subnational level, to prepare for and facilitate adaptation to climate change, including through the development of policies, plans, frameworks, and strategies, as well as the establishment and operation of climate change trust funds.
  - *Civil society.* Encompassing efforts to build the capacity of the public, including NGOs, to understand, prepare for, and respond to climate change.
14. **Social protection.** Based on DFID's definition of social protection, projects within this category focus on three sets of instruments to address chronic poverty and vulnerability:
- *Social insurance.* Referring to "the pooling of contributions by individuals in state or private organizations so that, if they suffer a shock or change in circumstances, they receive financial support."
  - *Social assistance.* Encompasses "non-contributory transfers that are given to those deemed vulnerable by society on the basis of their vulnerability or poverty."
  - *Workplace safety.* Involves the "setting and enforcing of minimum standards to protect citizens within the workplace" (DFID, 2006, p. 1).
- Adaptation projects that focus on labour market interventions and social assistance would be included in this category. No subcategories were established in relation to this macro project category.
15. **Multisectoral.** Defined as actions that simultaneously address more than one sector in one or multiple locations. It includes efforts that address more than one sector, which are challenging to tease apart, and in the context of this review includes large, multi-

country projects in which the specific sector of focus is nationally determined and, therefore, varies from country to country. No subcategories were established in relation to this macro project category.

16. **Other.** To capture areas of focus not clearly identified in the previous categories.

## Annex B: Projects and programs

Projects working to address vulnerability to the impacts of climate change in Pakistan are presented alphabetically in the table below.

Name of project	Objectives	Funder(s) and budget	Implementing agencies	Type of project	Sectors	Duration	Scale and location(s)
Building Capacity on Climate Change Adaptation in Coastal Areas of Pakistan	The project aims to implement action plans in vulnerable coastal communities that will reduce their risk due to climate change.	European Commission's Environment and Sustainable Management of Natural Resources program	LEAD Pakistan and WWF-UK	Assessment; community-based adaptation	Agriculture; aquaculture; coastal zone management; disaster risk management	January 2011 to December 2015	National
Building Climate Change Awareness in the South Asian Media	To improve media coverage of and public debate around climate change and development in South Asia by strengthening the capacity and understanding of newsmakers. Specifically its goals included: (1) increased capacity of selected mainstream journalists in South Asia to produce a greater quality and volume of reporting on climate change, with an emphasis on diverse stakeholder perspectives and "stories from the ground up"; and (2) raised capacity of news editors and producers to support climate change reporting in their outlets.	DFID and the Netherlands through the CDKN GBP 250,000	ICIMOD and the Panos Network	Capacity building	Communications and media	May 2012 to March 2014	Regional Bangladesh, India, Nepal, Pakistan, Bhutan, Sri Lanka
Building Effective Water Governance in the Asian Highlands	Working in the Asian highlands, the project aims to promote effective water resource management and integrate climate change impact analysis with vulnerability, livelihood option, and water policy assessments.	IDRC's Adaptation Research Initiative in Asia CAD 1.526 million	HELVETAS Swiss Intercooperation and Kunming Institute of Botany	Assessment; knowledge communication	Watershed management	January 2012 to approx July 2013	Regional Nepal, Pakistan, China

<p>Building the Capacity of Civil Society Organizations in Africa and Asia</p>	<p>The project aims to strengthen the effectiveness of civil society organizations to work with communities to adapt to climate change and ensure food security, to test innovative approaches that improve livelihood opportunities, and to support gender equality.</p>	<p>Canadian Department of Foreign Affairs, Trade and Development and the Aga Khan Foundation Canada through the Partnership for Advancing Human Development in Africa and Asia CAD 100 million</p>	<p>Aga Khan Development Network agencies</p>	<p>Capacity building; knowledge communication</p>	<p>Civil society</p>	<p>June 2012 to December 2017</p>	<p>Global Bangladesh, India, Pakistan, Tajikistan, Kenya, Tanzania, Uganda, Mali, Egypt, Afghanistan, Kyrgyzstan, Madagascar, Mozambique</p>
<p>Climate Change, Agriculture and Food Security in Pakistan: Adaptation options and strategies</p>	<p>To design a strategy for managing floods and related natural disasters arising from extreme and untimely weather events, and analyze the impact of climate change on the small and marginal farmers. Particular attention will be given to impacts on productivity, cropping patterns, livelihoods, and food security, and to identifying measures that could supplement local adaptive strategies.</p>	<p>IDRC</p>	<p>Pakistan Institute of Development Economics</p>	<p>Research</p>	<p>Agriculture</p>	<p>March 2012 to September 2015</p>	<p>National</p>
<p>Climate Leadership for Effective Adaptation and Resilience</p>	<p>To build the capacity of civil society in southern Pakistan to adapt to climate change. At the local level, the project will enhance the capacity of community service organizations and communities to identify their most pressing issues and influence policy formation. At the national level, networks of community service organizations and communities will be supported to collectively advocate for adaptation strategies and policies that specifically address the</p>	<p>DFID's Civil Society Challenge Fund</p>	<p>LEAD Pakistan</p>	<p>Capacity building; policy formation and integration; community-based adaptation</p>	<p>Civil society</p>	<p>August 2011 to February 2016</p>	<p>National</p>

<p>Climate Proofing Growth and Development in South Asia</p>	<p>vulnerabilities and rights of poor and at-risk communities.</p> <p>Integrate climate change adaptation and mitigation into development planning, budgeting, and delivery in national and subnational governments in Afghanistan, Bangladesh, India, Nepal, and Pakistan, by strengthening planning, budgeting, and delivery mechanisms; building awareness and capacity of stakeholders; providing technical and some implementation support; helping leverage domestic finance; and actively sharing knowledge.</p>	<p>DFID</p> <p>GBP 28.5 million</p>	<p>UNDP and Oxford Policy Management</p>	<p>Capacity building; knowledge communication; policy formation and integration</p>	<p>Government</p>	<p>October 2012 to 2019</p>	<p>Regional</p> <p>Bangladesh, India, Nepal, Pakistan, Afghanistan</p>
<p>Conservation and Sustainable Management of Biodiversity in Khyber Pakhtunkhwa</p>	<p>To strengthen the capacity of public and private actors at the provincial and district levels in Khyber Pakhtunkhwa to achieve sustainable development, conservation of biodiversity, and adaptation to climate change, building on experience gained through the implementation of pilot projects.</p>	<p>German Federal Ministry for Economic Cooperation and Development</p>	<p>Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH and the Planning and Development Department of the Government of Khyber Pakhtunkhwa</p>	<p>Assessment; capacity building; policy formation and integration</p>	<p>Biodiversity protection; ecosystem conservation</p>	<p>2012 to 2015</p>	<p>National</p>
<p>The Determinants, Impact and Cost Effectiveness of Climate Change Adaptation in Pakistan</p>	<p>The project will undertake microeconomic and political economy studies to generate information and recommendations that will enable government and other stakeholders to make informed decisions regarding the cost-effectiveness and political feasibility of different climate change adaptation interventions in the Indus Ecoregion.</p>	<p>IDRC</p>	<p>Lahore University of Management Sciences and WWF-Pakistan</p>	<p>Research</p>	<p>Agriculture; economics of adaptation</p>	<p>March 2012 to February 2015</p>	<p>National</p>
<p>Disaster Risk</p>	<p>To increase resilience to extreme</p>	<p>DFID and the</p>	<p>Munich Climate</p>	<p>Research</p>	<p>Disaster risk</p>	<p>April 2012</p>	<p>National</p>

<p>Insurance for Vulnerable Communities in Pakistan</p>	<p>climate events, the frequency of which is expected to increase due to climate change, support is being provided to the National Disaster Management Authority as it introduces financial risk mitigation measures as part of a wider effort to develop an integrated risk management system in Pakistan. Specifically, the project aims to design an insurance fund and develop an insurance strategy to guide the formation and operation of the fund.</p>	<p>Netherlands through the CDKN GBP 577,665</p>	<p>Insurance Initiative</p>	<p>management; insurance</p>	<p>to December 2015</p>
<p>Gender and Social Vulnerability to Climate Change: A study in disaster-prone areas in Sindh</p>	<p>The project will: (1) investigate the gender dimensions of socioeconomic vulnerability to climate change among rural communities of disaster-prone areas in Sindh Province; (2) assess the adaptive capacity of men and women at the community level and the social capital available to them; (3) formulate a set of gender-specific policy recommendations for inclusion in disaster management and climate change adaptation strategies and plans at the provincial and district levels; and (4) build awareness and understanding among relevant stakeholders.</p>	<p>IDRC and Royal Norwegian Embassy, Pakistan</p>	<p>Social Policy and Development Centre</p>	<p>Agriculture; disaster risk management; gender</p>	<p>March 2012 to February 2015</p>
<p>GLOBE Climate Legislators Initiative</p>	<p>This initiative is dedicated to advancing the legislative response to climate change in 33 key countries and, by doing so, to help create the political conditions for success in the UNFCCC negotiations under the Durban Platform. The initiative will strengthen the</p>	<p>DFID and the Netherlands through the CDKN GBP 167,530</p>	<p>Policy formation and integration</p>	<p>Government</p>	<p>September 2012 to December 2013 Global Bangladesh, India, Nepal, Pakistan, Ethiopia, Kenya, Colombia, El</p>

<p>domestic response to climate change in participating countries, assisting them to enact climate-related legislation which can enable the implementation of climate-compatible development policies and plans. A key focus, particularly in developing countries, will be to improve legislation to increase resilience to the impacts of climate change and to reduce disaster risk. By progressing national climate change legislation, it is hoped that countries can be more ambitious in the international negotiations and create greater links between legislators and negotiators.</p>	<p>Salvador, Jamaica, Mozambique, Peru, Rwanda</p>
<p>Groundwater Resilience to Climate Change and Abstraction in the Indo-Gangetic Basin</p>	<p>The project aimed to develop a strategic overview assessment of the occurrence and status of groundwater resources in the Indo-Gangetic basin and strengthen the evidence base linking groundwater resources, climate and abstraction, and emerging policy responses.</p>
<p>Department for International Development</p>	<p>British Geological Survey, Indian Institute of Technology Kharagpur, Institute for Social and Environmental Transition (ISET) – Nepal, ISET-International, MetaMeta, National Institute of Hydrology, Roorkee (India), Overseas Development Institute, University College London, and University of Dhaka</p>
<p>GBP 565,200</p>	<p>Research; knowledge communication</p>
<p>Research; knowledge communication</p>	<p>Freshwater supply; climate information</p>
<p>June 2012 to September 2014</p>	<p>Regional</p>
<p>Regional</p>	<p>Bangladesh, India, Nepal, Pakistan</p>
<p>Watershed</p>	<p>2014 to</p>
<p>Research; ICIMOD;</p>	<p>Regional</p>
<p>DFID and IDRC</p>	<p>Its overall goal is to contribute to</p>
<p>Himalayan</p>	<p>Research; Watershed</p>



Adaptation, Water and Resilience	enhanced climate resilience and adaptive capacities of the poor and vulnerable women, men, and children living in these river basins by leveraging research and pilot outcomes to influence policy and practice to improve their livelihoods.	through CARIAA CAD 13.5 million	Bangladesh Centre for Advanced Studies; The Energy and Resources Institute; Climate Change, Alternate Energy and Water Resources Institute of the Pakistan Agricultural Research Council; Alterra, Wageningen University and Research Centre, the Netherlands	capacity building; knowledge communication	management; multisectoral	2019	Bangladesh, India, Nepal, Pakistan
Himalayan Climate Change Adaptation Programme	The program aims to: (1) increase understanding of the uncertainties influencing climate change scenarios and water availability and demand projections for parts of major river basins in the region, and to encourage use of the knowledge thus created; (2) enhance capacities to assess, monitor, communicate, prepare for, and undertake actions to respond to challenges and opportunities from impacts of climate change and other drivers of change; and (3) make concrete and actionable proposals on strategies and policies (with particular reference to women and the poor) for uptake by stakeholders, including policymakers.	Norwegian Ministry of Foreign Affairs and the Swedish International Development Cooperation Agency	Led by: Center for International Climate and Environmental Research, ICIMOD, and GRID-Arendal  In Pakistan: Aga Khan Rural Support Programme, International Water Management Institute, Pakistan Agriculture Research Council, WWF International	Research; assessment; knowledge communication; community-based adaptation	Agriculture; watershed management; climate information	September 2011 to December 2017	Regional  Bangladesh, India, Pakistan, China

<p>Mainstreaming Climate Change Adaptation through Water Resource Management in Leather Industrial Zone Development</p>	<p>To reduce vulnerability and build resilience through integration of climate change adaptation into urban development. Specific components of the project aim to: (1) mainstream adaptation into urban and rural development planning; (2) build the capacity of targeted communities and leather business owners; (3) implement the Sialkot District and Sialkot urban plan; (4) disseminate information; and (5) demonstrate technology for water treatment and conservation in the pilot Sialkot Tannery Zone.</p>	<p>Special Climate Change Fund, United Nations Industrial Development Organization, and Sialkot Tannery Association</p>	<p>United Nations Industrial Development Organization, Sialkot Tannery Association, and the irrigation and environment departments of the Government of Punjab</p>	<p>Capacity building; policy formation and integration</p>	<p>Freshwater supply; private sector; urban areas</p>	<p>March 2014 to approx. March 2016</p>	<p>National</p>
<p>Managing Climate Risk for Urban Poor</p>	<p>This program will help cities plan for and invest in reducing the impacts of weather-related changes and extreme events, through a partnership involving the DFID, the Rockefeller Foundation and the Asian Development Bank (ADB), on 2 million urban poor and vulnerable people in 25 medium-sized cities in six Asian countries (initially Pakistan, Bangladesh, India, Vietnam, Indonesia and the Philippines). The project aims to improve planning processes so that they consider climate change risks, for developing and funding new investment and infrastructure opportunities, and for knowledge and lesson sharing by 2018. The project will focus on physical investments such as housing, drainage, flood protection and wastewater systems, and systemic improvements (e.g. improving building codes).</p>	<p>DFID, ADB, and Rockefeller Foundation</p>	<p>Research; capacity building; knowledge communication; policy formation and integration; field implementation</p>	<p>Urban areas</p>	<p>September 2013 to December 2017</p>	<p>Regional Pakistan, Bangladesh, India, Indonesia, Philippines, Vietnam</p>	

<p>Pathways to Resilience in Semi-Arid Economies</p>	<p>To spur climate-resilient development in African and Asian semi-arid lands by identifying economic threats and opportunities resulting from climate change. The project will work with stakeholders in government, business, civil society, and regional economic organizations to research five areas: climate risk, institutional and regulatory frameworks, markets, natural capital, and human capital. Focusing on practical needs, the project will shed light on climate risks and opportunities, leading to better informed policies and investments for climate resilience.</p>	<p>DFID and IDRC through CARIAA CAD 13.5 million</p>	<p>Overseas Development Institute (UK), Innovation Environment Développement Afrique (Senegal), Centre for Climate Change Studies, University of Dar es Salaam (Tanzania), Grantham Research Institute, London School of Economics (UK), and Sustainable Development Policy Institute (Pakistan)</p>	<p>Research; capacity building; knowledge communication; policy formation and integration</p>	<p>Multisectoral</p>	<p>2014 to 2019</p>	<p>Global Pakistan, Tajikistan, Kenya, Tanzania, Burkina Faso, Senegal</p>
<p>Reducing Risks and Vulnerabilities from Glacier Lake Outburst Floods in Northern Pakistan</p>	<p>To reduce risks and vulnerabilities from GLOFs and snowmelt flash floods in northern Pakistan by developing the human and technical capacity of public institutions and vulnerable communities. These objectives are to be achieved by developing the capacity of government officials at the local and federal levels to understand the risks associated with GLOFs and their potential effects on human and economic development. The project also will improve risk mapping, early warning, and disaster prevention planning, and undertake demonstration projects at the village and district levels.</p>	<p>Adaptation Fund, GOP, and UNDP USD 7.906 million</p>	<p>UNDP and the Ministry of Environment</p>	<p>Capacity building; field implementation</p>	<p>Disaster risk management; government</p>	<p>November 2011 to approx. November 2015</p>	<p>National</p>

Resilient Cities Program	Strengthen cities' ability to prepare for and adapt to changing conditions, and to withstand and recover rapidly from disruptions related to climate change, natural disasters, and other systemic shocks.	Global Facility for Disaster Reduction and Recovery and the World Bank	Assessment	Disaster risk management; urban areas	December 2013 to unknown	Global Pakistan, Ethiopia, Vietnam
Rural Livelihoods and Climate Change Adaptation in the Himalayas	Working in the Hindu Kush–Himalayan region, the project aims to help poor and vulnerable mountain communities adapt to the impacts of climate change. Specifically, it aims to reduce poverty, increase resilience, and ensure equity and greater well-being between men and women. To achieve these objectives, it is working to build the capacity of local institutions, promote new livelihood options, and encourage regional cooperation.	European Union Eur 10 million	ICIMOD Local partners in Pakistan: WWF, Aga Khan Rural Support Programme, Pakistan Agricultural Research Council, Pakistan Institute of Development Economics, and Rural Support Programme Network	Watershed management; rural areas	January 2013 to December 2018	Regional Bangladesh, Nepal, Pakistan, Bhutan, Myanmar
Scoping a Programme of Work on Climate Compatible Development for Pakistan	The project aimed to help the GOP develop a nationally appropriate work program for climate-compatible development. Specifically, the project focused on scoping and developing Terms of Reference for projects under the themes of mitigation and adaptation. A complementary study was undertaken on absorptive capacity for climate finance.	DFID and the Netherlands through the CDKN GBP 93,700	IISD and Energy research Centre of the Netherlands	Government	February 2013 to July 2013	National
Sheltering from a Gathering Storm	This research program focused on peri-urban areas of India, Vietnam, and Pakistan facing risks from typhoons, floods, and extreme heat. It tested the hypothesis that	DFID and the Netherlands through the CDKN GBP 800,000	ISET-International in partnership with Hue University (Vietnam),	Buildings; urban areas	April 2012 to March 2014	Regional India, Pakistan, Vietnam

<p>most investments in climate-resilient shelter designs can have a positive benefit-to-cost ratio accruing to vulnerable populations over a 30-year design life.</p>	<p>The project aims to support adaptation under different climate change scenarios and more efficient use of scarce water by improving irrigation water management at the tertiary and field levels in Sindh Province. Activities will focus on watercourse improvements, precision land levelling, and promoting the use of high-efficiency irrigation systems to produce high-value row crops (e.g., orchards, flowers).</p>	<p>World Bank and the Governments of Pakistan and Sindh USD 242.2 million</p>	<p>Gorakhpur Environmental Action Group (India), ISET-Pakistan, and ISET-Nepal</p>	<p>Sindh Agriculture Department</p>	<p>Agriculture</p>	<p>Field implementation</p>	<p>March 2015 to December 2021</p>	<p>National</p>
<p>Strengthening the Resilience of Coastal Communities, and Economies to Sea-Level Rise and Coastal Erosion</p>	<p>The project aims to: (1) undertake situation analysis and assessment to identify and understand existing coastal ecosystems' vulnerabilities to coastal erosion and sea level rise in Pakistan and Thailand; (2) identify and design specific "pilot interventions" that could be considered for future replication and/or scaling up in other Mangroves for the Future countries, based on the national assessment; and (3) implement pilot interventions for managing sea level rise-induced coastal erosion in each country, from which lessons will be distilled and good practices identified.</p>	<p>Mangroves for the Future, Government of the Republic of Korea, and UNEP Coordinating Body on the Seas of East Asia USD 240,000</p>	<p>UNEP Coordinating Body of East Asia, MOCC, and Thailand Ministry of Natural Resources and Environment</p>	<p>Coastal zone management</p>	<p>Assessment; field implementation</p>	<p>January 2013 to December 2014</p>	<p>Regional Pakistan, Thailand</p>	
<p>The Vulnerability of Pakistan's Water Sector to</p>	<p>The project aims to: (1) develop a fuller picture of the current state of knowledge regarding the exposure</p>	<p>Overseas Technical Unit of the Italian Embassy in Pakistan</p>	<p>MOCC, UNDP, IISD and the Centre for</p>	<p>Research; knowledge communication</p>	<p>Freshwater supply</p>	<p>May 2015 to August 2016</p>	<p>National</p>	

<p>the Impacts of Climate Change: Identification of gaps and recommendations for action</p>	<p>of Pakistan’s water resources to the impacts of climate change and the potential socioeconomic ramifications of these impacts; (2) identify priority research gaps, and barriers to be overcome to fill these gaps; and (3) present options to enhance understanding of and capacity to respond to the vulnerability of Pakistan’s water resources to climate change through revised or new policies, research programs, and other initiatives.</p>	<p>Euros 200,000</p>	<p>Climate Research and Development at COMSATS Institute of Information Technology Islamabad.</p>
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## 8. References

- Adaptation Partnership. (2015). Activities. Retrieved from <https://sites.google.com/a/ccrdproject.com/adaptation-partnership2/activities>
- Ahmad, M., Iqbal, M., & Khan, M.A. (2013). Climate change brief: Climate change, agriculture and food security in Pakistan: Adaptation options and strategies. Retrieved from <http://pide.org.pk/pdf/Climate%20Change%20Brief.pdf>
- Akhtar, S. (2015). Sea level change, causes and impacts: A case study of Pakistan. In Atta-Ur-Rahman, A.N. Khan, & R. Shaw (Eds.), *Disaster risk approaches in Pakistan* (pp. 175–194). Tokyo: Springer. Retrieved from <https://books.google.ca/books?id=bfpNBgAAQBAI>
- Asian Development Bank (ADB). (2014a). Asian development outlook 2014 update. Retrieved from <http://www.adb.org/countries/pakistan/economy>
- Asian Development Bank (ADB). (2014b). Basic statistics 2014. Retrieved from <http://www.adb.org/publications/basic-statistics-2014>
- Atta-Ur-Rahman & Shaw, R. (2015). Introduction and approaches of disaster risk reduction in Pakistan. In Atta-Ur-Rahman, A.N. Khan, & R. Shaw (Eds.), *Disaster risk approaches in Pakistan* (pp. 3–30). Tokyo: Springer. Retrieved from <https://books.google.ca/books?id=bfpNBgAAQBAI>
- Begum, R., & Yasmeen, G. (2011). Contribution of Pakistani women in agriculture: Productivity and constraints. Retrieved from: [http://www.researchgate.net/publication/262419592\\_CONTRIBUTION\\_OF\\_PAKISTANI\\_WOMEN\\_IN\\_AGRICULTURE\\_PRODUCTIVITY\\_AND\\_CONSTRAINTS](http://www.researchgate.net/publication/262419592_CONTRIBUTION_OF_PAKISTANI_WOMEN_IN_AGRICULTURE_PRODUCTIVITY_AND_CONSTRAINTS)
- Central Intelligence Agency. (2015). The world factbook: Pakistan. Retrieved from <https://www.cia.gov/library/publications/the-world-factbook/geos/pk.html>
- Chaudhry, Q., Mahmood, A., Rasul, G., & Afzaal, M. (2009). Climate change indicators of Pakistan (Pakistan Meteorological Department Technical Report No. PMD-22/2009). Retrieved from <http://www.pmd.gov.pk/CC%20Indicators.pdf>
- Christensen, J.H., Krishna Kumar, K., Aldrian, E., An, S.-I., Cavalcanti, I.F.A., de Castro, M., ... Zhou, T. (2013). Climate phenomena and their relevance for future regional climate change. In T.F. Stocker, D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, ... P.M. Midgley (Eds.), *Climate change 2013: The physical science basis. Working group I contribution to the fifth assessment report of the Intergovernmental Panel on Climate Change* (pp. 1217–1308). Cambridge: Cambridge University Press.

Climate Change Division (CCD). (2013). Framework for implementation of climate change policy (2014–2030). Islamabad: Government of Pakistan.

Climate Change Division (CCD). (2014). Work programme for climate change adaptation and mitigation in Pakistan: Priority actions. Islamabad: Government of Pakistan.

Climate Change Division (CCD) & United Nations Environment Programme (UNEP). (2013). The environment and climate change outlook for Pakistan. Cambridge, UK: United National Environment Programme (UNEP) World Conservation Monitoring Centre.

Climate Funds Update. (2015, April 30). The data: Recipients of the funds. Retrieved from <http://www.climatefundsupdate.org/data>

Climate Service Center. (2013). Climate fact sheet: Pakistan. Retrieved from Hamburg, Germany: Climate Service Center.

Collaborative Adaptation Research Initiative in Africa and Asia (CARIAA). (2015). Targeting climate change hot spots: Introducing the Collaborative Adaptation Research Initiative in Africa and Asia (CARIAA). Retrieved from <http://www.idrc.ca/EN/Documents/CARIAA-ENG-4pp-A4-WEB.pdf>

Craig, T. (2015, September 8). In Pakistan, a prime minister and a country rebound—at least for now. The Washington Post. Retrieved from [https://www.washingtonpost.com/world/asia\\_pacific/in-pakistan-a-prime-minister-and-a-country-rebound--at-least-for-now/2015/09/07/4661049e-5173-11e5-8c19-0b6825aa4a3a\\_story.html](https://www.washingtonpost.com/world/asia_pacific/in-pakistan-a-prime-minister-and-a-country-rebound--at-least-for-now/2015/09/07/4661049e-5173-11e5-8c19-0b6825aa4a3a_story.html)

Department for International Development (DFID). (2006). Social protection in poor countries. Social protection briefing note series, number 1. Retrieved from GSDRC website: <http://www.gsdrc.org/docs/open/SP17.pdf>

Diamond, K. (2015, March 2). The case for better aid to Pakistan: Climate, health, demographic challenges demand new approach. New security beat. Retrieved from <https://www.newsecuritybeat.org/2015/03/case-aid-pakistan-climate-health-demographic-challenges-demand-approach/>

Economist Intelligence Unit. (2014). The South Asia Women's Resilience Index: Examining the role of women in preparing for and recovering from disasters. Retrieved from <https://www.eiuperspectives.economist.com/infrastructure-cities/south-asia-womens-resilience-index>

Energy research Centre of the Netherlands & International Institute for Sustainable Development (IISD). (2015). Initial list of mitigation options in Pakistan for the Low-Carbon Scenario project [Internal document].



Food and Agriculture Organization. (2015). Women in agriculture in Pakistan. Retrieved from <http://www.fao.org/3/a-i4330e.pdf>

Fund for Peace. (2014). Fragile states index 2014. Retrieved from <http://ffp.statesindex.org/>

Gillick, S. (2013). Helping communities to adapt to climate change in Pakistan [Blog post]. DFID bloggers. Retrieved from <https://dfid.blog.gov.uk/2013/08/07/adapting-to-climate-change-in-pakistan/>

Global Facility for Disaster Reduction and Recovery (GFDRR). (2011). Vulnerability, risk reduction and adaptation to climate change: Pakistan. Climate risk and adaptation country profile series. Washington, DC: The World Bank.

Global Facility for Disaster Reduction and Recovery (GFDRR). (2014). Pakistan. Country program update series. Retrieved from <https://www.gfdr.org/sites/gfdr/files/region/PK.pdf>

Government of Pakistan (GOP). (2014). Executive summary. In Annual plan 2014–15. Retrieved from <http://121.52.153.178:8080/xmlui/handle/123456789/6701>

Government of Pakistan (GOP). (2015). Members of the standing committee: Climate change. Retrieved from <http://www.na.gov.pk/en/cmnen.php?comm=ODY>

Government of Sindh. (2014). Summary: Forest, Environment & Wildlife Department annual development programme 2014–2015. Retrieved from <http://www.sindhpn.gov.pk/ADP/2014-15/13-Forest,%20Environment%20&%20Wildlife.pdf>

Government of Punjab. (2014). MTFD 2014–17: Development program 2014–15. Retrieved from [http://pnd.punjab.gov.pk/system/files/ADP%202014-15\\_0.pdf](http://pnd.punjab.gov.pk/system/files/ADP%202014-15_0.pdf)

Hartmann, D.L., Klein Tank, A.M.G., Rusticucci, M., Alexander, L.V., Brönnimann, S., Abdul-Rahman Charabi, Y., ... Zhai, P.M. (2013). Observations: Atmosphere and surface. In T.F. Stocker, D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, ... P.M. Midgley (Eds.), *Climate change 2013: The physical science basis. Working group I contribution to the fifth assessment report of the Intergovernmental Panel on Climate Change* (pp. 159–254). Cambridge: Cambridge University Press.

Hijioka, Y., Lin, E., Pereira, J.J., Corlett, R.T., Cui, X., Insarov, G.E., ... Surjan, A. (2014). Asia. In V. Barros, C. Field, D. Dokken, M. Mastrandrea, K. Mach, T. Bilir, ... L. White (Eds.), *Climate change 2014: Impacts, adaptation and vulnerability. Part B: Regional Aspects. Working group II contribution to the fifth assessment report of the Intergovernmental Panel on Climate Change* (pp. 1327–1370). Cambridge: Cambridge University Press.

Intergovernmental Panel on Climate Change (IPCC). (2001). Annex B. Glossary of terms. In *Climate change 2001: Impacts, adaptation and vulnerability*. Retrieved from <http://www.ipcc.ch/pdf/glossary/tar-ipcc-terms-en.pdf>

Intergovernmental Panel on Climate Change (IPCC). (2013). Summary for policymakers. In T.F. Stocker, D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, ... P.M. Midgley (Eds.), *Climate change 2013: The physical science basis. Working group I contribution to the fifth assessment report of the Intergovernmental Panel on Climate Change* (pp. 3–29). Cambridge and New York: Cambridge University Press.

International Centre for Integrated Mountain Development (ICIMOD). (2016). Partnering for better livelihoods in Upper Indus. Retrieved from <http://www.icimod.org/?q=21181>

International Union for the Conservation of Nature (IUCN) Pakistan. (2009). Policy gap analysis: Government of Pakistan's agriculture and water policies with respect to climate change. Islamabad: IUCN Pakistan. Retrieved from [http://cmsdata.iucn.org/downloads/policy\\_gap\\_analysis\\_report.pdf](http://cmsdata.iucn.org/downloads/policy_gap_analysis_report.pdf)

Janjua, S. (2009). Climate change impacts: Adaptation challenges for Pakistan. *The International Journal of Climate Change: Impacts and Responses*, 1(4), 1–16.

Khan, F.I. (2011). Institutional arrangements for climate change in Pakistan (Project report series 19). Islamabad: Sustainable Development Policy Institute.

Khan, M., Amir, P., Ramay, S., Munawar, Z., & Ahmad, V. (2011). National economic & environmental development study. Islamabad: Government of Pakistan, Ministry of Environment.

Khan, M., & Pervaiz, A. (2012). National sustainable development strategy: Pakistan's pathway to a sustainable and resilient future. Islamabad: Government of Pakistan and UNDP.

Khan, M.A. (2015). Climate change risk and reduction approaches in Pakistan. In Atta-Ur-Rahman, A.N. Khan, & R. Shaw (Eds.), *Disaster risk approaches in Pakistan* (pp. 195–216). Tokyo: Springer. Retrieved from <https://books.google.ca/books?id=bfpNBgAAQBAI>

Khan, R.S. (2015). Pakistan reinstates ministry for climate change [Blog post]. Retrieved from <http://www.lead.org.pk/lead/postDetail.aspx?postid=199>

Kilroy, G. (2015). A review of the biophysical impacts of climate change in three hotspot regions in Africa and Asia. *Regional Environmental Change*, 15(5), 771–782. Retrieved from <http://link.springer.com/article/10.1007%2Fs10113-014-0709-6>

Kovach, T. (2015, July 8). Karachi's heat wave a sign of future challenges to Pakistan's fragile democracy. *New Security Beat*. Retrieved from

<http://www.newsecuritybeat.org/2015/07/karachis-heat-wave-sign-future-challenges-pakistans-fragile-democracy/>

Kreft, S., Eckstein, D., Junghans, L., Kerestan, C., & Hagen, U. (2014). Global climate risk index 2015. Who suffers most from extreme weather events? Weather-related loss events in 2013 and 1994 to 2013. Bonn: Germanwatch e.V.

LEAD Pakistan. (n.d.). Knowledge network on climate change. Retrieved from [http://www.lead.org.pk/cc/knowledgenetwork\\_climate\\_change.html](http://www.lead.org.pk/cc/knowledgenetwork_climate_change.html)

Ministry of Climate Change (MOCC). (2012a). National climate change policy. Islamabad: Government of Pakistan.

Ministry of Climate Change (MOCC). (2012b). National disaster risk reduction policy. Islamabad: Government of Pakistan.

Ministry of Environment. (2005). National environmental policy 2005. Islamabad: Government of Pakistan.

Ministry of Environment. (2009). National drinking water policy. Retrieved from <http://waterinfo.net.pk/sites/default/files/knowledge/Pakistan National Drinking Water Policy - 2009.pdf>

Ministry of Environment. (2010). National forest policy 2010. Islamabad: Government of Pakistan. Retrieved from <http://sindhforests.gov.pk/admin/MediaLibrary/National%20Forest%20Policy%202010.pdf>

Ministry of Finance. (2014a). Overview of the economy. In Pakistan economic survey 2013–14 (pp. i–xv). Retrieved from [http://finance.gov.pk/survey/chapters\\_14/Overview.pdf](http://finance.gov.pk/survey/chapters_14/Overview.pdf)

Ministry of Finance. (2014b). The federal medium term budget estimates for service delivery 2014–17. Islamabad: Government of Pakistan.

Ministry of National Food Security and Research (MNFSR). (2013). Agriculture and food security policy (draft). Islamabad: Government of Pakistan.

Ministry of Planning, Development and Reform (MPDR) & United Nations Development Programme (UNDP). (2013). Pakistan millennium development goals report 2013. Islamabad: Government of Pakistan.

Ministry of Planning, Development and Reform (MPDR). (2014). Pakistan 2025: One nation—One vision. Islamabad: Government of Pakistan. Retrieved from <http://fics.seecs.edu.pk/Vision/Vision-2025/Pakistan-Vision-2025.pdf>

Nachmany, M., Fankhauser, S., Townshend, T., Collins, M., Landesman, T., Matthews, A., ... Setzer, J. (2014). Pakistan. In *The GLOBE climate legislation study: A review of climate change legislation in 66 countries* (4th ed.) (pp. 434–441). London: GLOBE International and the Grantham Research Institute, London School of Economics. Retrieved from <http://www.globeinternational.org/pdfviewer>

Notre Dame Global Adaptation Index (ND-GAIN). (2015a). Country rankings. Retrieved from <http://index.gain.org/ranking>

Notre Dame Global Adaptation Index (ND-GAIN). (2015b). Pakistan. Retrieved from <http://index.gain.org/country/pakistan>

Organisation for Economic Co-operation and Development (OECD). (2011). Handbook on the OECD-DAC climate markers. Retrieved from <http://www.oecd.org/dac/stats/48785310.pdf>

Organisation for Economic Co-operation and Development (OECD). (2015). Rio markers. Retrieved February 7, 2015, from [https://public.tableausoftware.com/views/Climate-Related-Aid/IntegratedBi-multi?:embed=y&:display\\_count=no?&:showVizHome=no#1](https://public.tableausoftware.com/views/Climate-Related-Aid/IntegratedBi-multi?:embed=y&:display_count=no?&:showVizHome=no#1)

Parry, J., Keller, M., & Murphy, D. (2013). Identifying priority adaptation actions in Pakistan: A situation analysis. Winnipeg: International Institute for Sustainable Development.

Planning Commission. (2007). *Pakistan in the 21st century: Vision 2030*. Islamabad: Government of Pakistan. Retrieved from <http://greatgwadar.com/vzpanel/docs/PakistanVision2030.pdf>

Planning Commission. (2010a). *Pakistan millennium development goals report 2010*. Retrieved from <http://www.pc.gov.pk/mdgs-pak2010.html>

Planning Commission. (2010b). *Task force on climate change: Final report*. Islamabad: Government of Pakistan.

Planning Commission. (2011). *Pakistan: Framework for economic growth*. Islamabad: Government of Pakistan.

Punjab Environmental Protection Agency. (2012). *Capacity building of stakeholders for mitigating climate change impacts and earning money from carbon fund*. Retrieved from <http://epd.punjab.gov.pk/?q=cbsb>

Responding to Climate Change. (2013). *Pakistan's climate change laws*. Retrieved from <http://www.rtcc.org/2013/09/02/pakistans-climate-change-laws/>

Salik, K., Ishfaq, S., Saeed, F., Noel, E., & Syed, Q. (2015). *Pakistan: Country situation assessment* [Working paper]. Sustainable Development Policy Institute. Retrieved from <https://sdpi.org/publications/files/Pakistan-Country-Situation-Assessment.pdf>

Sattar, T. (2012). A sociological analysis of constraining factors of development in agriculture sector of Pakistan. *Journal of Economics and Sustainable Development*, 3(8), 8–24. Retrieved from <http://www.iiste.org/Journals/index.php/IJEDS/article/view/2303>

Shaikh, S., & Tunio, S. (2015). Pakistan pushes to put stalled climate policy into action. *PreventionWeb*. Retrieved from <http://www.preventionweb.net/news/view/44142>

Sud, R., Mishra, A., Varma, N., & Bhadwal, S. (2015). Adaptation policy and practice in densely populated glacier-fed river basins of South Asia: A systematic review. *Regional Environmental Change*, 15(5), 825–836. Retrieved from <http://link.springer.com/article/10.1007%2Fs10113-014-0711-z>

Tariq, A., Tabasam, N., Bakhsh, K., Ashfaq, M., & Hassan, S. (2014). Food security in the context of climate change in Pakistan. *Pakistan Journal of Commerce and Social Sciences*, 8(2), 540–550.

Transparency International. (2014). *Corruption perceptions index 2014: Results*. Retrieved from <http://www.transparency.org/cpi2014/results>

United Nations Development Programme (UNDP). (2014). *Human development report 2014: Sustaining human progress: Reducing vulnerabilities and building resilience*. Retrieved from <http://hdr.undp.org/en/content/human-development-report-2014>

United Nations Development Programme (UNDP). (2015). International development partners visit glacier lakes outburst floods (GLOF) project in Gilgit. Retrieved from <http://www.pk.undp.org/content/pakistan/en/home/presscenter/articles/2015/10/15/undp-inaugurates-project-to-protect-remote-communities-from-glac.html>

United Nations Entity for Gender Equality and the Empowerment of Women. (n.d.). *Gender mainstreaming: Concepts and definitions*. Retrieved from <http://www.un.org/womenwatch/osagi/conceptsanddefinitions.htm>

United Nations Environment Programme (UNEP). (2007). *Glossary*. In *Global environment outlook 4*. Retrieved from <http://www.unep.org/geo/geo4/report/Glossary.pdf>

United Nations International Strategy for Disaster Reduction. (2009). *2009 UNISDR terminology on disaster risk reduction*. Retrieved from [http://unisdr.org/files/7817\\_UNISDRTerminologyEnglish.pdf](http://unisdr.org/files/7817_UNISDRTerminologyEnglish.pdf)

United States Agency for International Development. (2014). *Where we work: Afghanistan and Pakistan*. Retrieved from <http://www.usaid.gov/where-we-work/afghanistan-and-pakistan>

World Bank. (2006). *Pakistan—Strategic country environmental assessment. Volume II: Technical annex. The cost of environmental degradation in Pakistan—An analysis of physical and monetary losses in environmental health and natural resources (Report No.*

36946-PK). Washington, DC: World Bank. Retrieved from <http://documents.worldbank.org/curated/en/2006/08/7100395/pakistan-strategic-country-environmental-assessment-vol-2-2-cost-environmental-degradation-pakistan-analysis-physical-monetary-losses-environmental-health-natural-resources>

World Bank. (2013). Turn down the heat: Climate extremes, regional impacts and the case for resilience. A report for the World Bank by the Potsdam Institute for Climate Impact Research and Climate Analytics. Washington: World Bank. Retrieved from <http://documents.worldbank.org/curated/en/2013/06/17862361/turn-down-heat-climate-extremes-regional-impacts-case-resilience-full-report>

World Bank. (2015a). Data: Pakistan. Retrieved from <http://data.worldbank.org/country/pakistan>

World Bank. (2015b). Databank: Indicators. Retrieved from <http://data.worldbank.org/indicator>

World Bank. (2015c). Pakistan dashboard. Climate change knowledge portal. Retrieved from [http://sdwebx.worldbank.org/climateportalb/home.cfm?page=country\\_profile&CCode=PAK&ThisTab=Dashboard](http://sdwebx.worldbank.org/climateportalb/home.cfm?page=country_profile&CCode=PAK&ThisTab=Dashboard)

World Health Organization. (n.d.). Frequently asked questions. Retrieved from <http://www.who.int/suggestions/faq/en/index.html>

World Economic Forum. (2015). Country/economy profiles: Pakistan. In K. Schwab (Ed.), The Global Competitiveness Report 2015–2016 (pp. 288–289). Geneva: World Economic Forum. Retrieved from [http://www3.weforum.org/docs/gcr/2015-2016/Global Competitiveness Report 2015-2016.pdf](http://www3.weforum.org/docs/gcr/2015-2016/Global%20Competitiveness%20Report%202015-2016.pdf)

World Wild Fund for Nature Pakistan (WWF-Pakistan). (2015). WWF-Pakistan and LUMS launch report to highlight the impacts of climate change on agriculture. Retrieved from [http://www.wwf-pakistan.org/newsroom/150415\\_lums.php](http://www.wwf-pakistan.org/newsroom/150415_lums.php)

Yu, W., Yang, Y., Savitsky, A., Alford, D., Brown, C., Wescoat, J., ... Robinson, S. (2013). Executive Summary. In The Indus Basin of Pakistan: The impacts of climate risks on water and agriculture. Washington, DC: World Bank.





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